SOAP
Society for Obstetric Anesthesia and Perinatology

46TH ANNUAL MEETING SYLLABUS

NEW APPROACHES TO OLD PROBLEMS IN OBSTETRIC ANESTHESIA

MAY 14-18, 2014

SHERATON CENTRE TORONTO HOTEL

TORONTO, ONTARIO CANADA

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American Society of Anesthesiologists

SOAP
Society for Obstetric Anesthesia and Perinatology

The Society for Obstetric Anesthesia and Perinatology Presents:

SOAP 46TH ANNUAL MEETING: "NEW APPROACHES TO OLD PROBLEMS IN OBSTETRIC ANESTHESIA"

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Society for Obstetric Anesthesia and Perinatology

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WELCOME TO THE 2014 ANNUAL MEETING IN TORONTO, ONTARIO, CANADA

Dear Colleagues and Accompanying Guests,

Welcome to Toronto and to the 46th SOAP Annual Meeting. As two members who have attended numerous annual meetings, we promise to provide you with the sessions you have come to expect and to love, while trying some new ones to hopefully pique your interest.

The meeting will be held in an exciting city with plenty of things to do. Toronto is the most populated city in Canada and is the capital of the province of Ontario. It is home to the famous CN Tower and the Casa Loma. While it is also home to the Toronto Blue Jays and Raptors, the main sport is hockey with the Toronto Maple Leafs. In order to insure that you get a true flavor of hockey, the opening reception will take place at the Hockey Hall of Fame, where you will learn everything you wanted about hockey while getting the once in a lifetime opportunity to see the Stanley Cup. The city is renowned as one of the most multicultural in the world and offers many different cuisines; you will be able to taste any type you desire within a short walk of the hotel. Please attend the complimentary early morning yoga sessions at the hotel, as you may find this an activity that will energize you to fully experience your day. The farewell banquet will be at the hotel and will offer the opportunity to relax and share some memories with colleagues. The hotel is centrally located and complimentary WiFi will be available in your room. Toronto is an easy city to explore and the best way to do it is walking and using public transportation or short cab rides. You will be steps away from plenty of shops and attractions (including the recently open aquarium just across from the CN Tower).

The pre-meeting activities will feature must-attend workshops. They are meant to address your practical needs. If you want to improve the education of your residents, nurses, or colleagues, the education workshop is definitely a must. It will prepare you for small group teaching as well as for that presentation for a larger audience. Given the popularity of the ultrasound workshops presented in previous years, we will continue to offer the comprehensive workshop on the use of ultrasound for obstetric anesthesia, as well as the one on transthoracic echocardiography. Finally, for those involved in MOCA®, one workshop will have you examine your practice concerning epidural analgesia for labor. By participating and by doing the required follow-up, you will be able to earn MOCA® Part IV credits: Practice Performance Assessment and Improvement.

The meeting will start with the Gertie Marx Competition, a tradition in which the future leaders in obstetric anesthesia have the opportunity to present their research. This session is judged with prizes awarded. Speaking of fellows, the Obstetric Anesthesia Fellowship has recently been accredited by the Accreditation Council for Graduate Medical Education. This achievement represents the hard work and dedication of Alan Santos, who will be receiving the distinguished service award. Eleni Tsigas, the executive director for the Preeclampsia Foundation, one of the largest patient-run advocacy groups and with representation in the American College of Obstetricians and Gynecologists, will be presenting. She will discuss what patients with preeclampsia wished their anesthesia providers knew. There will be multiple sessions presenting cutting edge research in obstetric anesthesia and perinatology, with oral presentations and poster reviews. There will also be a session discussing big data, which will help those interested in understanding and/or getting started in this type of research.

The first SOAP American Idol will occur. Junior faculty members will present on current topics in obstetric anesthesia and the membership will elect their favorite lecturer. The winner will be invited to present at the Sol Shnider meeting. Furthermore, there will be two patient safety panels that will provide very useful and practical information. For those involved in MOCA®, these panels will offer patient safety credits. The featured speaker for What's New in Obstetrics will be Dr. John Kingdom, a world leader in the management of women with preeclampsia. Last but not least, we will bring back the What's New in Neonatology to update us on the post-delivery management of the hypoxic neonate.

We are committed to offering you a meeting that provides outstanding learning in an atmosphere of great collegiality. The distinguishing feature of SOAP from other meetings is the people. Take the time to meet your colleagues and make new friends. Do not hesitate to contact either of us with questions, concerns and suggestions before or during the meeting. We want to make sure you leave Toronto thinking that this SOAP meeting was the best one to date!

Looking forwarding to seeing you all in Toronto,

Yours truly,

Robert R. Gaiser, M.D.
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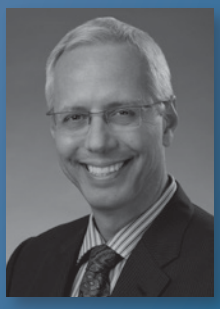

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PROGRAM INFORMATION

Mission Statement

The Society for Obstetric Anesthesia and Perinatology (SOAP) was founded in 1968 to provide a forum for discussion of problems unique to the peripartum period. SOAP is comprised of anesthesiologists, obstetricians, pediatricians, and basic scientists who share an interest in the care of the pregnant patient and the newborn.

The mission of this Society is to improve the pregnancy-related outcomes of women and neonates through the support of obstetric anesthesiology research, the provision of education to its members, other providers, and pregnant women, and the promotion of excellence in clinical anesthetic care.

A membership in SOAP is an opportunity to meet people who share your interests, and to stimulate improvements in health care for pregnant patients.

ACCME Accreditation and Designation Statements

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology. The American Society of Anesthesiologists is accredited by the ACCME to provide continuing medical education for physicians.

The American Society of Anesthesiologists designates this live activity for a maximum of 32 *AMA PRA Category 1 Credits*™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

*This amount includes the optional Pre-Meeting Workshops and Breakfast Panels.

Target Audience

The SOAP 46th Annual Meeting is intended for anesthesiologists, obstetricians, neonatologists, obstetric medicine specialists, maternal-fetal medicine specialists, residents, fellows and medical students. The Society supports the attendance by associate members in the educational sessions of the annual meeting. The program is generated from member requests and an assessment of need by the Program Committee. Attendance at this meeting does not guarantee competency or proficiency in the performance of any procedures which may be discussed or taught during the course.

Mission of SOAP Program Committee

The mission of the Society's Program Committee is to provide anesthesiologists, obstetricians, and other physicians and members of related allied health specialties with the knowledge that will reinforce past learning as well as disseminate new concepts, practices, and skills involving anesthesia and analgesia for the pregnant woman.

Participation in the SOAP 46th Annual Meeting

Attendance shall be open to all health practitioners, provided that they have registered for the meeting. CME credit will only be offered to M.D.s, D.O.s or equivalent. A completed Physician Verification of Attendance form must be turned in to SOAP at the conclusion of the meeting. The form will be available on-site.

Educational Format

CME activities may include the following formats: plenary sessions, debates, lectures, poster discussions, oral abstracts, problem-based learning, and skill-set workshops.

Annual Meeting Objectives

At the completion of this conference the participants should be able to:

1. Formulate comprehensive care plans for parturients with hemorrhage, severe preeclampsia and cardiovascular disease;
2. Explain the purpose of large database studies and formulate a plan for the interpretation of results from these studies;
3. Identify key elements for communication on the labor suite and develop a plan for the management of colleagues who experience an adverse outcome in the labor suite;
4. Explain the common problems confronting the parturient post-partum and increase involvement of the provider in the management of the parturient post-partum;
5. Decide whether remifentanil should be routinely offered as a means of analgesia to the laboring patient;
6. Formulate appropriate anesthetic care plans for management of complex, high-risk, and/or rare clinical cases;
7. Identify, discuss and critically evaluate current and recent peer-reviewed research related to obstetric anesthesia, obstetrics, perinatology, and allied medical disciplines;
8. Design and implement research investigations related to obstetric anesthesia, obstetrics, perinatology, and allied medical disciplines that are built upon the foundations of current research investigations;
9. Compare recent findings related to obstetric anesthesia to the prevailing standard of care, and adjust patient care plans accordingly;
10. Recognize factors related to academic success in obstetric anesthesia and apply that to career development;
11. Improve the management of the hypoxic neonate and explain the role of the provider and anesthetic management for cerebral protection

Special Needs Statement

The American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology are committed to making its activities accessible to all individuals and fully comply with the legal requirements of the Americans with Disabilities Act and the rules and regulations thereof. If you are in need of an accommodation, please do not hesitate to call the SOAP office at (414) 389-8611 and/or submit a description of your needs in writing to soap@soap.org.

Commercial Support Acknowledgement

This CME activity is supported by in-kind donations.

Mindray: Ultrasound Systems
Sonosite: Ultrasound Systems
Zonare: Ultrasound Systems and Probes

Disclosure

The American Society of Anesthesiologists adheres to ACCME Essential Areas, Standards, and Policies regarding industry support of continuing medical education. Disclosure of the planning committee and faculty's commercial relationships will be made known at the time of the activity. Faculty are required to openly disclose any limitations of data and/or any discussion of any off-label, experimental, or investigational uses of drugs or devices.

Resolution of Conflicts of Interest

In accordance with the ACCME Standards for Commercial Support of CME, the American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology will implement mechanisms, prior to the planning and implementation of this CME activity, to identify and resolve conflicts of interest for all individuals in a position to control content of this CME activity.

PROGRAM SCHEDULE

Wednesday, May 14, 2014

Concourse Level	7:00 a.m. - 6:00 p.m.	**Registration Hours**
Sheraton Hall C	8:00 a.m. - 12:00 p.m.	**Teaching Obstetric Anesthesia in 2014 Workshop** *Course Directors: William R. Camann, M.D.; Regina Y. Fragneto, M.D.; Richard C. Month, M.D.; Manuel C. Vallejo, Jr., M.D., D.M.D.*
Sheraton Hall AB	8:00 a.m. - 12:00 p.m.	**The Use of Ultrasound in Obstetric Anesthesia: Vascular Access, Neuraxial Anesthesia, TAP Block and Gastric Assessment Workshop** *Course Director: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC*
Sheraton Hall AB	1:00 p.m. - 5:00 p.m.	**Use of the Transthoracic Echocardiogram in the Management of the High Risk Parturient Workshop** *Course Directors: Brendan Carvalho, M.B.B.Ch., FRCA, M.D.C.H.; John T. Sullivan, M.D., M.B.A.*
Sheraton Hall C	1:00 p.m. - 5:00 p.m.	**Management of the Failed Epidural Workshop** *Course Directors: Regina Y. Fragneto, M.D.; Robert R. Gaiser, M.D.; Vernon H. Ross, M.D.*
	6:00 p.m. - 8:00 p.m.	**Welcome Reception at the Hockey Hall of Fame** Hockey Hall of Fame, Brookfield Place, 30 Yonge Street, Toronto, Ontario, Canada M5E1X8

Thursday, May 15, 2014

Concourse Level	6:00 a.m. - 6:00 p.m.	**Registration Hours**
Osgoode Ballroom	6:00 a.m. - 7:00 a.m.	**Yoga Class (Optional)**
Grand East	6:30 a.m. - 7:15 a.m.	**Continental Breakfast & Poster Viewing – *Exhibits Open***
Grand West and Centre	7:15 a.m. - 7:30 a.m.	**Welcome to the 46th Annual Meeting** *Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC; Robert R. Gaiser, M.D., Barbara M. Scavone, M.D.*
Grand West and Centre	7:30 a.m. - 9:00 a.m.	**Gertie Marx Research Competition** *Moderator: Gerard M. Bassell, M.D.*
Grand West and Centre	9:00 a.m. - 9:15 a.m.	**Distinguished Service Award** Recipient: Alan C. Santos, M.D., M.P.H. *Presenter: David J. Wlody, M.D.*
Sheraton Hall EF	9:15 a.m. - 10:00 a.m.	**Coffee Break, Exhibits & Poster Viewing**
Grand West and Centre	10:00 a.m. - 11:00 a.m.	**Special Lecture – Preeclampsia: What Patients Want You to Know** *Introduction: Robert R. Gaiser, M.D.* *Speaker: Eleni Tsigas*
Grand West and Centre	11:00 a.m. - 12:00 p.m.	**Research Hour of Power** •**Introduction to Big Data for Use in OB Research Including Methodological Considerations** *Speaker: Brian T. Bateman, M.D., M.Sc.* •**What Big Data has Taught Us About Postpartum Hemorrhage** *Speaker: Alexander Butwick, M.D.*

PROGRAM SCHEDULE *continued*

Thursday, May 15, 2014 (continued)

Grand West and Centre	12:00 p.m. - 1:30 p.m.	**SOAP Business Meeting & Elections** Boxed lunch will be provided in Grand East.
Grand West and Centre	1:30 p.m. - 2:30 p.m.	**Oral Presentation 1** *Moderator: Stephanie R. Goodman, M.D.*
Grand West and Centre	2:30 p.m. - 3:30 p.m.	**Poster Session 1** *Moderator: Yehuda Ginosar, B.Sc., M.B., B.S.*
Grand East and Sheraton Hall EF	3:30 p.m. - 4:00 p.m.	**Coffee Break, Exhibits & Poster Viewing**
Grand West and Centre	4:00 p.m. - 5:30 p.m.	**Obstetric Anesthesia American Idol** *Host: Robert R. Gaiser, M.D.* *Judges: Joy L. Hawkins, M.D.; Kenneth E. Nelson, M.D.; Scott Segal, M.D.*

Friday, May 16, 2014

Concourse Level	6:00 a.m. - 2:00 p.m.	**Registration Hours**
Grand East and Sheraton Hall EF	6:30 a.m. - 7:45 a.m.	**Continental Breakfast, Exhibits & Poster Viewing – *Exhibits Open***
Grand West and Centre	7:45 a.m. - 9:00 a.m.	**Best Paper Session** *Moderator: Paloma Toledo, M.D., M.P.H.*
Grand West and Centre	9:00 a.m. - 10:30 a.m.	**Caring for Our Own: Focusing on the Care Provider to Optimize Safety for Our Patients** •**Teaching Effective Communication on Labor & Delivery** *Speaker: May C.M. Pian-Smith, M.D., M.S.* •**The Second Victim** *Speaker: Stephen Pratt, M.D.* •**Motivating the Rat: Managing the Disruptive Co-Worker** *Speaker: Lawrence C. Tsen, M.D.*
Grand East and Sheraton Hall EF	10:30 a.m. - 11:15 a.m.	**Coffee Break, Exhibits and Poster Viewing**
Grand West and Centre	11:15 a.m. - 12:15 p.m.	**What's New in Obstetrics? Pathogenesis, Prevention & Management of Severe Preeclampsia** *Introduction: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC* *Speaker: John Kingdom, M.D.*
Grand West and Centre	12:15 p.m. - 1:15 p.m.	**Poster Session 2** *Moderator: Richard C. Month, M.D.*
Grand West and Centre	1:15 p.m. - 1:30 p.m.	**Meta-Analyses** *Moderator: Robert R. Gaiser, M.D.*
Sheraton Hall EF	1:30 p.m.	**Open Afternoon** Poster Viewing

PROGRAM SCHEDULE *continued*

Saturday, May 17, 2014

Concourse Level	6:00 a.m. - 5:00 p.m.	**Registration Hours**
Osgoode Ballroom	6:00 a.m. - 7:00 a.m.	**Yoga Class (Optional)**
Grand East and Sheraton Hall EF	6:30 a.m. - 7:45 a.m.	**Continental Breakfast & Poster Viewing**
Grand West and Centre	7:45 a.m. - 9:00 a.m.	**Oral Presentation 2** *Moderator: Klaus Kjaer, M.D.*
Grand West and Centre	9:00 a.m. - 10:00 a.m.	**Fred Hehre Lecture** *Introduction: Barbara M. Scavone, M.D.* *Speaker: David J. Wlody, M.D.*
Grand East and Sheraton Hall EF	10:00 a.m. -10:45 a.m.	**Coffee Break & Poster Viewing**
Grand West and Centre	10:45 a.m. - 11:45 a.m.	**Gerard W. Ostheimer Lecture: What's New in OB Anesthesia?** *Introduction: Arvind Palanisamy, M.D., FRCA* *Speaker: Lisa R. Leffert, M.D.*
Sheraton Hall EF	11:45 a.m. - 12:45 p.m.	**Lunch On Your Own & Poster Viewing**
Grand West and Centre	12:45 p.m. - 2:00 p.m.	**Host's Panel – Getting New Moms Ready to Rock in the Post-Partum: Obstetric Anesthesia Beyond Labor and Delivery** *Moderator: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC* •**Quality of Recovery in the Postpartum** *Speaker: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC* •**Hemoglobin Issues** *Speaker: Robin Russell, M.D.* •**Mood Issues** *Speaker: Beverly Young, M.D., FRCPC* •**Infection Issues** *Speaker: Allison McGeer, M.D., M.Sc., FRCPC*
Grand West and Centre	2:00 p.m. - 3:00 p.m.	**Poster Session 3** *Moderator: Michaela K. Farber, M.D., M.S.*
Grand East and Sheraton Hall EF	3:00 p.m. - 3:30 p.m.	**Coffee Break & Poster Viewing**
Grand West and Centre	3:30 p.m. - 3:50 p.m.	**Gertie Marx Recipients** *2012 Recipient* *Mrinalini Balki, M.B., B.S., M.D.,* *2013 Recipient* *Terrence K. Allen, M.B., B.S.*
Grand West and Centre	3:50 p.m. - 5:00 p.m.	**Pro-Con Debate: Remifentanil Should Be Routinely Offered for Labor Analgesia** *Moderator: McCallum R. Hoyt, M.D., M.B.A.* *Pro: David Bogod, M.B., B.S., FRCA, LLM* *Con: Mark I. Zakowski, M.D.*
Cocktails in Waterfall Garden and Provincial Ballroom for Dinner	6:00 p.m. - 10:00 p.m.	**SOAP Banquet at the Sheraton Centre Toronto Hotel**

PROGRAM SCHEDULE *continued*

Sunday, May 18, 2014

Concourse Level	6:30 a.m. - 12:00 p.m.	**Registration Hours**
Grand East	7:00 a.m. - 8:00 a.m.	**Continental Breakfast**
	7:00 a.m. - 8:30 a.m.	**Breakfast Panels**
Sheraton A		**Legends Remembered** *Speakers: Gerard M. Bassell, M.D.; Brenda A. Bucklin, M.D.; Patricia A. Dailey, M.D.; Robert R. Gaiser, M.D.; Richard M. Smiley, M.D., Ph.D.; Lawrence C. Tsen, M.D.*
Sheraton B		**Publication in Obstetric Anesthesia** *Speakers: Pamela Flood, M.D.; Robin Russell, M.D.; Cynthia A. Wong, M.D.*
Sheraton C		**A Career in Obstetric Anesthesia** *Speakers: Craig Palmer, M.D., Senior Career Member Perspective; Edward A. Yaghmour, M.D., Mid Career Member Perspective; Paloma Toledo, M.D., M.P.H., Junior Career Member Perspective*
Grand West and Centre	8:30 a.m. - 10:00 a.m.	**Practical Suggestions for Improving Safety in Your Unit** **Safety Rounds Beyond Board Sign Out** *Speaker: Yaakov Beilin, M.D.* **Team Training: Emergency Manuals Implementation, Crisis Simulation & Critical Event Debriefing** *Speaker: David L. Hepner, M.D., M.P.H.* **Equipment Rounds: Ways to Be Sure the Suction Works When You Need It** *Speaker: Edward McGonigal, M.D.*
Grand West and Centre	10:00 a.m. - 11:00 a.m.	**What's New in Neonatology? Avoiding Hypothermia/ Hyperthermia in the Delivery Room in the Newly Born Infant has Significant Beneficial Downstream Consequences** *Introduction: Klaus Kjaer, M.D.* *Speaker: Jeff Perlman, M.B., Ch. B.*
Grand West and Centre	11:00 a.m. - 12:00 p.m.	**Best Case Reports Review** *Moderator: Manuel C. Vallejo, Jr., M.D., D.M.D.*

PROGRAM MATERIAL

Wednesday, May 14, 2014

Teaching Obstetric Anesthesia in 2014 Workshop
Course Directors: William R. Camann, M.D.; Regina Y. Fragneto, M.D.; Richard C. Month, M.D.; Manuel C. Vallejo, Jr., M.D., D.M.D.

Use of the Transthoracic Echocardiogram in the Management of the High Risk Parturient Workshop
Course Directors: Brendan Carvalho, M.B.B.Ch., FRCA, M.D.C.H.; John T. Sullivan, M.D., M.B.A.

Management of the Failed Epidural Workshop
Course Directors: Regina Y. Fragneto, M.D.; Robert R. Gaiser, M.D.; Vernon H. Ross, M.D.

Title: How to Create a "WOW" Lecture in Obstetric Anesthesiology!

Speaker: William Camann, MD
Director, Obstetric Anesthesia, Brigham & Women's Hospital, Harvard Medical School, Boston, MA, USA

Objectives and Key Points:

1. Understand basic principles of public speaking, including how to maintain your audience's attention, how to properly behave in front of an audience, nuances of body language, and how to dress appropriately.

2. Recognize common verbal tics and mistakes often made when speaking publically, and how to learn from both good and bad public speakers.

3. Develop smooth transitions and appropriate flow to your talk.

4. Learn what NOT TO DO when delivering a lecture. (i.e., you want your lecture to be fantastic and memorable, learn how to make this happen)

5. Understand basic and advanced concepts in powerpoint construction, including an understanding (examples to be provided!) of the common "crimes" of poor powerpoint.

6. Understand basic and advanced concepts in fielding questions from your audience, including those from difficult people and handling the abusive/ludicrous/challenging question.

7. Summary: Not everyone is a naturally gifted, eloquent, talented public speaker. Nonetheless, everyone can still give a good public talk. I will show you how to do this.

Title: Teaching Obstetric Anesthesia in 2014 Workshop: Obstetric Anesthesia and the Milestone Project

Regina Fragneto, M.D., University of Kentucky College of Medicine, Lexington, KY

Objectives:

1. Participants will understand the Accreditation Council for Graduate Medical Education's outcomes-based milestones for anesthesiology and their role in the Next Accreditation System.
2. Participants will be able to identify those anesthesiology milestones that are most appropriate for evaluation during an obstetric anesthesia rotation.
3. Participants will be able to implement assessment methods to evaluate residents' competence in those milestones identified as appropriate for evaluation during an obstetric anesthesia rotation.

Summary:

The Accreditation Council for Graduate Medical Education (ACGME) is currently transitioning to the Next Accreditation System (NAS) for the evaluation of all residency training programs. Accreditation decisions for anesthesiology residency programs will be determined via the NAS beginning with the 2014-2015 academic year. Competency and outcomes-based education is the focus of the NAS with major emphasis placed on residents achieving specific milestones that are subsets of the six general competencies. The Anesthesiology Milestone Group describes the milestones as "knowledge, skills, attitudes, and other attributes for each of the ACGME competencies organized in a developmental framework from less to more advanced. They are descriptors and targets for resident performance as the resident moves from entry into residency through graduation."
Each resident's performance level for the 25 milestones defined by the Anesthesiology Milestone Project must be determined every 6 months and reported to the ACGME. The 5 levels of performance are defined as:

- Level 1 – Successfully performing milestones expected of a resident who has completed one year of residency training but not yet entered CA1 year
- Level 2 – Successfully performing milestones expected of an anesthesiology resident who has not yet had significant subspecialty anesthesiology training
- Level 3 – Successfully performing milestones expected of a resident who has completed anesthesiology subspecialty rotations
- Level 4 – Successfully performing milestones expected of a resident who is ready to graduate from residency training and begin independent practice
- Level 5 – Successfully performing at a level similar to someone who has been practicing anesthesiology for several years.

These performance data will be one component used in the NAS to evaluate the educational effectiveness of residency programs. A major challenge to every training program is to identify valid and reliable assessment methods for the milestones that are also feasible within the time and cost constraints of the individual department. Significant faculty education will be required to ensure effective assessments, and some educators have suggested that a subset of faculty members rather than all faculty be responsible for evaluating residents' milestones achievement. Likewise, it may be cost- and time-effective to evaluate specific milestones during designated rotations rather than attempt to evaluate all milestones in all rotations. Milestones that would be most appropriate for evaluation during an obstetric anesthesia rotation are described in the table below.

Milestone	Description
PC 1	Preanesthetic evaluation, assessment, preparation
PC 2	Anesthetic plan and conduct
PC 3	Peri-procedural pain management
PC 4	Management of peri-anesthetic complications
PC 5	Crisis managment
PC 10	Technical skills – regional anesthesia
SBP 1	Coordination of patient care within the health care system
PBLI 4	Education of patient, family, students, residents, other health professionals
Prof 1	Responsibility to patients, families, society
Prof 2	Honesty, integrity, ethical behavior
ICS 1	Communication with patients and families
ICS 2	Communication with other professionals
ICS 3	Team and leadership skills

(PC=Patient Care; SBP=Systems-based Practice; PBLI=Practice-based Learning & Improvement; Prof=Professionalism; ICS=Interpersonal & Communication Skills)

A multimodal approach to assessment of the milestones will be needed with each residency program developing their own evaluation plan based on departmental resources. Working groups from the Society for Education in Anesthesia recently attempted to gain some consensus regarding best evaluation methods for specific milestones. Their results found the highest degree of agreement for the following evaluations tools:

- Patient Care - Objective Structured Clinical Exam, Simulation, Direct Clinical Observation using checklists, rating scales, or scoring rubrics
- Professionalism - 360° Evaluations, Peer Evaluations, Direct Clinical Observation
- Interpersonal & Communication Skills – Simulation, 360° Evaluations, Direct Clinical Observation

References:

1. The Anesthesiology Milestone Project. http://www.acgme.org/acgmeweb/Portals/0/PDFs/Milestones/AnesthesiologyMilestones.pdf. Accessed January 22, 2014.
2. Ebert TJ, Fox CA. Competency-based education in Anesthesiology. *Anesthesiology* 2014; 120:24-31.
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6. Milestones Evaluation Tool. Society for Education in Anesthesia.http://seahq.net/images/stories/MilestonesWorkshop/milestones%20assess%20eval%20tool%20cvrs%205-9-13.pdf. Accessed January 22, 2014.

Teaching Obstetric Anesthesia in 2014 Workshop: Effective Bedside Teaching of Obstetric Anesthesia

Manuel C. Vallejo, M.D., D.M.D.
Professor of Anesthesiology, Obstetrics & Gynecology
Chair, Department of Anesthesiology
West Virginia University School of Medicine

Objectives

1. Describe and discuss the challenges associated with effective bedside teaching
2. Describe the skills necessary for effective bedside teaching
3. Describe and discuss several learning strategies for effective bedside teaching

Summary: Effective bedside teaching integrates problem based learning with basic science and evidence based medicine. The effective bedside teacher knows teaching differs according to the level of training, establishes what the student already knows, inspires and then builds on the learning experience.
Society has the right to know physicians are competent and can practice their profession in a compassionate and skillful manner. Performance on high stakes examinations does not accurately reflect what doctors do in actual patient care and patient outcomes are the best measures of quality to assess learners in clinical settings. It is at the bedside that lifelong problem based learning can be stimulated, guided, developed, and integrated with basic science and evidence based medicine. Bedside teaching puts medicine and the patient into perspective for the learner, and enables students to view the experienced clinician in action. The bedside teacher often plays many roles simultaneously, switching from one role to another during the same encounter. Educators today are required to have an expanded toolkit of teaching skills and clinical expertise requiring more student-centered teaching, competency based assessment, and emphasis on professionalism.

Physicians are usually well prepared for their clinical roles, but few are trained for teaching. There are many skills that cannot be taught in a classroom, particularly the humanistic aspects of medicine that require the presence of the patient. It is not unusual for learning and service to take place concurrently while patient care demands take priority over teaching.

As physicians become ever busier clinically, being an effective teacher becomes more challenging in the context of expanding clinical responsibilities and shrinking teaching time. Clinical teaching can be a demanding, complex and often frustrating task, a task many clinicians assume without adequate preparation or orientation. The bedside teacher is often faced with time constraints, varying learner levels, unpredictable and unexpected teaching moments with no time for elaboration, lack of clear objectives and expectations, engaging multiple levels of learners (i.e. students, junior residents, senior residents), lack of incentives and rewards for teaching, uncomfortable physical clinical environment, and the presence or absence of the patient themselves.

Skills that make an excellent clinical teacher and effective bedside teacher include sharing a passion for teaching, being clear, organized, accessible, supportive, compassionate, establishes rapport, provides direction and feedback, exhibits integrity and respect for others, demonstrates clinical competence, utilizes planning and orienting strategies, possess a broad repertoire of teaching methods and scripts, engages in self-evaluation and reflection, draws upon multiple forms of knowledge, targets teaching to the learners' level of knowledge, solicits feedback on teaching, reflects to advance to the highest level of teaching and moves from being a technically sound teacher to a professional and scholarly teacher.
Recognized bedside teaching methods include the *Stanford Faculty Development Model for Clinical Teaching*, and the *One-Minute Preceptor*. In *'Knowles Principles of Adult Learning'*, there is a specific purpose in mind. Students are voluntary participants in learning who require meaning and relevance, active involvement in learning, need clear goals and objectives, need feedback, and are reflective. Approaches to teaching in the clinical setting will differ according to the level of the students being taught. It is important to establish what is already known relevant to the patient's presentation, including their understanding of the scientific background as well as the clinical aspects. The questions '*Why*' and '*So what*' are an essential part of the clinical teachers armamentarium.

Teachers need to establish a positive learning environment where strengths are reinforced, errors acknowledged and corrected, and feedback is expected and accepted. Teachers are often very hesitant to provide negative feedback, or avoid it altogether which can have adverse consequences on patient care. Frequently, feedback is non-specific and unhelpful to learners, (e.g. 'good job', 'bad patient communication') and trainees may view negative feedback as a personal attack. Student feedback is a crucial step in the acquisition of clinical skills which can enlighten the trainees of their strengths and weaknesses.

Key points:

1. The number one characteristic of a good teacher is enthusiasm for teaching.
2. Patient outcomes are the best measures of quality to assess learners in clinical settings.
3. It is at the bedside that lifelong problem based learning can be integrated, stimulated, guided, and developed with basic science and evidence based medicine.

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Teaching Obstetric Anesthesia with the iPad

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Interim Chief of Obstetric Anesthesia
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Introduction

The Apple iPad is a revolutionary device that created the tablet computing market while completely transforming and repurposing the mobile computing scene. Met with nearly universal derision when announced on January 27, 2010 (mostly for the name), the first generation iPad sold 300,000 units in its first 24 hours of availability, and 1,000,000 in its first month. In less than four years, Apple has sold nearly 200 million iPads worldwide, making it by far the tablet device with the highest market share.

Teaching with the iPad

As medical schools and residency programs have begun to replace standard texts with iPads, the question of how to educate with this new device has come to the forefront.

The most important question to ask when answering this is: *What is an iPad?* **Above all, an iPad is a content-consumption device**. Due to its small form factor and lack of a keyboard, **content-creation**, a common use for the personal computer, is difficult. To facilitate this content consumption, there are three pathways:

- *Content Retrieval:* Leveraging built-in and add-on applications (Apps) to display and consume content. This is the easiest and primary use of the iPad in education.
- *Content Creation:* Utilizing first- and third-party utilities to create content for specific purposes. This content takes many different forms (apps, books, videos, et cetera).
- *Content Distribution:* The most important and underutilized tools in the iOS armamentarium. Creating centralized and controlled-access repositories of content for use within a teaching environment.

Content Retrieval

Literature Review and Textbooks:

The iPad makes literature retrieval and review very simple with free apps from multiple publishers. Both **Anesthesiology** and **Anesthesia and Analgesia** have standalone free apps in the App Store. Individual issues can be purchased within the app or, with an ASA or IARS membership, full access to Anesthesiology or A&A (respectively) is included. Individual articles can be stored, marked, and searched for future retrieval. Have your own repository of PDF-files already? Store them in **iBooks** for easy retrieval and sharing.

Similarly, textbooks and review books are also often available on the iPad. Some companies (e.g. **Lippincott**) have individual apps for each of their books, while others (e.g. **Elsevier**) have all-encompassing bookstore apps. Any books you may have access to through Expert Consult are now available through **Inkling**. And, of course, there are a handful of OB Anesthesia texts (e.g. **Chestnut's Obstetric Anesthesia** and **Obstetric Anesthesia Handbook**) available through the iBooks Store.

Anatomy:

Few topics have leant themselves so well to the iPad platform as has musculoskeletal and neuroanatomy. The 3D capabilities of new generation iPads allow for on-demand 3D modeling and overlays, allowing for close inspection of specific areas at multiple angles. Two excellent examples of this capability are **Essential Anatomy 3** (3D4Medical.com) and **Human Anatomy Atlas** (Visible Body). Both offer tight and wide zoom features, layering techniques, and self-selectable viewing angles.

Specialty Apps:

While OB-Anesthesia-specific specialty apps are uncommon, new apps are being created daily. Examples include **iLarynx** (R. Glassenberg), a fiberoptic intubation simulator, and **AnestAssist PK/PD** (Palma Healthcare Systems LLC), an anesthetic pharmacokinetics modeling front-end.

The Internet:
The most common source for content consumption will be from the Internet at-large. As a full-featured browser, **Safari** will allow access to most websites that are available on a personal computer. **Wikipedia** and its Anesthesia equivalent **OpenAnesthesia.org** both are easily accessible via Safari. Teaching videos through **YouTube** are also readily available and easily consumable through the iPad. Links and bookmarks can be shared among groups to find the best available teaching resources.

Content Creation
Bedside Content Creation:
There are many scratchpad apps available, all of which are fundamentally similar: they replace pen and scratch paper at the bedside or in the OR for quick sketches or reviews. **Penultimate** (Evernote) allows for simple note creation with an intuitive interface and easy sharing via e-mail, iMessage, or AirDrop.

iBooks Author:
While not technically an iPad App, **iBooks Author** is a free utility distributed by Apple that allows the creation of robust eBooks readable through the iBooks app on any iPad (but, importantly, *not iPhones or iPods*). Books can be simple plain text or have interactive images or image galleries, videos, review questions, et cetera. iBooks may be shared via e-mail, iMessage, AirDrop, any number of dissemination apps and software (see below), or via the iBooks Store. Books released through the iBooks Store allow for push updates – when changes occur to the book, all users are prompted to download the updates.

Presentations:
Most of us have a repository of lectures and talks already written; these are now easy to take to the bedside or the OR for teaching via the iPad. There are two competing full-featured office suites for iOS. Apple's offering is known as iWork, and the presentation component is called **Keynote**. It is a full-featured presentation manager akin to Microsoft's PowerPoint, allowing for both creation and display of presentations on the iPad. It is cross-platform (available for both iOS and OS X) and inexpensive (at $19.99 for iOS). It has approximately 95% compatibility with PowerPoint files, though converted PowerPoint files may require minor reformatting to display correctly.

Until April 2014, Keynote was the only real option available for presentations on the iPad. This changed with the release of **Microsoft Office** for the iPad, which is 100% cross-compatible with Office for PC and Mac. **PowerPoint for iPad** allows for both creation and display of presentations. PowerPoint for iPad requires a subscription to Office 365 (Microsoft's online office portal).

Content Distribution
Peer-to-peer:
Sharing between iPads, as of iOS7, is built-in and easy to achieve. Apple apps, as well as many third-party apps, can share data via **AirDrop**. AirDrop allows two individuals to share files over-the-air via an ad-hoc connection between the two devices utilizing WiFi and Bluetooth LE (*both* must be activated, though not necessarily connected, for AirDrop to function). Without e-mail or a mass-storage device, two adjacent iPads can share presentations, papers, videos, and other files. On iOS7, AirDrop is activated from the Control Center (swipe up from the bottom of the screen).

Shared Notebook:
With the iPad, within the Cloud, there are multiple ways to share data in a communal repository. One way is the "shared notebook" model. In this model, different notes, papers, images, videos, and other files can be shared among a group of people, all of whom can add to the repository. **Evernote** is the most popular, and among the most robust, of these note-sharing suites. Notes, including handwritten notes, PDFs, and, to a lesser extent, images, are all text-searchable, and multiple users are able to contribute to the group. All notebooks are accessible only with permission from the creator or a designee.

Curriculum Management:
The other method of sharing within a communal repository is via Curriculum Management software. Through **iTunes U**, anyone can create a full curriculum, with associated papers, videos, images, sound files, and lectures, that can be easily shared on any iOS device through the free iTunes U app. Access is controlled through iTunes U by the coordinator/teacher/professor. This platform is unidirectional; "students" cannot add to the curriculum.

SOAP TTE Workshop Synopsis:

Objectives:

Following this workshop, attendees will be able to:

1. Review the basic physics principles underlying the application of ultrasound imaging
2. Demonstrate basic proficiency in obtaining 2-D transthoracic ultrasound images of the heart, lung and vena cava as a part of the point-of-care, focused echocardiographic examination of the obstetric patient
3. Provide qualitative assessment of cardiac contractility, chamber size and intravascular volume status
4. Recognize the applications and limitations of focused TTE performed by the obstetric anesthesiologist and the appropriate indications for a formal cardiology consult

S**ummary:**

The use of point-of-care, focused transthoracic echocardiography (TTE) is gaining recognition as a safe, non-invasive method for obtaining useful physiologic data in the critically ill patient. Anesthesiologists routinely use transesophageal echocardiography in anesthetized patients and employ surface ultrasound to assist in the placement vascular access catheters and regional anesthetics. TTE offers another opportunity for anesthesiologists to support clinical decision making including in the domain of obstetrics where the majority of patients are conscious with neuraxial anesthetic techniques, and TEE probe placement is not feasible. As with TEE, the skill set required to effectively employ TTE encompasses both image acquisition and interpretation.

Image Acquisition

Image acquisition of thoracic structures using surface ultrasound presents some challenges. As compared with TEE, the TTE probe is not stabilized and acoustic signal coupling can be compromised by the bony anatomy such as the ribs and sternum, as well as the air-filled pleura.

Interpretation

Competency in interpreting echocardiographic images has been categorized as emergency and levels 1-3. This range represents a continuum of escalating expertise.[1] The purpose of this workshop is to provide a basic overview of TTE application in obstetrics and an opportunity for limited practical experience in image acquisition and interpretation in the domain of emergency and level 1 examination.

Lower domain TTE interpretation emphasizes qualitative over quantitative evaluation. Anatomic and physiologic elements examined may include left and right ventricular systolic function, myocardial wall thickness, ventricular and atrial chamber size, inferior vena cava diameter and plasticity, and bilateral pleura.[2] These findings can be correlated with the clinical context and applied immediately to decision making. As these are new and developing applications of an ultrasonography, there are limited data to link its use to improved outcomes at this time. Those who advocate for its wider dissemination cite non-invasiveness and low-cost as obvious benefits and believe that it increases the accuracy of clinical assessment and guides further diagnostic work-up.[3] Caution is warranted in recognizing the limits of one's capabilities within the construct of the tiered competencies.

Potential Applications in Obstetrics

Within the domain of obstetric s, the most obvious application of its use includes evaluating unexplained hypotension. Other possible applications include guiding management during hemorrhage, pulmonary embolus/cor pulmonale, peripartum cardiomyopathy and perhaps severe preeclampsia. During hemorrhage, TTE can be used to assess adequacy of resuscitation. Severe cases of pulmonary embolism manifest with obvious right heart failure. Preeclampsia has been defined as a very heterogeneous clinical entity with widely variable CVP and cardiac output.[4] This, of course, occurs in the setting of vulnerability to pulmonary and cerebral edema, stroke and renal failure which may make judicious fluid management decisions more critical. In addition, the ability to conduct TTE in high-risk cardiac patients, determine volume status in peripartum hemorrhage or preoperatively screen obstetric patients may prove to be very beneficial for patient care and safety in the obstetric setting.

There are limited data linking the use of TTE with improved clinical outcomes and currently none in the setting of obstetric management. In acute care settings, however, the value of this point-of-care ultrasound application has been reported to aid in more rapid patient assessment. In a randomized, controlled trial in the setting of emergency medicine, for example, immediate evaluation of non-trauma patients that presented with hypotension with TTE substantially narrowed the differential diagnosis as compared with delayed use of TTE.[5]

Equipment

Optimizing image acquisition with TTE requires knowledge of the anatomical structures to be examined, basic technical aspects of ultrasound and appropriate equipment selection. Ultrasonic probes vary in size and shape of their footprints, frequency domains and special features. For TTE, low frequency, phased array probes are preferred as they can optimize image clarity with small acoustic windows and a deep, moving target. Phased array probes can be used with most standard ultrasound machines, and may or may not require software modification.

Machine Controls

Machine controls vary between different manufacturers. However, common features include image mode (M, 2-D, Color Flow and Doppler), focus depth, signal gain, recording and freeze functions, and a basic familiarity with these controls will help in optimizing image acquisition. Advanced features including cardiac calculations are beyond the scope of emergency and level 1 interpretation domains.

Standard TTE Views

Parasternal long axis- "Scout view"

Probe placement: Left parasternal border at approximately the 3-4th intercostal space

Index orientation: Toward right shoulder (10 o'clock)

Optimizing the window: Apex is present to the left for orientation; identify longest, widest mid-chamber view of the LV

Visible: RV, LV and septum; MV and AV in the same plane

Applications:

1. LV and RV cavity size, wall excursion
2. Good view of the pericardium, pericardial fluid
3. Screening view of the aortic and mitral valves (valve excursion)

Parasternal short axis

Probe placement: Left parasternal border at approximately the 3-4th intercostal space (rotate the probe 90 degrees from PSLA view)

Index orientation: Toward left shoulder (2 o'clock)

Optimizing the window: Level of papillary muscles; look for concentric LV chamber, not elliptical

Visible: Segments of the LV in short axis from apex to base; MV, AV, papillary muscles

Applications:

1. Global LV and RV systolic function estimation
2. Septal size and kinetics
3. Volume status

Apical 4-chamber

Probe Placement: Inferior/ lateral to nipple, point of maximal impulse (PMI)

Index orientation: Toward left shoulder or side (2 o'clock)

Optimizing the window: Center apex and septum, look for large mid-chamber cuts of LV and RV

Applications:

1. Compare chambers side-by-side
2. Doppler in-plane across valves
3. Aortic outflow track visualized (apical 5-chamber view)

Subcostal

Probe placement: Sub-xiphoid or right subcostal, aimed cephalad directly or thru the liver

Index orientation: Cephalad (12 o'clock)

Optimizing view: Identify RA and tilt the probe right for IVC (look for respiratory variation, emptying into RA, hepatic vein)

Applications:

1. Assessing volume status by applying *M-Mode* to this image, one can observe respiratory variation in the IVC diameter which is a relatively sensitive measure of volume status.
2. Although the focus of lower tiered interpretation domain remains qualitative, practitioners may find these reference values helpful:[6]

IVC Measured	% Collapse	CVP (cmH20)
<1.5cm	>50%	0-5
1.5-2.5cm	>50%	5-10
1.5-2.5cm	<50%	10-15
> 2.5 cm	Little Phasicity	15-20

Pulmonary Ultrasound

Ultrasound is reliable and convenient way of examining lung pathology and has been reported to be superior to chest radiography in detecting pneumothorax.[7]

Probe Placement: Linear, phased array or curvilinear probe placed in longitudinal (cephalad-caudad axis) perpendicular to the ribs

Index orientation: Cephalad (12 o'clock)

Optimizing the window: Observe pleura and lung parenchyma between the ribs in both 2D and M mode. Pleura are hyperechoic (sliding sign in 2D and pleural lines/seashore sign in M mode). A and B lines (increased in pulmonary edema) artifacts should be noted. With pneumothorax, there is absent sliding sign of the pleura and 'seashore' sign. Pleural effusions and hemothorax may be observed in the most dependent part of the lung.

Applications:

1. Diagnosing pneumothorax, hemothorax and pleural effusions
2. Identifying pulmonary edema

References:

1. Oxorn D: Con: Physician-performed ultrasound: The time has come for routine physician use in acute care medicine. Anesth Analg 2012;105(5):1004-6
2. Holm JH: Perioperative Use of Focus Assessed Transthoracic Echocardiography (FATE). Anesth Analg 2012;105(5):1029-32
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Failed Epidural Catheter on the Labor Suite: How to Make Your Catheters Work

This PPAI activity fulfills the Case Evaluation requirement of Part IV of the Maintenance of Certification in Anesthesiology Program (MOCA) of the American Board of Anesthesiology (ABA). Please consult the ABA Website, www.theABA.org, for a list of all MOCA requirements.

Premeeting

Thos participating in this workshop should collect data from their practice as to the number of epidural catheters placed for labor analgesia that fail to provide adequate anesthesia for cesarean delivery and as to the number of accidental dural punctures. This data should come from a six month time period. When examining the epidural catheter that failed to provide adequate anesthesia, how many boluses did the patient receive during labor and how many times was the anesthesiologist required to evaluate the patient? It is important to include this data in the identification of failed epidural catheters. For accidental dural puncture, how was the accidental dural puncture managed? Do you have a policy for the management of accidental dural puncture?

Workshop

Epidural catheters placed for labor do not always provide adequate surgical anesthesia for cesarean delivery. Campbell et al reviewed the incidence of "failed" epidural over a three year period.(1) Of the 895 women who required cesarean delivery, 775 parturients had successful epidural anesthesia. The incidence of failed epidural in this institution was 13.4%. Subsequent authors have also examined epidural catheters that have failed to provide adequate anesthesia for cesarean delivery.(2) One of the largest risk factors was the experience of the provider, the less the experience, the greater the risk. Other factors that have been identified are inadequate labor analgesia.(3) All of these studies highlight that an epidural that fails to provide adequate anesthesia was most likely missed during labor. The key to decreasing this incidence is identifying the non-functioning epidural catheter during labor and replacing it.

Another example of a complication that occurs during epidural placement is accidental dural puncture. A recent survey of members of the Society of Obstetric Anesthesia and Perinatology revealed that of the respondents, very few had a written protocol for the management of an accidental dural puncture.(4) when an accidental dural puncture occurs, the practitioner may resite the epidural catheter or place the catheter intrathecally. Both of these maneuvers have advantages and disadvantages.(5,6) Furthermore, there are various prophylactic measures that have been advocated to prevent the development of a headache following accidental dural puncture. (7,8)

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1. Campbell DC, Tran T. Conversion of epidural labour analgesia to epidural anesthesia for intrapartum Cesarean delivery. Can J Anesth 2009;56:19-26.
2. Hermanides J, Hollmann MW, Stevens MF, Lirk P. Failed epidural: causes and management. Br J Anaesth 2012;109:144-54.
3. Lee S, Lew E, Lim Y, Sia AT. Failure of augmentation of labor epidural analgesia for intrapartum cesarean delivery: a retrospective review. Anesth Analg 2009;108:252-4.
4. Baysinger CL, Pope JE, Lockhart EM, Mercaldo ND. The management of accidental dural puncture and postdural puncture headache: A North American Study. J Clin Anesth 2011;23:349-60.
5. Ayad S, Demian Y, Narouze SN, Tetzlaff JE. Subarachnoid catheter placement after wet tap for analgesia in labor: Influence on the risk of headache in obstetric patients. Reg Anesth Pain Med 2003;28:512-5.
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7. Paech MJ, Doherty DA, Christmas T, Wong CA. Epidural Blood Patch Trial Group. The volume of blood for epidural blood patch in obstetrics: A randomized, blinded clinical trial. Anesth Analg 2011;113:126-33.
8. Hakim SM. Cosyntropin for prophylaxis against postdural puncture headache after accidental dural puncture. Anesthesiology 2010;113:413-20.

Work Product
Design a protocol for the management of accidental dural puncture and design a protocol to prevent failed epidural catheters.

Facilitators:
Regina Fragneto, M.D.
Robert Gaiser, M.D.
Vernon Ross, M.D.

PROGRAM MATERIAL

Thursday, May 15, 2014

Gertie Marx Research Competition
Moderator: Gerard M. Bassell, M.D.

Special Lecture – Preeclampsia: What Patients Want You to Know
Introduction: Robert R. Gaiser, M.D.
Speaker: Eleni Tsigas

Research Hour of Power: Introduction to Big Data for Use in OB Research Including Methodological Considerations
Speaker: Brian T. Bateman, M.D., M.Sc.

Research Hour of Power: What Big Data Has Taught Us About Postpartum Hemorrhage
Speaker: Alexander Butwick, M.B.B.S.

Oral Presentation 1
Moderator: Stephanie R. Goodman, M.D.

Abstract #: GM-01

A perioperative course of gabapentin improves pain relief after cesarean delivery: a randomized controlled trial

Presenting Author: David Monks MD
Presenting Author's Institution: Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Co-Author: Kristi Downey MSc - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
David Hoppe MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Paul Bernstein MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Vibhuti Shah MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Jose CA Carvalho MD PhD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario

Introduction: One small RCT suggested a benefit from a preoperative dose of 600 mg gabapentin in reducing postcesarean pain in the context of spinal anesthesia and a multi-modal analgesic regimen inclusive of intrathecal morphine (1). A subsequent RCT, designed to find the optimal dose, cast some doubt on this finding and suggested that a larger study was required (2). Based on these trials and following a trend in the literature, we hypothesized that a perioperative course of gabapentin would reduce postcesarean pain.

Methods: Healthy women scheduled for elective cesarean delivery performed under spinal anesthesia with 1.6-1.8 ml of 0.75% hyperbaric bupivacaine, 10 mcg fentanyl and 100 mcg morphine were randomized to receive a perioperative course of either gabapentin or placebo. The dosing in the treatment group consisted of a preoperative dose of 600 mg gabapentin followed by a 48 hour postoperative course of 200 mg three times a day. Both groups received a standardized regimen of regular oral acetaminophen and diclofenac. Parenteral morphine was administered as required. Postoperative pain, at rest and on movement, and satisfaction were measured on a visual analogue scale (VAS 0-100 mm) along with opioid consumption and side effects at 24 and 48 hours after the incision. Neonatal outcomes were APGAR scores, need for resuscitative support, umbilical blood gases and breast feeding difficulties. Telephone interviews were conducted at 2 and 6 weeks to assess for persistent pain. The primary outcome was pain on movement at 48 hours postoperatively.

Results: 204 women were randomized, 17 were excluded and 187 were analyzed. There was no difference in VAS pain scores on movement at 48 hours between groups (mean [SD]): gabapentin 33.6 [21.2] vs. placebo 35.6 [24.5], p=0.54). However, there was a significant reduction in VAS pain scores at rest (12.2 [16.3] vs. 18.3 [17.6], p=0.015) and on movement (39.0 [21.6] vs. 46.9 [23.1], p=0.016), and greater satisfaction scores (mean [SD]: 87.9 [15.8] vs. 77.5 [22.2], p=0.003) at 24 hours in the gabapentin group. The number(%) of patients receiving additional parenteral opioids in the first 24 hours was also significantly lower in the gabapentin group (17 [17.7] vs. 29 [31.9], p=0.025). There was a significant increase in the incidence of sedation in the first 24 hours (55.2% vs. 39.6%, p=0.032) in the gabapentin group. There was no difference in neonatal outcomes between the groups. There was also no difference in the incidence of pain at 2 and 6 weeks postpartum (36.1% vs. 49.4% and 5.6% vs. 4.2% in the gabapentin and placebo groups, respectively).

Discussion: A perioperative course of gabapentin reduces pain and opioid consumption in the first 24 hours post cesarean delivery. Although an increase in sedation is observed with the use of gabapentin, patient satisfaction with pain management is higher.

References:

1. Anesth Analg 2011;112:167-73

2. Anesth Analg 2012;115:1336

Abstract #: GM-02

Calcium activated chloride channels: critical mediators of calcium dynamics in human myometrial cells

Presenting Author: George Gallos MD
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Co-Author: Kyra Bernstein MD - Columbia School of Physicians and Surgeons - New York, New York
Jennifer Danielsson MD - Columbia University - New York, New York
George Gallos MD - Columbia University - NY, NY

Objective: Myometrial contraction is intimately dependent on calcium. In the pregnant myometrium, an initial intracellular calcium wave is spread throughout the uterus via gap junctions . The resultant increased calcium levels activate myosin light chain kinase and promote myosin-actin bridging, allowing for cytoskeletal contraction. Two mechanisms govern the initial elevation in intracellular calcium: membrane depolarization and GPCR induced sarcoplasmic release. Based on prior observations that calcium activated chloride channels (CaCCs) participate in the propogation of myometrial contractions, and our prior observations that CaCC blockade completely abolishes intracellular calcium elevations in human myometrial cells, we hypothesize that CaCCs are central to modulation of calcium dynamics in the human myometrium. We sought to determine the role CaCCs play in these two integral mechanisms of intracellular calcium handling: cell membrane depolarization, and GPCR-mediated SR calcium release.

Methods: Immortalized human myometrial cells were grown to confluence in 96 well plates. In all experiments, fluorescence was measured on a Flexstation 3 plate reader and drugs were injected in real time. For GPCR-mediated SR release studies, cells were loaded with two fluorescent calcium indicators to obtain differential cytosolic (Fura-2) and sarcoplasmic (Mag-Fluo-4) calcium loading. GPCR agonists (10uM bradykinin or 1uM oxytocin) were injected in the presence and absence of escalating doses of a specific CaCC antagonist (10uM, 25uM, 50uM, and 100uM benzbromarone). For membrane potential studies, cells were loaded with the potential indicator FLIPR and injected with either a CaCC antagonist (50uM benzbromarone) or K-gluconate 40mM (positive depolarizing control) or NS-1619 10uM (positive hyperpolarizaing control). Data is reported as percentage of mean inhibition vs control or mean fluorescence (RFU) and SEM. In all cases $p<0.05$ was considered significant.

Results: The CaCC antagonist benzbromarone (100uM) suppressed bradykinin mediated peak Fura-2 fluorescence [Cai] by 85.1% ($p<0.001$, N=7) and nadir Mag-Fluo-4 fluorescence [CaSR] by 92.2% ($p<0.001$, N=7); 100uM benzbromarone suppressed oxytocin mediated Fura-2 peak by 77.6% ($p<0.001$; N=5). In FLIPR studies, CaCC modulation resulted in significant changes in membrane potential. Eact significantly depolarized the membrane (25.33±11.6 RFU) paralleling the effect of K-gluconate (98±28.57 RFU) compared to vehicle control (3.2±0.6 RFU, $p<0.05$). Similarly, benzbromarone hyperpolarized the myometrial cell membrane (-25.67±4.9 RFU; $p<0.05$) paralleling the effect from NS1619 (-39±1.5 RFU) compared to vehicle control.

Conclusions: CaCCs are integral to the 2 central aspects of human myometrial calcium handling: GPCR-mediated SR calcium release, and membrane potential modulation. Our results suggest the exciting possibility that CaCC antagonisim represents a novel means to achieve tocolysis.

Abstract #: GM-03

Does Epidural Analgesia Lead To Maternal Fever?

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Kui Zhang Ph.D. - University of Alabama at Birmingham - Birmingham, AL
Matt C Wyatt M.S.H.I. - University of Alabama at Birmingham - Birmingham, AL

Background: In recent years, several reports have indicated that maternal temperature elevations during labor may also be observed in the absence of an infection. Presumed noninfectious causes of maternal temperature elevations include epidural analgesia, endogenous heat production generated by the contracting uterus, and delivery in an overheated room. In a recent study, the authors conducted a prospective cohort study in women scheduled for labor induction and determined that the temperature trend in the peripartum period did not change after epidural placement. Because that study focused on afebrile patients, we are now directing our attention to febrile parturients. In this retrospective case-control study, we compare temperature slope change associated with epidural placement between those patients with peripartum fever and afebrile controls.

Methods: We identified all parturients in 2012 who developed fever > 101 deg F at any point or who had a temperature > 100.4 deg F for ≥ 1 hour during admission. We then randomly matched each febrile case with three afebrile controls who also delivered within a 24-hour period of the febrile parturient's delivery time. We excluded those patients who underwent caesarian section. To evaluate the possible role of epidural analgesia, we compared the temperature slope change before and after epidural analgesia in both the febrile group and afebrile group. We then also determined if there was an association of maternal fever and epidural analgesia and whether there was an association of labor duration and maternal fever.

Results: Women who experienced fever during their labor had a higher epidural rate (97% versus 79%; Pearson $\chi^2=11.9, p=0.0006$) but also had longer labor (15.23 ± 8.78 hours versus 10.09 ± 9.19 hours; log-likelihood $\chi^2=11.9$, $p = 0.0002$). To determine if epidural analgesia caused fever, we looked at the temporal relationship of temperature and epidural anesthesia in the following manner: we compared the change in slope of temperature - before and after epidural anesthesia - between the two groups. The change in slope was similar in the afebrile group (-0.077 ± 0.423 , mean ± SD) and the febrile group (-0.131 ± 0.389 , mean ± SD). These reductions in the temperature slope did not differ from each other statistically (t-ratio = -0.872, p=0.386).

Conclusions: In this retrospective case-control study, epidural analgesia had no effect on maternal temperature based on the slope analysis in either the febrile or afebrile groups, but a higher epidural placement rate and longer labor times are associated with the febrile group. Since prolonged labor is associated with maternal fever but epidural analgesia does not alter temperature slopes significantly, the epidural placement rate may be higher in the febrile group because their labor is prolonged and therefore more painful, and a longer labor provides additional time to provide epidural analgesia.

Abstract #: GM-04

Opioid Abuse and Dependence during Pregnancy: Epidemiology, Temporal Trends, Risk Factors and Associated Maternal and Obstetrical Outcomes

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Caitlin R Clancy BA - Massachusetts General Hospital - Boston, Massachusetts
Andreea A Creanga MD, PhD - Centers for Disease Control and Prevention - Atlanta, Georgea
Lisa R Leffert MD - Massachusetts General Hospital - Boston, Massachusetts

Background: This study sought to (1) investigate the nationwide trends in maternal opioid abuse/dependence during pregnancy in the United States (U.S.), and (2) assess its impact on maternal and obstetrical outcomes.

Methods: Hospitalizations for delivery were extracted from the Nationwide Inpatient Sample, which contains information on approximately 20% of all delivery admissions in the U.S. Using ICD-9 CM diagnosis codes, we identified deliveries, maternal opioid abuse/dependence and obstetrical outcomes that may be associated with maternal opioid abuse/dependence. Temporal trends in the prevalence of maternal opioid abuse/dependence from 1998 to 2011 were assessed. With data from 2007 to 2011, logistic regression analysis was used to examine the associations between maternal opioid abuse/dependence and obstetrical outcomes, controlling for maternal age, race, insurance type, tobacco, alcohol, or other illicit drug use, and psychiatric conditions. We conducted a sensitivity analysis comparing obstetrical outcomes in women with opioid abuse/dependence and those abusing/dependent on other illicit drugs in an effort to overcome the confounding effects of lifestyle, nutrition, and other factors that are difficult to account for in administrative data.

Results: The prevalence of opioid abuse/dependence during pregnancy increased by 127% during the study period (from 1.7 per 1,000 deliveries in 1998 to 3.9 per 1,000 deliveries in 2011) (p for trend <0.001). Trends analysis stratified by age and race revealed the most dramatic increases among the age group 20-34 years (162%), and white women (479%), respectively. Maternal opioid abuse/dependence was associated with an increased risk of obstetrical complications, including maternal death during hospitalization (adjusted odds ratio (aOR) 4.63, 95% confidence interval (CI) 1.77-12.12), maternal cardiac arrest (aOR 3.60, 95% CI 1.42-9.12), length of stay >7 days (aOR 2.2, 95% CI 1.97-2.50), transfusion (aOR 1.70, 95% CI 1.49-1.93), caesarean delivery (aOR 1.20, 95% CI 1.12-1.27), placental abruption (aOR 2.35, 95% CI 2.14-2.58), premature rupture of membrane (PROM) (aOR 1.44, 95% CI 1.32-1.58), stillbirth (aOR 1.53, 95% CI 1.28-1.82), preterm labor (aOR 2.13, 95% CI 1.99-2.27), intrauterine growth restriction (aOR 2.66, 95% CI 2.42-2.93), and oligohydramnios (aOR 1.72, 95% CI 1.57-1.88). When we compared opioid and non-opioid drug abusing/dependent parturients, all the statistically significant associations from the primary analysis persisted except for maternal cardiac arrest, placental abruption and PROM.

Conclusion: Opioid abuse/dependence during pregnancy is associated with considerable obstetrical morbidity and maternal mortality, and its prevalence is dramatically increasing in the U.S. Given the epidemic of opioid abuse in the U.S., identifying preventive strategies and therapeutic interventions in women who continue to abuse opioids during pregnancy are important priorities for future research.

Abstract #: GM-05

Pharmacokinetics and Placental Transfer of Magnesium Sulfate in Pregnant Women

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Brendan Carvalho MD - Stanford University School of Medicine - Stanford, California

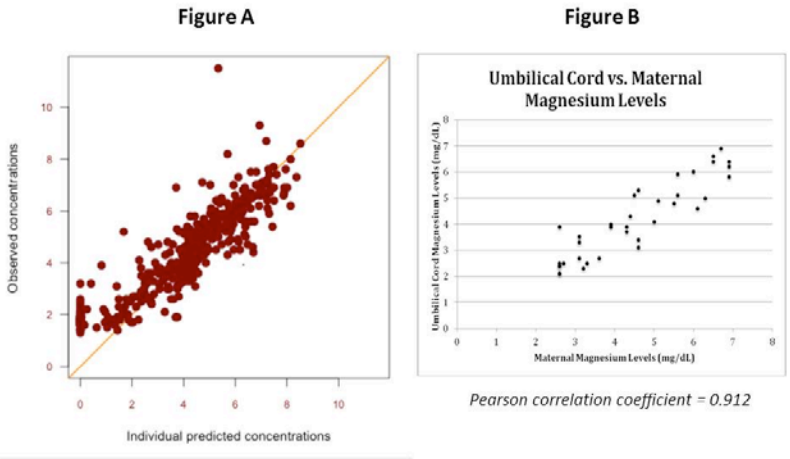
Introduction: Magnesium sulfate (MS) is one of the most commonly prescribed intravenous medications in obstetrics, and is used for seizure prophylaxis in preeclampsia, tocolysis in threatened preterm labor, and neuroprotection of extreme preterm (< 32 wks gestation) fetuses (1). Maternal and fetal harm may result from under- or over-dosing of MS (2). Despite wide-spread use, there is limited data about MS pharmacokinetics (PK). The aim of this study was to characterize the PK and placental transfer of MS in pregnant women.

Methods: Pregnant women admitted to the hospital with preeclampsia, preterm labor or extreme prematurity, and prescribed MS were consented to participate in this prospective, IRB-approved study. Women received a 4g loading dose (over 20 min) and a 2g/hr maintenance dose of MS as clinically indicated. Maternal blood samples were obtained prior to MS administration; 30 min, 1 hr, 2 hr, 4 hr, and every 6 hr during MS administration; and 1 hr, 3 hr, 6 hr, 9 hr, and 12 hr after MS was discontinued. Cord blood was also sampled for MS at delivery. A population PK approach was used to analyze MS levels. A two-compartment linear disposition model with nonlinear mixed-effects modeling and visual predictive check was used for PK modeling of observed and predicted serum MS concentrations.

Results: PK profiles of 56 pregnant women in this ongoing study were analyzed. Maternal data was best described using a two-compartment model. The model adequately predicted the individual serum MS concentrations after MS administration (Figure A). The mean population parameter estimates were: clearance 2.92 mL/min; inter-compartmental clearance 5.05 mL/min central volume of distribution 0.93 L; and peripheral volume of distribution 7.04 L. MS readily crossed the placenta; maternal serum and umbilical cord MS levels were highly correlated (Figure B).

Conclusions: The study accurately characterizes the PK of MS administered to pregnant women. Covariate PK analysis and maternal/neonatal pharmacodynamics (PD) determinations are currently ongoing. These reported PK findings are a key first step to creating PK-PD optimized treatment protocols. Tailoring MS treatment protocols will advance the management of preeclampsia seizure prophylaxis, preterm tocolysis, and fetal neuroprotection by maximizing the benefits of MS exposure while minimizing unwanted maternal and neonatal side effects.

Figure A: Observed versus individual predicted magnesium concentrations in pregnant women receiving intravenous magnesium sulfate
Figure B: Correlation of maternal serum and umbilical cord magnesium sulfate levels



References:
1. Obstet Gynecol 2009;114: 669-73

2. Obstet Gynecol 2007;110: 61-7

Abstract #: GM-06

The Influence Of A Night Float Call System On The Incidence Of Inadvertent Dural Puncture In Obstetric Anesthesia: A Retrospective Impact Study

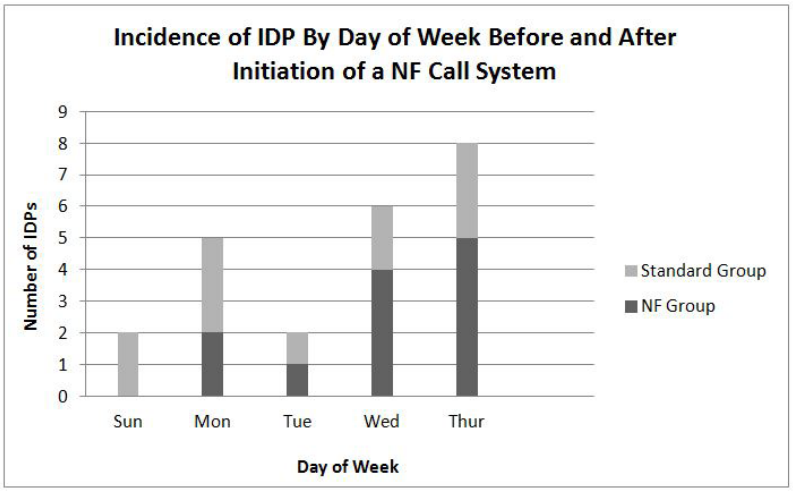
Presenting Author: Kelly G. Elterman MD
Presenting Author's Institution: Brigham and Women's Hospital - Boston, MA
Co-Author: Lawrence C. Tsen MD - Brigham and Women's Hospital - Boston, MA
Michaela K. Farber MD - Brigham and Women's Hospital - Boston, MA

BACKGROUND: Sleep deprivation and extended work hours are known to affect the quality of medical care. Recently, limiting the work week to 80 hours averaged over 4 weeks has been associated with increased sleep, a reduction in attention failure, [1] and a decrease in medical errors. [2] Residents often work 24-hour shifts; however, with the work hour changes, many departments have developed a nightfloat (NF) call system to redistribute resident workload. Our department instituted a 5-day NF system for obstetric anesthesia residents on July 1, 2013. NF systems have been shown to cause sleep disturbances and decreased alertness, [3] but the impact of such a change on neuraxial technique complications is unknown. We evaluated the incidence of inadvertent dural puncture (IDP) among residents before and after initiation of a NF system.

METHODS: We performed a retrospective chart review of all IDPs that occurred during two six-month periods, July 1 – December 31, 2013 (NF group) and July 1 – December 31, 2012 (standard group). We defined IDP as a frank wet tap or an unintentional spinal catheter immediately after epidural attempt. For each IDP identified, the date, time, trainee level, and type of call were collected. Residents in the NF group were often floated from other services, while residents in the standard group were on the obstetric anesthesia service.

RESULTS: The incidence of IDP increased from 0.75% (20 of 2656 total placements) to 1.4% (39 of 2808 total placements) after institution of NF (p=0.023). While not significant, complications tripled among CA1 residents (7% vs. 20%; p=0.391). CA3 residents from other services had more than twice as many IDPs overnight as residents who were on the obstetric anesthesia rotation (28% vs. 12%, p=0.157). Finally, more IDPs occurred on the last two days among NF residents compared to non-NF residents (75% vs. 46%, p=0.226, Figure).

CONCLUSION: Our results demonstrate a significant increase in IDPs after initiation of a NF system. Progressive fatigue over the course of a NF week may be contributing, as complications occurred more frequently on days 4 and 5. Although further investigation is necessary, consideration of sleep deprivation-related complications and the value of assigning obstetric anesthesia call to residents while on service may be beneficial prior to adopting a NF system.



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2. Landrigan CP et al. NEJM, 2004

3. Cavallo A et al. Cronobiol Int, 2002

Special Lecture - Preeclampsia: What Patients Want You to Know

Introduction: Robert R. Gaiser, M.D.
Speaker: Eleni Tsigas

Notes

Big Data in OB and OB Anesthesia Research

Brian T. Bateman, M.D., M.Sc., Harvard University Medical School, Boston, MA

Objectives:

1. Describe the types of research that can be performed using big data.
2. Describe the methodological considerations associated with performing and interpreting research using big data.
3. Describe the strengths and limitations of research performed using big data.

Synopsis:

As patients interact with the healthcare system, large volumes of data regarding the payment and administration of health services are generated. These include submitted claims for procedures, medications, and diagnostic tests. While not collected primarily for research purposes, these data are increasingly used by investigators to describe disease epidemiology and patterns of healthcare utilization, as well as to perform healthcare policy analysis and comparative effectiveness and safety research.

Databases derived from claims have many advantages. They are generally very large; for instance, the Nationwide Inpatient Sample has information on approximately 800,000 hospital admissions for delivery each year. This makes them useful for the analysis of rare events and, as such, claims data have been foundational to the study of severe obstetric morbidity.[1-6] The large size also facilitates their use in studies of medication safety in pregnancy in which the outcomes of interest, such as birth defects, may be uncommon.[7] In addition, claims databases generally draw from a variety of care settings, allowing for the examination of "real-world" patterns of utilization.[8] Finally, many of these databases are longitudinal, allowing researchers to follow patients over long periods with near continuous assessment.

However, there are a number of challenges associated with using claims data for research. These include the challenges inherent in all observational research, including the potential for selection bias, information bias, and confounding bias. But there are also challenges that are particularly great in claims data, including the strong potential for misclassification of outcomes, exposures, and confounding covariates. The impact of misclassification of each of these factors needs to be considered carefully in performing or interpreting comparative effectiveness or safety research with claims data.

Outcome misclassification, as it turns out, is generally not as problematic as one might think. In research based on claims data, it is important that the outcome be defined with high specificity. If an outcome can be defined with 100% specificity (and misclassification is non-differential with respect to exposure), then estimates of relative risk will be unbiased even if the outcome is defined with poor sensitivity. High specificity can often be achieved because if a diagnosis is coded (particularly in the inpatient setting), it has generally been made and recorded by a healthcare practitioner.[9]

When the exposure of interest is a medication or a treatment, these are often captured with fidelity in claims data. When a medical or obstetrical condition is the exposure of interest, particular attention must be paid to circumstances in which recording of the exposure may be affected by the outcome. For example, if an adverse obstetrical outcome occurs, there is the potential that patient risk factors (exposure) may be more carefully recorded.

Misclassification of or inability to measure confounders is perhaps the greatest challenge in studies using claims data. This can, however, be frequently overcome through careful study design and analysis. When possible, it is useful to minimize confounding at the design stage through the use of active comparators.[9, 10] Further, confounding conditions can be captured through the use of proxies—including medications, procedures, or patterns of healthcare utilization. Methods have even been

developed to empirically define and prioritize hundreds of claims representing confounders or their proxies.[11] With careful attention, the challenge of confounding can often be overcome, and valid, causal effects can be identified.

With the increasing use of claims data to perform research in obstetrics and obstetric anesthesia, both investigators and consumers of this research need to be aware of the strengths and limitations of analyses based on these kinds of data. Carefully performed research using these "big data" can provide important insights that improve the care of obstetric patients.

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Title: Research Hour of Power – What Big Data has Taught Us About Postpartum Hemorrhage

Speaker: Dr. Alexander Butwick – Stanford University School of Medicine, Stanford, California, USA.

Objectives:

The objectives of this presentation are as follows:

1. Discuss how big data has been used in epidemiologic studies of postpartum hemorrhage (PPH).
2. Summarize key findings of big data studies on PPH.
3. Discuss how big data can advance the prevention and management of PPH.

Summary:

Big data offer tremendous value to researchers who study maternal conditions and perinatal outcomes with a low prevalence, such as postpartum hemorrhage (PPH). For population-wide studies of PPH, researchers have sourced big data from data-rich registries (such as perinatal and birth registries) or datasets from federal agencies (such as the Center for Medicare and Medicaid Services). For example, the Nationwide Inpatient Sample (NIS), the largest U.S. inpatient care database, contains diagnosis and procedure codes for individual hospitalizations, and these codes have been used in a number of big data studies of PPH. Using the NIS, Callaghan et al. examined data from approximately 10,500,000 delivery hospitalizations between 1994 – 2006 and reported that the overall rate of PPH had increased by 26% (from 2.3% to 2.9%). A similar trend of change was observed for PPH due to uterine atony (1.6% to 2.4% respectively), suggesting that uterine atony was the main driver for the rising rate of PPH. Other investigators have used the NIS and state-wide databases to examine temporal trends and risk factors for PPH as well as other medical and surgical interventions related to severe PPH, such as peripartum hysterectomy and massive transfusion. In addition, big data can be used to determine whether specific characteristics of the delivery population are associated with PPH, such as obesity, race/ethnicity.

Big data are integral in analyses that assess the impact of PPH on maternal and perinatal outcomes. With regard to U.S. maternal mortality, PPH is responsible for approximately 12% of all maternal deaths. PPH has also been identified as a major etiologic factor for severe obstetric morbidity. In the U.S., the rate of obstetric morbidity linked to blood transfusion has increased in recent years (from 34 transfusions / 10,000 delivery hospitalizations between 1998-1999 to 96 transfusions/ 10,000 delivery hospitalizations between 2008-2009). These data remind us that the prevention and management of PPH continues to be a topic of major clinical and public health importance in contemporary obstetric practice. Although observational studies using big data are not intended to replace other kinds of clinical research, such as clinical trials, it is possible that novel study designs that incorporate big data acquisition can be considered for *prospective* studies of PPH.

Key Points:

1. Big data allows researchers the opportunity to study outcomes with a low prevalence, such as PPH.
2. Studies using big data have expanded our knowledge of the epidemiology of PPH.
3. Rates of PPH in well-developed countries are increasing and the main driver appears to be uterine atony.
4. Using big data, observational studies can be valuable for investigating associations between specific independent variables, such as obesity, race/ethnicity and PPH.
5. Novel study designs, such alternating intervention trials, can provide large amounts of clinical data. These designs may be of value in future studies investigating new treatment approaches for PPH.

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Abstract #: O1-01

A novel proliposomal ropivacaine preparation: preclinical and human volunteer studies.

Presenting Author: Yehuda Ginosar BSc MBBS
Presenting Author's Institution: Hadassah Hebrew University Medical Center - Jerusalem
Co-Author: Simon Haroutinian PhD - Hadassah Hebrew University Medical Center - Jerusalem
Leonid Kagan PhD - Rutgers, State University of New Jersey - Piscataway, NJ
Elyad Davidson MD - Hadassah Hebrew University Medical Center - Jerusalem

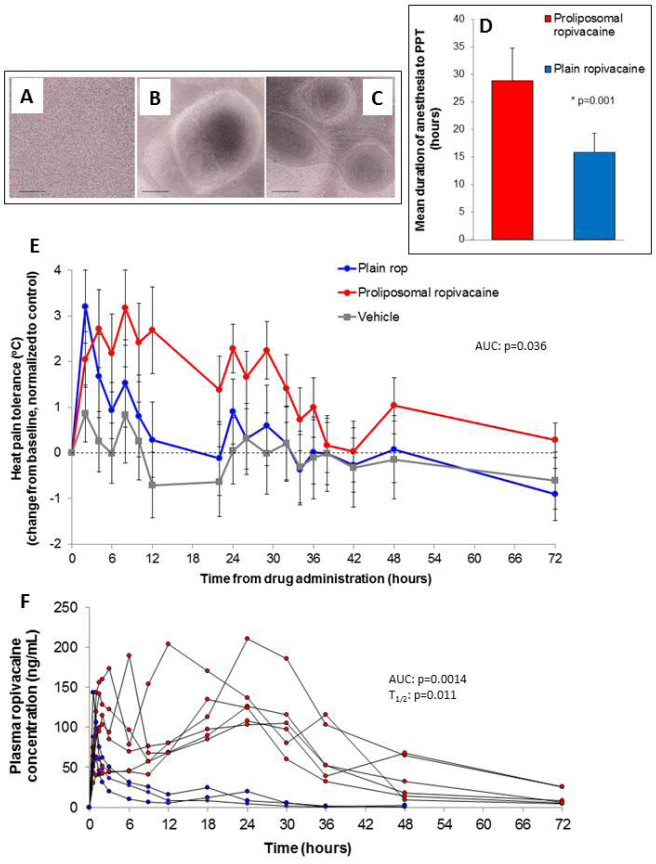
Background:
Slow-release liposomal formulations of local anesthetics prolong plasma redistribution and reduce peak plasma drug concentration. Clinical applicability of current liposomal preparations is limited by short liposomal shelf-life. We describe a novel proliposomal preparation of ropivaciane oil with a shelf-life of in excess of two years at room temperature, that produces multilamellar liposomal vesicles on exposure to aqueous media. Preliminary data demonstrated a maximal tolerable dose in mice at least 40 times greater than for plain ropivacaine. Here we present pharmacodynamic and pharmacokinetic data in human volunteers following subcutaneous administration.

Methods & Results:
In vitro: The formulation was assessed for nanoparticles using cryo-transmission electron microscopy (cryo-TEM). On exposure to plasma the study drug went from a particle-free homogenous oil to an emulsion containing multilamellar liposomal vesicles (Fig A-C).

Human PD: In a randomized / blinded study 15 volunteers received 2.5mL s.c. of proliposomal 4% ropivacaine, plain 0.5% ropivacaine and vehicle. Pinprick and experimental heat pain tolerance were assessed over 72 hrs. There was increased duration in pinprick anesthesia; proliposomal and plain ropvicaine were 28.8 (6.0) hours and 15.9 (3.5) hours respectively; mean difference 16.8 hours (95%CI 10.0 to 23.7; p=0.001). There was an increased duration in experimental heat pain analgesia; p=0.036.

Human PK: 9 volunteers received 2.5mL s.c. of either proliposomal 4% ropivacaine (n=6), plain 0.5% ropivacaine (n=3); plasma ropivacaine concentrations was assessed over 72 hours. There was only a 64% increase in peak plasma concentration in the proliposomal ropivacaine group (164 ± 43 ng/mL compared with 100 ± 41 ng/mL in the plain ropivacaine group) despite an eight-fold increase in ropivacaine dose in the proliposomal group. Peak plasma concentrations were well below the putative toxic plasma concentration for both groups. The terminal half life (13.8±3.6 hrs) and area under the curve (5090±1476 h×ng/mL) for proliposomal ropivacaine were greatly increased when compared to plain ropivacaine (5.9±2.3 hrs and 593±168 h×ng/mL respectively).

Conclusions:
The PKPD effect of proliposomal ropivacaine is compatible with liposomal local anesthetics. The advantage of the proliposomal oil is its ease of preparation and its extended shelf-stability at room temperature.



Abstract #: O1-02

Hypertensive Disorders of Pregnancy-related Stroke: Incidence, Trends, Risk Factors, and Outcomes in the Nationwide Inpatient Sample

Presenting Author: Lisa R Leffert M.D.
Presenting Author's Institution: Massachusetts General Hospital - Boston, MA
Co-Author: Brian T. Bateman M.D., MSc - Massachusetts General Hospital - Boston, MA
Caitlin R. Clancy B.A. - Massachusetts General Hospital - Boston, MA
Elena V. Kuklina M.D., PhD. - Centers for Disease Control - Atlanta, GA

Introduction: Despite the fact that stroke is one of the most feared complications of hypertensive disorders of pregnancy (HDP) (1,2), there is a dearth of literature examining the prevalence, etiologies, risk factors, and outcomes of hypertension-related stroke in pregnancy.

Methods: Using the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality, we extracted all pregnancy hospitalizations of women aged >15-44 years from 1994-2011 (N=81,983,217). Stroke hospitalizations (N =31,673) and their comorbidities were identified by the International Classification of Diseases, 9th edition (ICD-9 CM) codes. All statistical analyses accounted for the complex sampling design of the data source. Odds ratios (OR) with 95% confidence intervals (95% CI) for stroke were obtained using logistic regression analysis after adjustment for study period, age, payer, hospital teaching status, region, and delivery mode.

Results: Between 1994-1995 and 2010-2011, the nationwide rates of pregnancy related stroke with HDP increased by 102.6% (from 0.8 to 1.6 per 10,000 pregnancy hospitalizations) while the rate of pregnancy related stroke without HDP increased by 46.6% (from 2.2 to 3.2 per 10,000 pregnancy hospitalizations). Compared to women without HDP, women with HDP were about 5.2 (95% CI: 4.9-5.6) times more likely to have stroke. Systemic lupus erythematosus, primary thrombocytopenia, congenital coagulation defects, sickle cell anemia , atrial fibrillation, and valve disorders were all independent RF for stroke (OR ranged from 2.3 (95% CI: 1.7-3.0) for sickle cell anemia to 19.4 (95% CI: 12.2-30.8) for atrial fibrillation), and when coupled with HDP showed a markedly elevated risk for stroke (OR ranged from 11.6 (95% CI:8.0-16.8) for congenital coagulation defects to 37.6 (95% CI: 19.7-71.9) for atrial fibrillation). Stroke-related complications, including the need for mechanical ventilation, seizures, pneumonia, prolonged hospital stay and death during hospitalization were increased in women with HDP-related stroke compared to women with non-HDP-related stroke, with OR ranging from 1.2 (95% CI: 1.1-1.4) for prolonged hospital stay to 1.9 (95% CI: 1.6-2.3) for mechanical ventilation.

Conclusion: Having specific traditional stroke risk factors substantially increases the risk of stroke in women with HDP. Compared with non-HDP-related stroke, HDP-related stroke has two distinctive characteristics: a greater increase in prevalence since the mid-1990s (3) and significantly higher rates of stroke-related complications.

(1) Obstet Gynecol, 2009; 113:1299-306. (2) Women's Health, 2011; 7:363-74. (3) Stroke, 2011; 42:2564-70.

Abstract #: O1-03

Perioperative hemodynamics in women with early- and late-onset preeclampsia

Presenting Author: Eldrid Langesaeter MD, PhD
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Co-Author: Tor H Hauge MSc, PhD - Ministy of Trade and Industry - Oslo, Norway
Robert A Dyer MD, PhD - University of Cape Town - Cape Town, South Africa

Background: The aim of this study was to describe hemodynamic changes pre-delivery and during spinal anaesthesia for cesarean delivery, in women with severe preeclampsia (PE), and to compare findings in early- versus late-onset severe disease.
Methods: A total of 68 women with severe PE were included in this observational study, conducted at the High Risk Referral Unit of Oslo University Hospital, Rikshospitalet, Norway. All patients had beat by beat arterial blood pressure and cardiac output (CO) monitoring with the LiDCOplus monitor.

Results: Thirty-six patients scheduled for cesarean delivery (CD) for worsening maternal disease had hemodynamic monitoring during spinal anesthesia (SA), 21 with early-onset- (GA<34 weeks), and 15 with late-onset disease (GA>34 weeks). There were no between-group differences in blood pressure predelivery (mean arterial pressure 138- versus 137 mmHg). Magnesium sulphate was administered to 15/21 (71.4%) in the early-onset group and 8/15 (53%) in the late-onset group. Antihypertensive treatment was given to all except 3 (14.3%) and 5 (33.3%) patients in the early-onset and late-onset groups respectively. The early-onset patients had a higher hemoglobin/hematocrit pre-delivery (13.1 vs 12.2 g/dl, p=0.022), higher systemic vascular resistance (SVR) (1850 vs 1377 dyne.s.cm-5, p=0.006), and lower CO (6.0 vs 7.8 l/min, p=0.002), compared to the late-onset group. These patients received higher doses of spinal bupivacaine (11.3 mg) than the late-onset group (9.9 mg). Following induction of SA, both groups had similar minor hemodynamic changes in blood pressure, SVR, and CO. There were no between-group differences in the volume of fluids or vasopressor dose administered. The mean birth weight was 1362- and 2683 g in the early- and late onset groups respectively. APGAR score was statistically significantly lower (p=0.028), and there were 4 fetal deaths in the early-onset group.

Conclusions: These observational data suggest that in patients with severe PE presenting for CD with equivalent degrees of hypertension, SVR is higher and CO lower in early-onset- compared with late-onset PE. Changes in CO, SVR, and blood pressure in responses to SA were similar and minor in the majority of patients in both groups even though the early-onset group had higher doses of spinal bupivacaine.

Ref.
Valensise H. et al. Early and late preeclampsia.Two different maternal hemodynamic states in the latent phase of the disease. Hypertension 2008;52:873 □ 880.

Abstract #: O1-04

Peripartum maternal outcomes of term breech presentation delivery: impact of successful external cephalic version

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Co-Author: Bat Zion Shachar MD - Stanford University School of Medicine, Stanford California, USA - Stanford, California
Lawrence C Tsen MD - Brigham and Women's Hospital, Harvard Medical School, Boston, MA - Boston, MA
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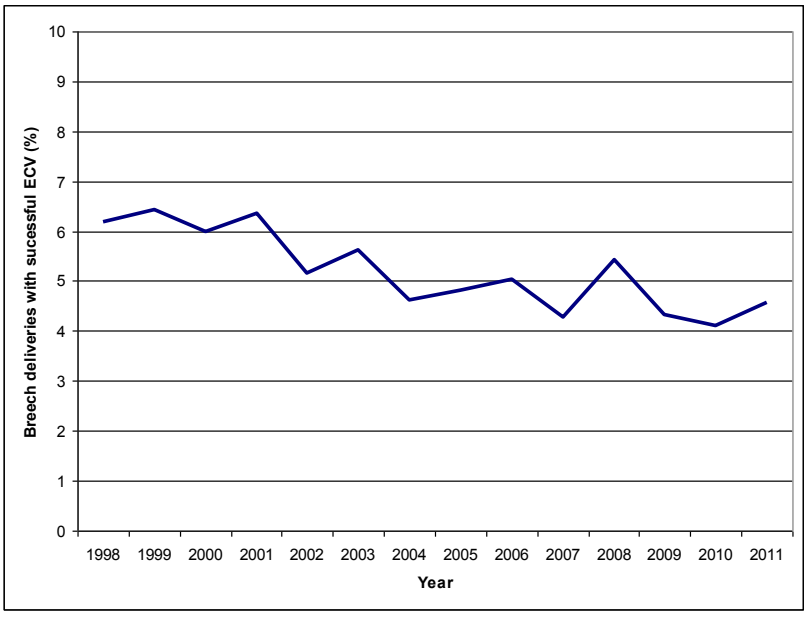
Objective: External cephalic version (ECV) allows for vaginal delivery of a previously breech presentation fetus;(1) however, the maternal outcomes and costs associated with breech presentation delivery and successful ECV are largely unreported. We report these outcomes in a large, nationwide sample of delivery admissions.

Methods: Term deliveries were sourced following either successful ECV or persistent breech presentation, using ICD-9 codes and the Nationwide Inpatient Sample (20% of US inpatient hospital admissions); we excluded contraindications to ECV. Temporal trends were evaluated for the proportion of breech deliveries undergoing successful ECV. Logistic regression analysis determined predictors for successful ECV among breech deliveries. Maternal outcomes following successful ECV were compared to those with persistent breech adjusting for potential confounders.

Results: From 1998-2011, we identified 1,079,576 women with breech presentation; 56,409 (5.2%) underwent successful ECV. The cesarean delivery (CD) rate was 20.2% following successful ECV vs. 94.9% for persistent breech presentation. The proportion of successful ECV declined over the 14-year period (Figure). Successful ECV is associated with significant reductions in maternal sepsis (adjusted odds ratio (aOR) 0.35, 95% confidence interval (CI) 0.24-0.51) and non-significant reductions in pulmonary embolism, transfusion, hysterectomy, and anesthetic complications. Successful ECV was associated with reduced hospital charges, 2,271 USD, 95% CI 2,553-1,989 and maternal hospital stay, 0.67 days, 95% CI 0.73-0.60. The hospital CD rate (all deliveries, not just breech presentation) was the most significant predictor of successful ECV: Adjusting for other characteristics (reference was CD rate < 20%), the aOR of successful ECV was 0.75 (95% CI 0.62-0.90) for CD rate of 20-24%, 0.60 (95% CI 0.49-0.73) for 25-29%, 0.48 (95% CI 0.37-0.64) for 30-34%, and 0.35 (95% CI 0.29-0.43) for ≥35%.

Figure depicting temporal trends for successful ECV 1998-2011



Conclusion: In our nationwide US sample, ECV utilization was low. Successful ECV is performed less frequently at centers with high CD rates. Delivery following successful ECV is associated with reductions in CD rates, costs, and maternal morbidity. Efforts to increase the practice of ECV, including use of neuraxial analgesia and anesthesia (2), should be supported.

References: (1) ACOG Committee Opinion No. 340. Obstet Gynecol. 2006;108:235-7. (2) Sultan P et al. Int J Obstet Anesth 2011, 20:299–306.

Abstract #: O1-05

Second Line Uterotonic Agents and the Risk of Hemorrhage-Related Morbidity

Presenting Author: Alexander Butwick MBBS, FRCA, MS
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Co-Author: Brendan Carvalho MBBCh, FRCA - Stanford University School of Medicine - Stanford, CA
Yar Blumenfeld MD - Stanford University School of Medicine - Stanford, CA
Yasser El-Sayed MD - Stanford University School of Medicine - Stanford, CA
Brian Bateman MD - Massachusetts General Hospital - Boston, MA

Introduction: Uterine atony is a leading cause of postpartum hemorrhage (PPH).(1) Second line uterotonic agents, notably methylergonovine maleate (methergine) and carboprost (hemabate) are recommended to treat severe or refractory uterine atony in patients who fail to respond to first line therapy such as uterine massage and oxytocin.(2) However, there are few data comparing outcomes in patients with uterine atony who receive either methergine or hemabate.

Methods: We performed a retrospective cohort study using data from the NIH-MFMU Cesarean Registry. We identified 1,335 patients who underwent cesarean delivery (CD) and received methergine or hemabate. Patients with hypertensive disorders or asthma were excluded as they would not be eligible for both medications. The primary study outcome was hemorrhage-related morbidity (HRM), defined as the presence of at least one of the following: intraoperative or postoperative RBC transfusion, uterine artery or hypogastric artery ligation. We performed propensity score (PS) matching using a 1:1 ratio to account for potential confounders which included: maternal age, gestational age, race, BMI at delivery, diabetes, multiple gestation, repeat CD, previa, presence of labor or labor induction, chorioamnionitis, and neonatal birthweight.

Table. Odds Ratios of Hemorrhage-Related Morbidity

	Hemorrhage-Related Morbidity/ patients, n		
	Methergine	**Hemabate**	**OR* (95% CI)**
Unadjusted	76/870	81/465	2.2 (1.58-3.08)
PS-score matched cohort	34/369	59/369	1.88 (1.19-2.94)

* Odds Ratio of Hemorrhage-Related Morbidity for Hemabate vs Methergine

Results: Within our cohort, 1,335 of 57,182 (2.3%) patients received either methergine (n=870) or hemabate (n=465) after failing to respond to first line therapy (uterine massage and oxytocin). The PS matched cohort comprised 369 pairs of patients who received either methergine or hemabate. In the matched cohort, the incidence of HRM was 16.0% in the hemabate group and 9.2% in the methergine group (Table). After accounting for measured confounders, hemabate was associated with an increased risk of HRM (odds ratio 1.88, 95% confidence interval 1.19 to 2.94) (Table).

Discussion: In this retrospective cohort study, those patients treated with the second-line uterotonic agent hemabate were at increased risk for progression to HRM compared to those treated with methergine, independent of measured confounders. These data suggest that methergine may be a more effective second line uterotonic agent than hemabate. Randomized-controlled trials should be conducted to confirm these findings.

References: (1) Anesth Analg 2010;110:1368-73 (2) Obstet Gynecol 2006;108:1039-47.

PROGRAM MATERIAL

Friday, May 16, 2014

Best Paper Session
Moderator: Paloma Toledo, M.D., M.P.H.

Caring for Our Own: Focusing on the Care Provider to Optimize Safety for Our Patients

Teaching Effective Communication on Labor & Delivery
Speaker: May C.M. Pian-Smith, M.D., M.S.

The Second Victim
Speaker: Stephen Pratt, M.D.

Motivating the Rat: Managing the Disruptive Co-Worker
Speaker: Lawrence C. Tsen, M.D.

What's New in Obstetrics? Pathogenesis, Prevention & Management of Severe Preeclampsia
Introduction: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC
Speaker: John Kingdom, M.D.

Meta-Analyses
Moderator: Robert R. Gaiser, M.D.

Abstract #: BP-01

Both phenylephrine and hypercapnia cause acute placental and fetal organ hypoperfusion with fetal brain sparing in rat pregnancy: BOLD functional MRI changes mirrored by Doppler ultrasound.

Presenting Author: Yehuda Ginosar BSc MBBS
Presenting Author's Institution: Hadassah Hebrew University Medical Center - Jerusalem
Co-Author: Yuval Gielchinsky MD PhD - Hadassah Hebrew University Medical Center - Jerusalem
Nathalie Corchia Nachmanson BSc - Hadassah Hebrew University Medical Center - Jerusalem
Joel Shapiro MBBCh - Hadassah Hebrew University Medical Center - Jerusalem
Uriel Elchalal MD - Hadassah Hebrew University Medical Center - Jerusalem
Rinat Abramovich PhD - Hadassah Hebrew University Medical Center - Jerusalem

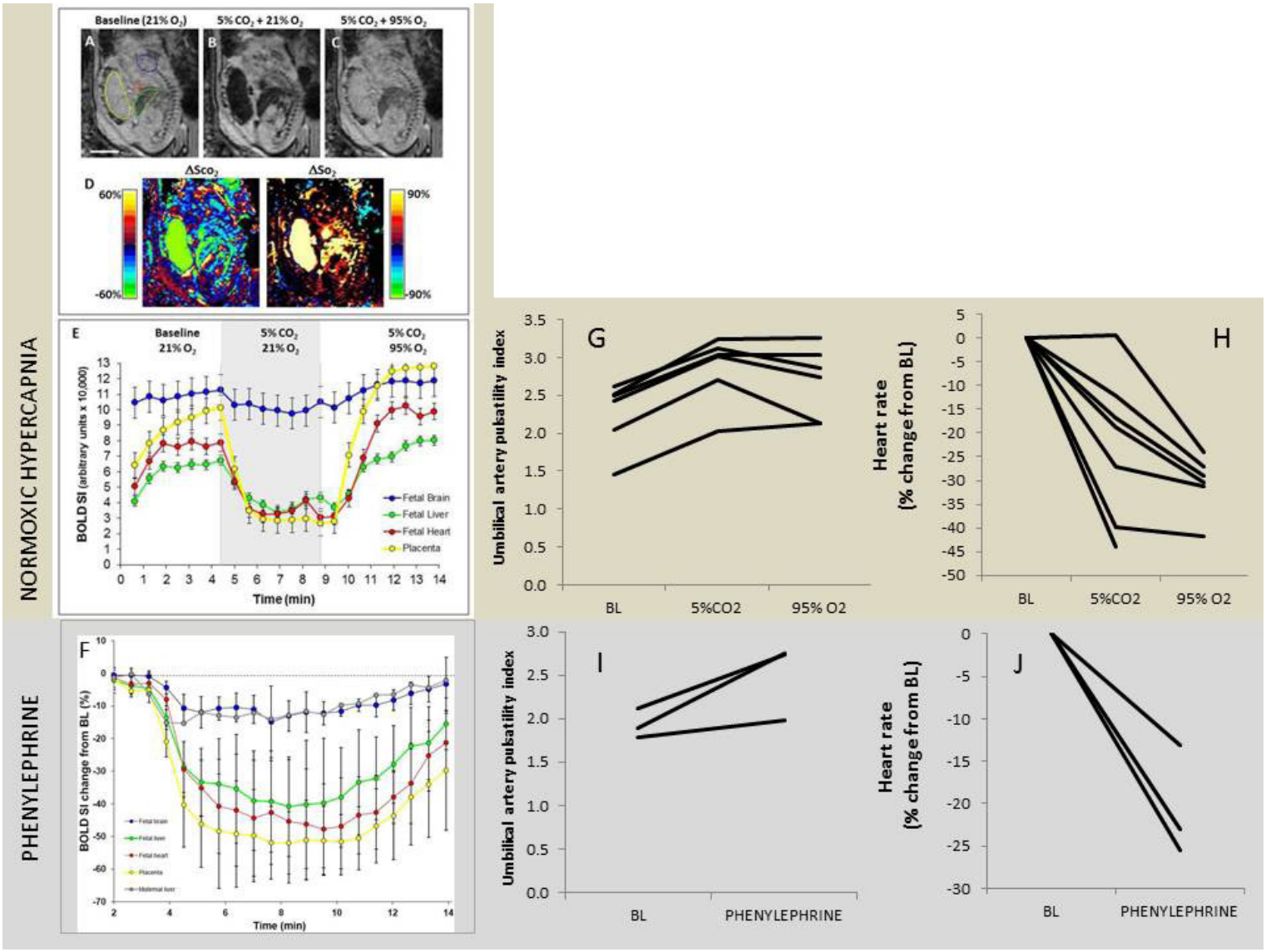
Background: The fetal circulatory changes that follow acute placental hypoperfusion are not fully understood. Most available data comes from Doppler ultrasound but is limited as it cannot assess placental and fetal vessels simultaneously and cannot make repeated measurements at short fixed time intervals. We have used blood oxygen-level dependent functional magnetic resonance imaging (BOLD-fMRI) as a novel fetal imaging strategy to identify acute changes in placental and fetal organ perfusion. We used this technique to demonstrate acute placental hypoperfusion (and fetal brain sparing) in response to both acute normoxic hypercapnia and intravenous maternal phenylephrine administration. In this study we hypothesize that regional changes in BOLD-fMRI will be accompanied by similar changes in Doppler ultrasound pulsatility index.

Methods: All experiments were performed on spontaneously breathing adult female Wistar rats (on E20), anesthetized with 30 mg/kg intraperitoneal pentobarbital. For normoxic hypercapnia (n=7), animals were attached by a loose-fitting facemask to a breathing system with 4 l/min fresh gas flow; for three consecutive 4 min periods, animals breathed the following gases in sequence: medical air, air-carbon dioxide (5% CO2, 21% O2, 74% N2) and carbogen (5% CO2, 95% O2). In the phenylephrine group (n=3), animals received drug (10microgram/kg) in tail vein as a bolus. Doppler ultrasound pulsatility index and fetal heart rate were assessed in umbilical arteries and ductus venosus. Abdominal fur was removed; gel applied to the abdomen; Doppler performed using high-resolution ultrasound imaging system Vevo 770, VisualSonics, equipped with a 40mHz mechanical transducer (RMV707B) focal length of 6 mm, a frame rate of 30 Hz, and an 8 × 8 mm field of view with spatial resolution of 30 μm. Doppler indices of pulsatility index were obtained from at least three similar consecutive waveforms. Decreased values indicate decreased vascular resistance and correlated with increased flow.

Results: There was a marked increase in umbilical artery PI following hypercapnia 27.4% (2.7) and phenylephrine 28.7% (9.7), accompanied by fetal bradycardia -22.5% (5.9) and -20.6% (3.8) respectively. These results are represented in Fig G-J and may be compared with earlier data in Fig A-F.

Conclusion: The changes in Doppler flows support our previous observations of using BOLD-fMRI as a non-invasive monitor of fetal hemodynamic responses to acute intrauterine asphyxia

Abstract #: BP-01



Abstract #: BP-02

Magnesium modulates IL-6-induced maternal fever and increases fetal brain activated astrocytes

Presenting Author: Carlo Pancaro M.D. Assistant Professor
Presenting Author's Institution: Tufts Medical Center - Boston, MA
Co-Author: James Marchand Ph.D. Assistant Professor of Anatomy - Tufts Medical Center - Boston, MA
Roman Schumann M.D. Associate Professor of Anesthesiology - Tufts Medical Center - Boston, MA
Errol R. Norwitz M.D., Ph.D. Professor of Obstetrics - Tufts Medical Center - Boston, MA
B. Scott Segal M.D., M.H.C.M. Professor of Anesthesiology - Tufts Medical Center - Boston, MA

Background: Fever in labor is associated with seizures, cerebral palsy and other fetal brain injuries. Labor epidural analgesia is a common risk factor for intrapartum fever and is associated with a noninfectious increase in maternal interleukin-6 (IL-6)(1). We previously reported that systemic injection of IL-6 in pregnant rats leads to fever and fetal brain microglial activation and inflammation. Magnesium sulfate (MgSO4) is commonly used clinically and reduces the risk of neonatal brain injury(2). We hypothesized that maternal MgSO4 would alter the maternal and fetal brain effects of IL-6.

Methods: With DLAM approval, pregnant rats (N=9) were injected with either Saline (n=3), IL-6 (n=3) or MgSO4 and IL-6 (n=3) at 0, 1.5, and 3 hr on gestational day 20 (GD20; term=22d) and core temperature was recorded. 24 hr post injection, dams were anesthetized and fetal forebrains removed and processed for histochemical analyses of Glial Fibrillary Acidic Protein (GFAP), a marker of astrocyte activation. Temperature differences were compared by RM ANOVA and counts of GFAP+ cells were compared by chi-square.

Results: Compared to saline, IL-6 injection increased temperature while MgSO4 decreased it progressively at 3 hours (vehicle 37 ± 0.15 °C, IL-6 37.3 ± 0.14, IL-6 MgSO4 36.2 ± 0.4) (P=0.03). A rebound temperature increase was observed in the MgSO4 IL-6 group at 270 minutes (37 ± 0.5,P=0.03). The saline group showed very few GFAP- stained cells. IL-6 increased GFAP staining (50%) and IL-6 MgSO4 further increased GFAP+ cells (70%, $p<0.05$; Figure).

Conclusions: MgSO4 suppresses the IL-6-induced increase in maternal temperature, though the effect appears short-lived after discontinuation of the drug. MgSO4 also activates fetal astrocytes and tripotent stem cells in our model. GFAP is a marker of differentiated astrocytes, but it is also expressed in adult multipotent cells of the subventricular zone, an important area in developmental synaptogenesis(3-4). Astrocytes may also promote myelination, and protect neurons by several mechanisms. The possible neuroprotection of MgSO4 is a promising observation for future investigation.

1) AJOG 2002;187(4):834-838

2) NEJM 2008;359(9):895-905

3) Gen Dev 2012; 1;26(9):891-907

4) Acta Neurop. 2010;119(1):7-35

Abstract #: BP-03

Pharmacokinetics of Ondansetron in Pregnant Women and Neonates

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Presenting Author's Institution: Stanford University School of Medicine - Palo Alto, California
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Jeffrey Galinkin MD - University of Colorado - Aurora, Colorado
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Introduction: Ondansetron is a potent, selective 5-HT3 antagonist used to prevent and treat nausea and vomiting in obstetrics.(1) Ondansetron may also be effective in preventing maternal narcotic withdrawal symptoms or neonatal abstinence syndrome (NAS).(2) Physiological changes in pregnancy may affect drug pharmacokinetics (PK), however there is limited information about ondansetron PK in pregnant women or neonates. The aim of this study was to characterize ondansetron PK in pregnant (versus non-pregnant) women and neonates, and determine placental transfer.

Methods: Healthy women undergoing cesarean delivery were randomly assigned to receive 4- or 8-mg IV ondansetron for this prospective, open-label, IRB-approved study. A population PK approach was used to analyze ondansetron concentrations in 372 blood samples obtained from 20 non-pregnant and 40 pregnant women and their neonates after treatment with either 4- or 8-mg of ondansetron. Maternal blood was sampled at 7, 15, 40 min, and 8 h after ondansetron administration; neonatal levels were measured at 30 and 90 min, 2, 6 and 24 h after birth; and ondansteron levels were measured from venous umbilical cord blood at time of delivery. A two-compartment linear disposition model was used to describe the data and a two-stage NONMEM approach applied to obtain covariate modeling. Visual predictive check evaluated final model prediction of observed and predicted ondansetron concentrations.

Results: The analysis demonstrated that ondansetron PK is not affected by pregnancy; the ondansetron dose was the most important covariate affecting its PK; ondansetron readily crossed the placenta; and ondansetron displayed a significantly longer half-life in neonates (Figure). The mean population parameter estimates were central distribution volume of 28 L; clearances of 22 L/h and 15 L/h for 4- and 8-mg doses respectively; and steady-state volumes of 167 L and 124 L for 4- and 8-mg doses respectively.

Conclusions: Ondansetron exhibits pregnancy-independent PK suggesting that the dose does not need to be altered during pregnancy. Ondansetron readily crosses the placenta, and neonatal drug elimination during the first day of life is significantly delayed compared to maternal elimination. Data from this study can be used to guide trans-placental and neonatal dosing regimens to prevent NAS in babies born to narcotic-consuming mothers.

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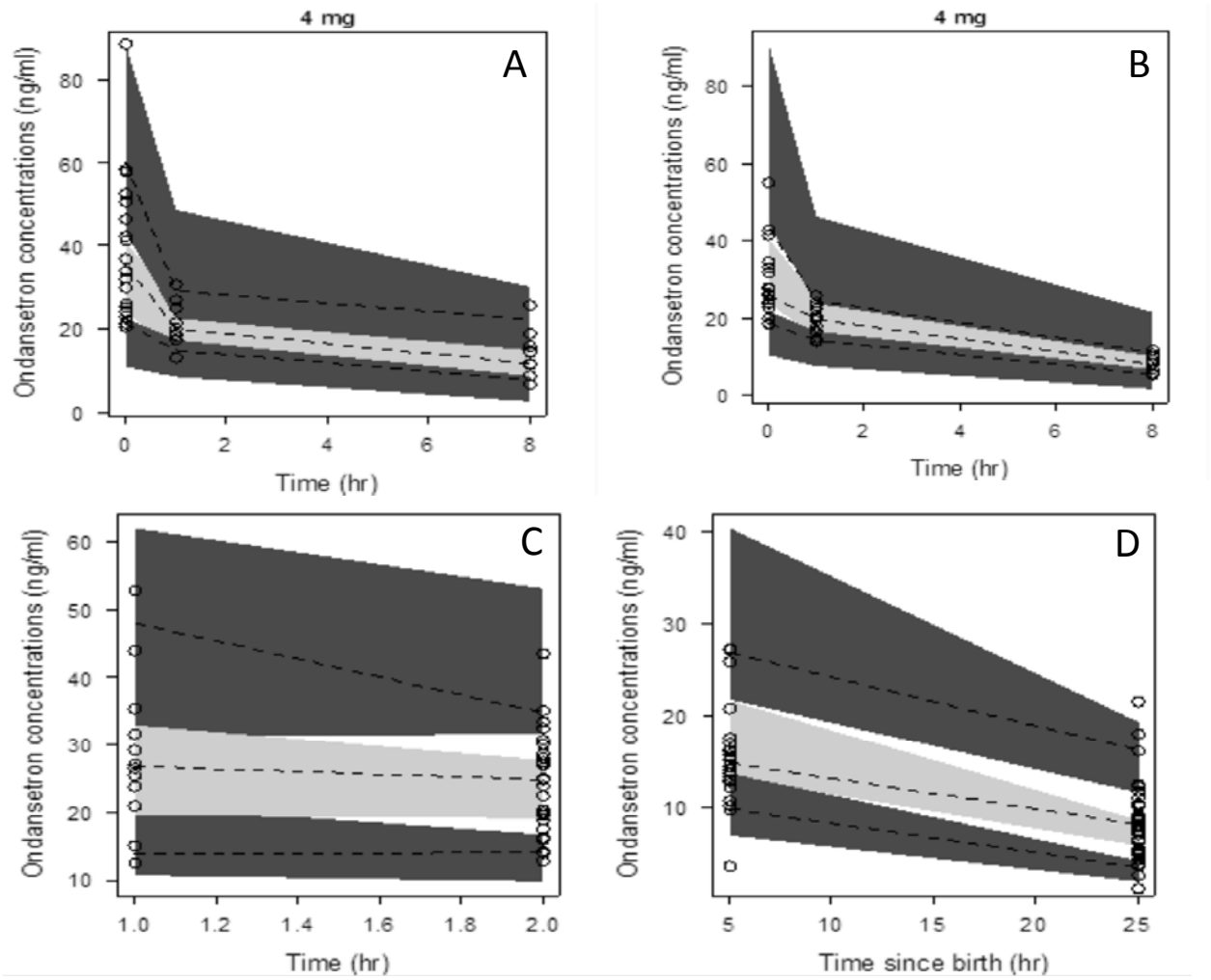
Figure: Visual predictive check of the final pharmacokinetic model for ondansetron blood concentrations in non-pregnant women (A), pregnant women (B), umbilical cord (C), and neonates (D)



Dashed lines represent the 5th, 50th, and 95th percentile of observed concentrations. Shaded areas represent the 95% CI for the 5th, 50th, and 95th percentile of simulated concentrations. Points represent the observed concentrations.

Abstract #: BP-04

Serotonin Increases Human Myometrial Contractility in a Focal Adhesion Signaling Independent Manner

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Background: Serotonin (5HT) is a potent uterine stimulant and vascular constrictor, but the signaling pathways for 5HT-induced uterine contractions have not been identified. Src kinase is a major regulator of focal adhesion (FA) turnover in myometrium. (1) Using microarray data confirmed by cellular biochemistry, 5HT-2a expression increases significantly in late pregnancy. Thus, 5HT might play a role in regulation of uterine contractility. Our hypothesis was to determine whether Src kinase modulates 5HT-induced contraction and whether 5HT activates FA signaling.

Methods: After informed written consent, human uterine samples were collected from term pregnant women undergoing Cesarean section. Myometrial strips were exposed to 5HT in a myobath and contractility was measured as area under curve for 10 minutes (AUC 10'). We tested the effect of PP2, a Src kinase inhibitor, on 5HT-induced contraction. Phosphorylation and activation of FA signaling molecules, FAK (focal adhesion kinase) and ERK, were assessed by Western immunoblotting.

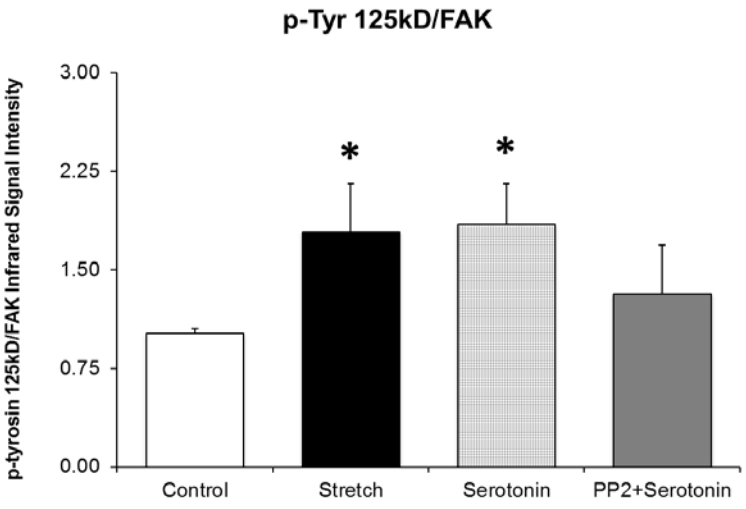

Fig. 1 Serotonin increases tyrosine phosphorylation of focal adhesion kinase (FAK).
Phospho-tyrosine signals are normalized with total FAK protein levels. * $p < 0.05$, compared to control.

Results: 5HT significantly increased tyrosine phosphorylation of FAK (Fig. 1), as did mechanical stretch. 5HT-induced phosphorylation of ERK1/2 was also observed. FAK and ERK activation are well known to be associated with FA signaling. (2) Furthermore, 10-6M 5HT markedly augmented spontaneous contraction and significantly increased contractility (AUC 10' baseline 12.4±1.4 vs. 223.9±98.7, n=6, p=0.028). Stretch of smooth muscle also induced contraction, to a greater extent compared to 5HT (AUC 10' 908.9±144.5). Pretreatment of PP2 significantly suppressed 5HT-induced ERK serine phosphorylation, but failed to prevent FAK tyrosine phosphorylation, indicating that FAK is an upstream kinase positioned to ERK in FA signaling pathway. More importantly, Src inhibitor had no inhibition on 5HT-induced contraction (AUC 10' 154±25.9 vs. 223.9±98.7, p=0.75). The data suggest that 5HT could activate FA signaling, but acts predominantly via a FA signaling-independent pathways.

Conclusion: We demonstrated that 5HT regulates uterine contractility on isolated uterine strips in a FA signaling-independent manner. Also, inhibition of ERK phosphorylation by PP2 fails to prevent 5HT-induced contractions. These data point to the possibility that serotonin is a potent uterotonic agent that may play a key role in uterine atony and postpartum hemorrhage.

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Abstract #: BP-05

The effect of progestins on TNFα induced MMP9 activity and mRNA expression in primary chorion and amnion cells in term fetal membranes

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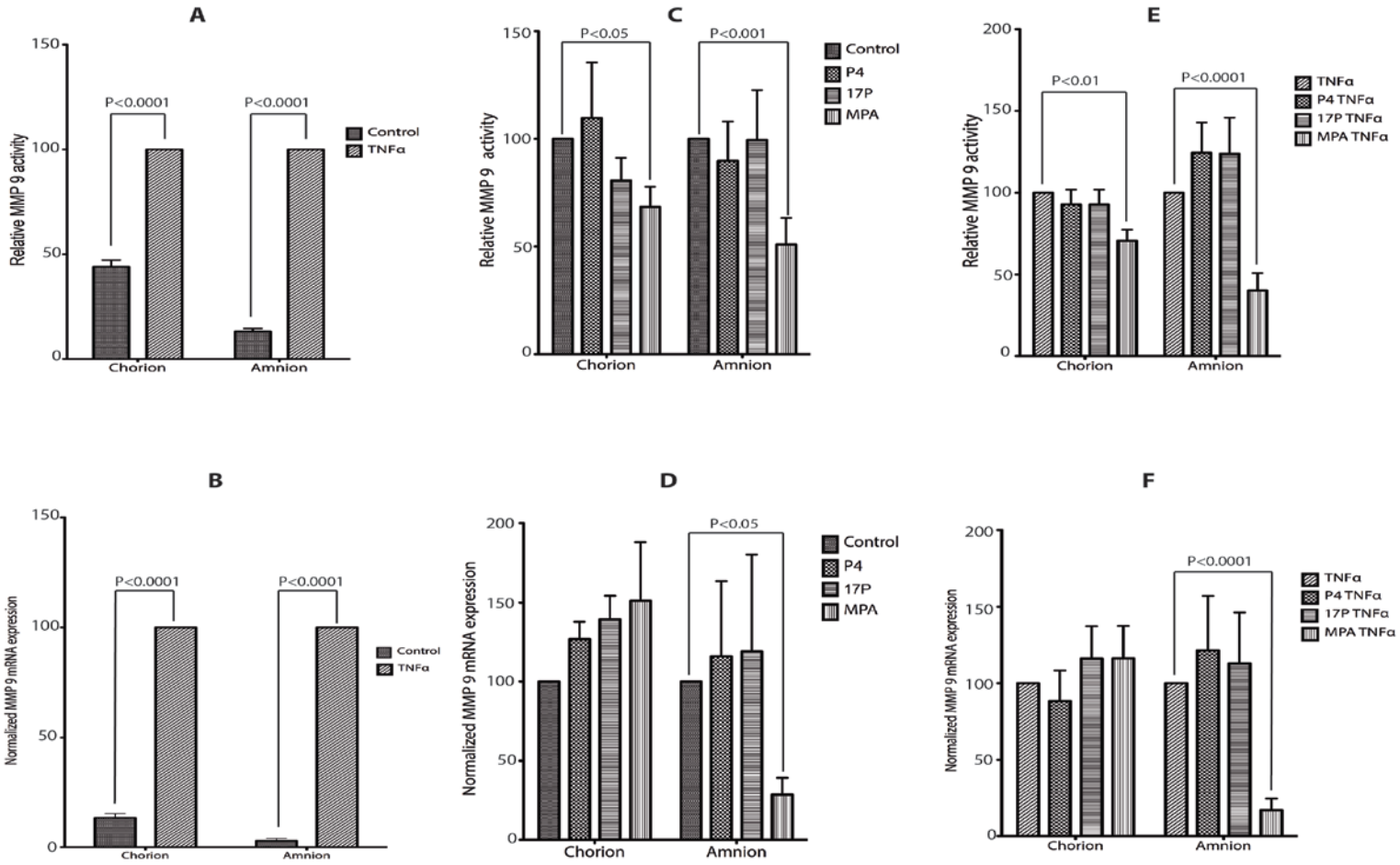
Mechanisms to prevent PPROM are limited but progestins may play a role. We have previously demonstrated that progestins attenuate TNFα induced matrix metalloproteinase-9 (MMP9) activity in a cytotrophoblast cell line. TNFα induced MMP9 activity and expression in fetal membranes leads to membrane weakening and rupture and is a key pathophysiologic process in PPROM. However whether progestins have a similar effect in primary amnion and chorion cells of fetal membranes is unknown. The objective of this study was to evaluate the effect of progestins on basal and TNFα-induced MMP9 activity and mRNA expression in primary chorion and amnion cells harvested from the fetal membranes of term non-laboring patients.

Methods: Fetal membranes were harvested from term uncomplicated non-laboring patients following elective cesarean delivery (n=6). Primary amnion and chorion cells were isolated using our established protocol. Harvested cells were incubated and grown to confluence in serum containing cell culture media. Cell cultures were pretreated with control (vehicle), progesterone (P4), 17 alpha-hydroxyprogesterone caproate (17P) or medroxyprogesterone acetate (MPA) at 10-6 M concentration for 6 h followed by stimulation with TNFα at 10 ng/ml for an additional 24 h. Cell culture media were harvested for MMP9 activity quantification using gelatin zymography. Total RNA was extracted from cell lysates and reverse transcribed into cDNA. MMP 9 and GAPDH mRNA expression were quantified by RT-qPCR using prevalidated Taqman probes. MMP9 mRNA expression was normalized to GAPDH. Both MMP9 activity and mRNA data were normalized to control or TNFα only stimulation, summarized as mean ± SEM and analyzed by 2way ANOVA.

Results: Compared to the control level, TNFα increased mRNA expression and MMP9 activity (fig A&B). MPA, but not P4 and 17P, reduced basal MMP9 activity in primary chorion and amnion cells (fig C), but only reduced basal mRNA expression in primary amnion cells when compared with controls (fig D). MPA also reduced TNFα-induced MMP9 activity in both primary chorion and amnion cells (fig E), but only reduced TNFα-induced MMP9 mRNA expression in primary amnion cells (fig F) when compared with TNFα only stimulation.

Conclusion: Our findings demonstrate a possible mechanism by which progestins may prevent PPROM but also suggest that different molecular mechanisms are involved in the attenuation of basal and TNFα induced MMP9 activity by MPA in the chorion and the amnion.

Abstract #: BP-05



TNFα stimulation increased MMP9 activity (A) and mRNA levels (B) above that of the control group (MMP9 activity and mRNA expression normalized to TNFα stimulation). MPA reduced basal MMP9 activity in both primary amnion and chorion cells (C) but reduced basal mRNA expression only in primary amnion cells (D) (MMP9 activity and mRNA expression normalized to the control group). MPA reduced MMP9 activity in primary chorion and amnion cells (E) but reduced MMP9 mRNA expression only in primary amnion cells (MMP9 activity and mRNA expression normalized to TNFα stimulation).

Caring for Our Own: Focusing on the care provider to optimize safety for our patients
Improving Effective Communication on Labor and Delivery

Presenting Author: May C.M. Pian-Smith, M.D., M.S.
Presenting Author's Institution: Harvard Medical School - Boston, MA, USA

Most of our clinical practice on the Labor Unit is unscheduled and often fast-paced. Rapidly evolving clinical situations and evolving management strategies necessitate frequent and effective interdisciplinary communications. Not surprisingly many sentinel events and closed claims cases have been associated with imperfect communication. In fact, in many of these instances a co-worker had concerns about a safety issue but did not speak-up about them .

Research studies, primarily in the business and psychology domains, have uncovered implicit, subconscious assumptions and fears that individuals have, often not grounded in truth, that act to self-censor us. These fears include fear that input is not welcomed, fear of embarrassment, fear of being wrong, fear of retribution, and fear that nothing good will come of taking such risks. Poor communication erodes the psychological safety of a workplace and is itself a marker for a poor culture of safety. This lecture will highlight what has been studied and is known about the importance of effective communication, and the efficacy of implemented programming, based on a review of published literature and our own institutional experiences.

Improving communication and creating sustainable culture change will require more than simply "teaching" through drills and training sessions. Studies have shown that interventions need to be substantive and repetitive, reflecting the priority that culture change is given by institutional leadership. Shared experiential learning among interdisciplinary colleagues helps to create a "shared mental model" that allows individuals to have the moral courage to think of the greater good, rather than individuals' risks. Hierarchies can inhibit speaking up; thus inclusive leaders are needed to model ideal communication, and to ask for, deliberately listen to, and express thanks for input from all team members.

Improved communication has been linked to improved psychological safety, improved provider resiliency, and a decreased sense of professional burn-out. Certainly these are important factors in caring for ourselves, each other and ultimately our patients.

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Caring for Our Own: Focusing on the Care Provider to Optimize Safety for Our Patients
Impact of Adverse Events on the Clinician

Stephen D Pratt, MD

The impact of medical error on patient outcomes has been well described. Even when appropriate care is provided, a large number of patients experience harm. Medicine is a high risk profession. The impact that error or patient harm has on the clinicians involved has only begun to be understood. In 2000, Wu used the term “second victim” to describe the emotional and physical injuries that clinician experience when they are involved in an error or adverse event. Over the ensuing decade, our understanding of this phenomenon has grown significantly.

The number of clinicians impacted by the second victim syndrome is not known, but it is certainly large. The 1999 Institute of Medicine report demonstrated the up to 100,000 people die each year due to medical error, and a recent report by the Office of the Inspector General found that up to 14% of Medicare patients who enter the hospital experience unexpected harm. These data suggest that the number of clinicians at risk is significant. In two separate studies, Scott et al asked their staff whether they had been involved in a case that caused them significant emotional distress within the previous year. Up to 30% responded that they had. Gazoni et al found that 84% of anesthesia providers had been involved in a serious unexpected outcome during their career (Death, stroke, wrong site surgery, etc), and that more than 70% of them had ongoing feelings of anxiety, guilt and reliving of the event. In the most striking data, Shanafelt found that more than 6% of surgeon had experienced suicidal ideation within the previous year, and that these thoughts were strongly associated with adverse events.

These data demonstrate not only the frequency of the second victim phenomenon, but also speak to the degree of impact it can have on the provider. Scott described the natural history of the second victims, outlining six physical and 17 psychosocial symptoms commonly experienced. Perhaps the most important emotional impact comes from the feelings of incompetence, isolation and guilt that tend to accompany these adverse events. These symptoms tended to occur over a predictable series of six stages:

- Chaos and accident response
- Intrusive reflections
- Restoring personal integrity
- Enduring the inquisition
- Obtaining emotional first aid
- Moving on (this included those who left the field of medicine).

Sadly, few clinicians receive help dealing with the normal reactions to these events. To the contrary, many are told not to talk to anyone because there could be a law suit. This emotional isolation has led some to take their own lives.

The mandate to care for clinicians after an adverse event should not be based solely the moral imperative to heal the clinician; it may be important from a quality and safety standpoint. Medical error is a strong predictor of burnout, especially among house staff. In a sad and ironic twist, burnout is also a strong predictor of making medical errors. Thus, helping clinicians to heal and to thrive after adverse events and medical errors may actually help to decrease both future errors and the subsequent emotional distress and burnout that they may cause.

The best way to care for the second victim has not been established. Individuals should understand that there is much that they can do to care for themselves (Physical exercise, relaxation techniques, keeping life as routine as possible, avoiding alcohol and drug use, don’t try to hide your feelings, eat regularly but minimize the use of sugar and caffeine). In addition they should understand that while avoiding discussions about the minute medical details of the event may be good legal advice, discussing one’s emotions

in response to the event is probably not harmful to a potential legal defense. Most organizations already have many supports that clinicians could use (clergy, Employee assistance programs, social workers, etc). However, second victim specific support may be needed. At an organizational level, Scott described a three-tiered approach involving local managers, trained peer supports, and finally the use of profession support (psychologist, employee assistance program, clergy, etc) when needed. The peer support program is activated for major adverse events, and clinician are approached and actively offered support. Alternatively, clinician can seek out the peer supports for events that may have been especially traumatic to them. The Cleveland Clinic has created a "Code Lavender" that clinicians can activate whenever they are feeling especially stressed, traumatized, or burned out. Medically Induced Trauma Support Services (MITSS) is a non-profit organization that offers support to clinicians, families and institutions trying to deal with the emotional impact of adverse events. It is clear that must research and clinical work are needed in the field.

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Caring for Our Own: Focusing on the Care Provider to Optimize Safety for Our Patients
Motivating the Rat: Managing the Disruptive Co-Worker

Presenting Author: Lawrence C. Tsen, M.D.

Objectives: Following this session, learners will be able to:
1. Identify the impact of disruptive behavior in the healthcare environment
2. Accept responsibility for altering disruptive behavior in your work environment
3. Incorporate difficult conversation concepts into responses at an institutional, departmental and individual level

Summary: Almost 90% of healthcare workers have observed or experienced disruptive behavior,[1] which the Joint Commission defines as "conduct that intimidates others to the extent that quality and safety are compromised".[2] Disruptive individuals have real costs: litigation, including harassment of personnel and patient injury lawsuits,[3] reduced communication, hidden mistakes, staff turnover and the creation of a culture and environment that is tolerant, indifferent, or supportive of disruptive behaviors.[4]

Altering the Disruptive Culture and Individual

Institutions can establish a culture of professionalism by creating a code of conduct, an anonymous reporting system, and a method of investigation, monitoring, and education. Altering behaviors can be initiated through a multisource evaluation followed by a direct discussion with the individual in the presence of someone with meaningful authority (e.g. divisional, departmental, or hospital leader). During such discussions, disruptive behaviors and their potential etiologies should be explored, assistance offered (e.g. counselling or coaching, treatment programs), expectations contracted, including a firm non-retaliation policy and implications for not altering behavior, performance measured and timely follow-up and feedback given.

Managing Individual Responses

When confronting a difficult individual, be mindful of your words and actions, and focus on the 'staying in the present' (i.e. it is not helpful to list past offences, or anticipate future offences), and discussing the implications of their behavior rather than the intent.

When engaging in a conversation:
- Ask the person in a respectful way to move the discussion, particularly if in a patient care area, to a neutral space
- Share the impact of the behavior observed
- Invite the person's perspective
- Rest your own internal voice, which may attempt to contradict their words
- Listen to and paraphrase their words to ensure mutual understanding
- Find a 'third story' which incorporates their and your perspectives
- Amplify any conclusions (i.e. "it sounds like you really get agitated when the equipment is not set up correctly; why don't we talk to the equipment technician to ensure that does not happen again").

Documenting and reporting the details of the interaction to the responsible manager or leader within the division (or higher, if the immediate leader is part of the problem) is the next step. Although reporters fear a 'tattle-tale' reputation, more often they are perceived as individuals willing to bring awareness and change to a longstanding behavioral issue.

Key points:
1. Disruptive individuals have a pronounced effect on patient safety and work culture
2. Management of the disruptive health care worker has individual, divisional and institutional benefits.
3. A commitment to a healing, professional culture can lead to a better working environment where all can do their best work.

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Whats New in Obstetrics?
Title: Recent Advances in Obstetrics: Pathogenesis, Prevention and Management of Severe Pre-eclampsia

John Kingdom MD – Mount Sinai Hospital, University of Toronto, Canada

Objectives:
The objectives of this presentation are to review

1. Recent advances in the placental basis of vascular dysfunction in preeclampsia
2. Current Evidence and Guidelines for Screening and Prevention of preeclampsia
3. Emerging evidence to support the use of NICOM to direct patient stabilization via anti-hypertensive treatment
4. Research trends that may become relevant to Anesthetists in the next 5 years.

Summary:
Severe preeclampsia is a complex hypertensive disorder affecting up to 5% of our contemporary pregnant population. Almost all epidemiologic risk factors are on the rise, to amplify the underlying "placental basis" of the disease, especially when it presents <32 weeks' gestation. The under-perfused placenta switches to produce soluble factors that cross the pulmonary circulation and act as "anti-angiogenic" signaling systems to the arterial tree, compromising functions of several critical organs, especially the liver, kidneys, brain and heart.
Most preeclampsia occurs in women with near-term pregnancies. Delivery by induction or cesarean will reverse the disease and produce a healthy infant. Invasive hemodynamic monitoring of such women historically revealed a "hyper-dynamic" circulation with increased cardiac output. By contrast, women with early-onset disease were found to have a volume-contracted state with reduced cardiac output; their hypertension was due to a substantial elevation in systemic vascular resistance. These very distinct phenotypes can now be recognized non-invasively using new methods of hemodynamic assessment and correlate with maternal blood markers of disease.

Currently, women deemed at risk of preeclampsia will benefit from a 50% risk reduction, when commenced <16 weeks' gestation. Such data challenges clinicians to develop effective screening strategies – promising examples will be discussed. Women judged high-risk for early-onset preeclampsia, based on their medical or prior obstetrical history, or on placental testing in the current pregnancy, may benefit to a similar 50% risk reduction from daily self-injected prophylactic doses of low molecular weight heparin. The importance of effective patient (and family) education cannot be over-emphasized and the work of the Preeclampsia Foundation deserves our appreciation.

Women admitted to high-dependency, or labor & delivery environments with severe preterm preeclmapsia need efficient and close collaboration between specialties to achieve optimal stabilization – and potentially prolong their pregnancies safely. Such women are often given potent IV anti-hypertensive drugs, with no real-time knowledge of hemodynamic status – the potential value and safety of NICOM in this setting will be discussed.

Current research trends, predicted to be of clinical relevance within 5 years, will be discussed. These include: 1) optimized screening methods for severe preeclampsia, 2) the "non-anticoagulant" action/s of LMWH that stop the abnormal placenta from inducing a maternal hypertensive vasculopathy, and 3) the acceptance that a method of NICOM should be an integral part of the decision-making algorithm in the management of severe hypertension in pregnancy.

Abstract #: MA-01

Exteriorization compared to in situ uterine repair for cesarean delivery: a systematic review and meta-analysis

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Co-Author: John C. Boyd MSc - IWK Health Centre - Halifax, Nova Scotia
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Ashraf S. Habib MB, ChB, MSc, MHS, FRCA - Duke University Medical Center - Durham, North Carolina

Cesarean delivery (CD) is one of the most common surgical procedure performed in the world. The optimal surgical technique to limit maternal morbidity is debatable. One aspect of this debate relates to the method of uterine repair following delivery. Proponents of uterine exteriorization (UE) claim better surgical visualization, faster repair, and better control of hemostasis, whereas those who favor in situ (IS) repair are concerned about uterine traction causing nausea, vomiting, pain, hemodynamic instability, and trauma and infection to the surrounding structures. We performed a systematic review of randomized controlled trials (RCTs) to compare UE versus IS repair during CD on maternal complications.

Methods: This review adhered to PRISMA guidelines. CENTRAL, MEDLINE (PubMed), EMBASE, and CINAHL were systematically searched. The MeSH term for CD and its different spellings were combined with text searches for "repair", "uterus", "exteriorization". The results of these searches were combined with a sensitive methodological filter for RCTs, meta-analyses, and systematic reviews. Primary outcomes sought included incidence of intraoperative complications (nausea, vomiting, pain), blood loss (reduction in hemoglobin, estimated blood loss) and postoperative infection (endometritis, wound infection). Secondary outcomes included operative time, hospital stay, blood transfusion, fever, postoperative pain, and return of bowel function. Studies were included if they reported any of the primary outcomes.

Results: Sixteen RCTs were selected for in-depth full-text review, from which 14 were deemed low-risk of bias and included in this systematic review. A total of 9077 subjects underwent UE, while 9054 subjects had IS repair. Endometritis pooled results showed a significant difference favoring IS repair. There was a significant difference favoring IS repair for return of bowel function. Although there was a tendency to favor UE for estimated blood loss, this was not significant. The data for intraoperative pain is inadequate to reach a conclusion due to the wide confidence intervals. Pooled results of the two repair techniques did not show a difference in intraoperative nausea or vomiting, drop in hemoglobin, wound infection, operative time, hospital stay, blood transfusion, and fever.

Discussion: We found that IS repair may be associated with less endometritis and faster return of bowel function. More well conducted randomised controlled trials are needed that focus specifically on intraoperative complications such as nausea, vomiting and hemodynamic instability.

References: Cochrane Database Syst Rev 2004 (4): CD000085, Am J Obstet Gynecol 2009 200: 625 e621-628, Ann Intern Med 2009 151: 264-269, W264

Analysis	Number of RCTs n = 14	Exteriorisation patients n = 9077	In Situ patients n = 9054	Odds Ratio (OR) or Mean Difference (MD)	p-value	Heterogeneity
Intraoperative Nausea	4	534	537	OR 1.14; 95% CI [0.70, 1.87]	0.60	50%
Intraoperative Vomiting	4	536	539	OR 1.10; 95% CI [0.65, 1.83]	0.73	33%
Intraoperative Pain	3	213	226	OR 1.57; 95% CI [0.91, 2.74]	0.11	0%
Drop in Hemoglobin (g/dL)	5	3297	3288	MD -0.14; 95% CI [-0.31, 0.04]	0.13	85%
Estimated Blood Loss (ml)	6	454	454	MD -61.03; 95% CI [-127.34, 5.28]	0.07	76%
Endometritis	7	8340	8320	OR 1.40; 95% CI [1.08, 1.81]	**0.01**	44%
Wound Infection	8	8096	8092	OR 1.07; 95% CI [0.60, 1.89]	0.83	89%
Return of Bowel Function	3	2739	2734	MD 3.16; 95% CI [1. 05, 5.27]	**0.003**	92%
Operative Time (min)	12	8551	8534	MD 0.61; 95% CI [-2.70, 3.91]	0.72	99%
Hospital Stay (days)	8	8084	8077	MD 0.15; 95% CI [-0.11, 0.41]	0.25	98%
Blood Transfusion	9	8288	8280	OR 1.02; 95% CI [0.43, 2.42]	0.96	56%
Fever	5	5305	5305	OR 1.03; 95% CI [0.73, 1.44]	0.88	0%

Abstract #: MA-02

Physiologic Changes of Pregnancy Commonly Overlap with Systemic Inflammatory Response Syndrome Criteria: A Systematic Review

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Baskar Rajala M.B.B.S - University of Michigan Health System - Ann Arbor, MI
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Background: Maternal sepsis is currently the leading cause of direct deaths in the United Kingdom and maternal sepsis-related deaths have doubled in the United States. (1,2) Despite public health implications, the literature lacks evidence-based criteria for Systemic Inflammatory Response Syndrome (SIRS) that specifically adjust for the physiologic changes of gestation and parturition.

Objective: The aim of this study was to conduct a systematic analysis of the normal range values for physiological and laboratory variables in the parturient compared with SIRS criteria.

Methods: PubMed and Embase databases (from 1950 to 2012) were searched to identify observational, randomized controlled trials, case-control, longitudinal, and cross-sectional studies including the following variables during pregnancy: temperature, respiratory rate, PaCO2, heart rate, and white blood cell count. The mean, standard deviation, and two standard deviations from the mean for all criteria parameters published in the literature were reported during the 1st, 2nd, 3rd trimesters, labor, postpartum up to 48 hours, and postpartum four to twelve weeks were compared with SIRS criteria.

Results: Eighty-seven studies were identified with 8,824 patients and 15,323 data points from studies that met inclusion criteria. All mean values for PaCO2 during pregnancy (and up to 48 hours postpartum) were below 32 mmHg. During early and late labor (and up to 48 hours postpartum), the SIRS criterion of white blood cell count of 12 x 10^9/L was within one standard deviation from the mean for non-septic women. SIRS-defining criteria for temperature, respiratory rate, and heart rate were identified between one and two standard deviations above the mean values for normal pregnant and postpartum women. Values outside of the highest two standard deviations from the mean for the remaining criteria were the following: temperature > 38·1°C, respiratory rate > 25 breaths per minute, and heart rate > 107 beats per minute.

Conclusion: Current SIRS criteria often overlap with normal physiology during pregnancy and the immediate postpartum period. This study demonstrates that alternative criteria must be developed to diagnose maternal sepsis.

1)Cantwell R, Clutton-Brock T, Cooper G, et al. Saving Mothers' Lives: Reviewing maternal deaths to make motherhood safer: 2006-2008. The Eighth Report of the Confidential Enquiries into Maternal Deaths in the United Kingdom. BJOG 2011;118:1-203.

2)Bauer ME, Bateman BT, Bauer ST, et al. Maternal sepsis mortality and morbidity during hospitalization for delivery: temporal trends and independent associations for severe sepsis. Anesth Analg 2013;117:944-50.

Abstract #: MA-03

The effect of epidural local anesthetic concentration on labor outcomes: A meta-analysis

Presenting Author: Brandon M Togioka MD
Presenting Author's Institution: Oregon Health and Science University - Portland, OR
Co-Author: Katherine Seligman MD - Oregon Health and Science University - Portland, OR

Introduction:
Despite the publication of multiple randomized controlled trials (RCTs) and meta-analyses the effect of epidural analgesia on labor outcomes remains controversial. This may be because all epidurals are not the same. The effect of an epidural on labor may depend upon the concentration of local anesthetic solution run through it. We performed a meta-analysis of available RCTs to assess the effect of varying epidural local anesthetic concentration on instrument-assisted and cesarean delivery rates.

Methods:
This study qualified for exemption from the Oregon Health and Science University IRB. Systematic literature searches of the PubMed, EMBASE, and Cochrane Central databases were conducted in May 2013 for relevant RCTs using terms related to epidural analgesia and labor outcomes. Search terms were: [Epidural OR Obstetrical Analgesia OR Obstetrical Anesthesia OR Patient-Controlled Analgesia] AND [Obstetric Labor OR Second Stage Labor OR labor Pain OR Pregnancy]. Studies were included if they compared epidural solutions administered in the same manner (continuous infusion, PCEA, provider bolus, etc.) containing two different local anesthetic concentrations. Data on pertinent study characteristics and relevant outcomes were recorded and analyzed for each accepted article. A random effects model was used. All data analysis was completed with RevMan version 5.1.0 (The Cochrane Collaboration, 2011).

Results:
The search yielded 24 studies that met all inclusion criteria. There were a total of 2053 subjects in the high concentration group and 2485 subjects in the low concentration group. Most of the studies used bupivacaine in the epidural solution. The high concentration solutions varied between 0.1% and 0.5%. The low concentration solutions varied between 0.031% and 0.25%. One study compared 0.1% ropivacaine to 0.15% ropivacaine. Using a higher concentration local anesthetic epidural solution was associated with a significant increase in cesarean delivery rate (Odds Ratio [OR]=1.19; 95% confidence interval [CI]: 1.01 to 1.41, $p = 0.04$) and instrument-assisted delivery rate (OR=1.31; 95% CI: 1.13 to 1.53, $p < 0.001$). Using a higher concentration local anesthetic solution was associated with an increased risk of motor block (OR=4.76; 95% CI: 2.84 to 7.99, $p < 0.001$), but was not associated with any increase in odds of maternal hypotension (OR=0.85; 95% CI: 0.51 to 1.42, $p = 0.55$).

Conclusions:
Our meta-analysis examining the effect of varying local anesthetic concentration on labor outcomes found an association between higher concentrations of local anesthetic and the need for cesarean and instrument-assisted vaginal delivery. In this meta-analysis, the difference in local anesthetic concentration between the two study arms was enough to affect the incidence of motor block.

PROGRAM MATERIAL

Saturday, May 17, 2014

Oral Presentation 2
Moderator: Klaus Kjaer, M.D.

Fred Hehre Lecture
Introduction: Barbara M. Scavone, M.D.
Speaker: David J. Wlody, M.D.

Gerard W. Ostheimer Lecture: What's New in OB Anesthesia?
Introduction: Arvind Palanisamy, M.D., FRCA
Speaker: Lisa R. Leffert, M.D.

Host's Panel – Getting New Moms Ready to Rock in the Post-Partum: Obstetric Anesthesia Beyond Labor and Delivery
Moderator: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC

Quality of Recovery in the Postpartum
Speaker: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC

Hemoglobin Issues
Speaker: Robin Russell, M.D.

Mood Issues
Speaker: Beverly Young, M.D., FRCPC

Infection Issues
Speaker: Allison McGeer, M.D., M.Sc., FRCPC

Pro-Con Debate: Remifentanil Should Be Routinely Offered forLabor Analgesia
Moderator: McCallum R. Hoyt, M.D., M.B.A.
Pro: David Bogod, M.B., B.S., FRCA, LLM
Con: Mark I. Zakowski, M.D.

Abstract #: O2-01 & T-68

Dexmedetomidine For Management Of Awake Craniotomy In A Pregnant Patient

Presenting Author: Emily E Sharpe M.D.
Presenting Author's Institution: Mayo Clinic College of Medicine - Rochester, MN
Co-Author: Jeffrey J Pasternak M.D. - Mayo Clinic College of Medicine - Rochester, MN

Awake craniotomy is often indicated for neurosurgical procedures requiring intraoperative monitoring of speech or motor function. We describe the management of a pregnant patient referred for awake craniotomy for glioma resection. Although the use of dexmedetomidine for awake neurosurgical procedures has been described, this is the first report of the use of dexmedetomidine for an awake neurosurgical procedure during pregnancy.

A 27 year old G2P1001 female who developed a new-onset seizure was found to have a large intra-axial left superior temporal neoplasm consistent with glioma. As the tumor was located near eloquent cortex responsible for control of speech and motor function, she was to undergo awake left craniotomy, motor and speech mapping, and resection at 20 weeks gestation.

Surgery was performed in the supine position with left uterine displacement. Fetal heart tones and uterine contractility were assessed both before and following surgery, and intermittently during the procedure. Sedation was maintained with a dexmedetomidine infusion. Dexmedetomidine was infused at 0.4-0.5 ug/kg/hour initially with intermittent doses of propofol (10-30mg). The infusion was decreased to 0.2 ug/kg/hr during motor and speech mapping. After successful mapping was complete, dexmedetomidine was increased to 0.3-0.7 ug/kg/hr for increased sedation during tumor resection and closure. There was no evidence of changes in fetal heart tones or uterine contractions during the perioperative period. Postoperative MRI confirmed gross total resection of tumor and patient did not have any new neurologic deficits. She uneventfully delivered a healthy baby at term.

Dexmedetomidine is an α2 adrenergic receptor agonist with sedative, anxiolytic, and analgesic effects that does not cause respiratory depression (1). These characteristics make it very useful for sedation during awake craniotomy as there is limited access to the airway. However, the effects of dexmedetomidine on the preterm fetus are not well described. Dexmedetomidine has minimal effects on fetal cardiovascular status and cerebral oxygenation in preterm fetal sheep (2). Also, dexmedetomidine was found to enhance the frequency and amplitude of contractions in human myometrium in vitro (3). We did not observe any adverse effects due to dexmedetomidine in the fetus. This may be attributable to high placental retention of dexmedetomidine thus minimizing fetal exposure to the drug (4). Further research is required to better understand the effects and safety of dexmedetomidine in the pregnant patient.

References:

1. Bekker AY. Anesth Analg 2001;92:1251-3
2. Uemura K. Int J Obstet Anesth. 2012;21:339-47
3. Sia AT. Int J Obstet Anesth. 2005;14:104-7
4. Karaman S. Adv Ther. 2006;23:238-43

Abstract #: O2-02

Effect of 5-HT3 Antagonists on Isolated Human Pregnant Myometrium: An in-vitro Study

Presenting Author: Xuemei Lin MD
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Co-Author: Jie Zhou MD, MS, MBA - Brigham and Women's Hospital, Harvard Medical School - Boston, MA
Yu Du MD - West China Second Hospital, Sichuan University - Chengdu, Sichuan

Introduction: The 5-hydroxytryptamine (HT)3 receptor antagonists are effective antiemetic agents. They have been extensively used peri-operatively during the recent years. Although 5-HT contracts human uterine artery smooth muscle predominately through 5-HT2 receptors, there was evidence of 5-HT3 receptors on the rat uterine preparation. The effect of 5-HT3 receptor antagonists on human myometrial contractility was unclear.

Methods: Upon IRB approval, 24 healthy term parturients scheduled for elective cesarean delivery were recruited. All parturients had a lower segment transverse incision which was performed under spinal anesthesia. After the delivery of fetus and placenta, longitudinal section of myometrial tissue was excised from the midline portion of the lower uterine incision. Oxytocin infusion was withheld until the sample myometrium was collected. The myometrial tissue was then placed in Krebs buffer and transported to the research laboratory within 30 minutes. Myometrial strips were randomly allocated to four groups: control group (Group I, n=6), ondansetron group (Group II, n=6), granisetron group (Group III, n=6) and tropisetron group (Group IV, n=6) and mounted on the myograph. 0.9% normal saline (control group) and five incremental concentration of doses (1 ng/mL, 10 ng/mL, 102 ng/mL, 103 ng/mL and 104 ng/mL) of a 5-HT3 antagonist were sequentially microinjected into the bath. The myometrial contractile characteristics after each drug injection, including contractile force, interval and duration, were analyzed.

Results: The 5-HT3 receptor antagonist, including ondansetron, granisetron and tropisetron at concentrations ranging from 1 ng/mL to 104 ng/mL, had no effects on spontaneous contractions of myometrial strips.

Discussion: Pharmacokinetic studies in human volunteers showed that the therapeutic plasma concentration of ondansetron, granisetron and tropisetron was 80-100 ng/mL, 17-42 ng/mL, and 10-50 ng/mL, respectively. The plasma protein binding percentage of ondansetron, granisetron and tropisetron was approximately 73%,. 65% and 59-70%, respectively. Therefore the concentrations of these 5-HT3 receptor antagonists we investigated in this study were pharmacological or suprapharmacological doses. We confirmed that 5-HT3 antagonists have no effect on human myometrial contractility during the peripartum period.

References:

1. Karlsson, et al. Hum Reprod 1997

2. Ononiwu, et al. Afr J Med Med Sci 2002

Abstract #: O2-03

Effect of Dexmedetomidine on Isolated Human Myometrial Contractility: An in-vitro Study

Presenting Author: Jie Zhou MD, MS, MBA
Presenting Author's Institution: Brigham and Women's Hospital, Harvard Medical School - Boston, MA
Co-Author: Xuemei Lin MD - West China Second Hospital, Sichuan University - Chengdu, Sichuan
Yu Du MD - West China Second Hospital, Sichuan University - Chengdu, Sichuan

Introduction: Dexmedetomidine, a selective alpha-2 agonist, has been used extensively in anesthesia during the recent years. Its application in labor analgesia has been reported. However, there is concern regarding its increased contractility effect on human myometrium.

Methods: Following approval by the institutional ethics committee, 6 healthy term parturients scheduled for elective caesarean delivery were recruited. All parturients had a lower segment transverse incision which was performed under spinal anesthesia. After the delivery of fetus and placenta, longitudinal section of myometrial tissue was excised from the midline portion of the lower uterine incision. Oxytocin infusion was withheld until the sample myometrium was collected. The myometrial tissue was then placed in Krebs buffer, mounted in the myograph. Normal saline and five incremental concentration of doses of dexmedetomidine, at 0.1 ng/mL, 1 ng/mL, 10 ng/mL, 100 ng/mL, and 1 mcg/mL, were sequentially microinjected into the bath. The myometrial contractile characteristics after each drug injection, including contractile force, interval and duration, were analyzed.

Results: Dexmedetomidine demonstrated no significant effect on the spontaneous contractile characteristics of human myometrial strips in all concentrations listed above. Positive control group was added with exposing human myometrial strips in 0.01 U/mL oxytocin, which revealed increased contractile frequency and force. Addition of dexmedetomidine did not provide enhancement of myometrial contractility.

Discussion: In our study, dexmedetomidine did not reproduce the in-vitro contractile-enhancing effects on human myometrium which was demonstrated by Sia, et al. An recent investigation of dexmedetomidine effect on rat uterine muscle revealed reduced contractile frequency in Krebs solution and decreased contractile force in Ca2+-free solution during late-pregnancy, suggesting that this phenomenon could be related to stage of pregnancy and intracellular Ca2+ level. We are currently investigating the issue.

References:

1. Zhou, et al. SOAP 2011
2. Sia, et al. Int J Obstet Anesth 2005
3. Ocal, et al. Indian J Pharmacol 2013

Abstract #: O2-04

In vitro human myometrial contractility with various uterotonic agents and their combinations

Presenting Author: Mrinalini Balki MBBS, MD
Presenting Author's Institution: Mount Sinai Hospital, University of Toronto - Toronto, Ontario
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Nivetha Ramachandran PhD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
John Kingdom MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Jose CA Carvalho MD, PhD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario

Introduction: Oxytocin (OT) is the most widely used uterotonic agent in the prevention of PPH; additional drugs such as carboprost (CARB) and ergonovine (ERG) are used if OT alone proves ineffective. The comparative efficacy of the individual uterotonics, as well as of their combinations is still poorly understood. We hypothesized that the use of ERG or CARB in combination with OT would improve contractility compared to OT alone in myometrial strips, pretreated or not with OT.

Methods: This in-vitro study was done on myometrial samples obtained from term pregnant women undergoing CS under regional anesthesia. After obtaining spontaneous contractions in organ baths, the samples were either pretreated with OT 10-5M (Experimental) or physiological salt solution (Control) for 2h. This was followed by dose-response testing with OT, ERG, or CARB [10-10 to 10-5M]), either alone or in combination with a fixed low dose (10-10M) (LDOx) or high dose (10-6M) (HDOx) OT. The amplitude, frequency and motility index (MI=ampxfreq) of contractions during the dose response period were analyzed with linear regression models, and compared among the groups. The primary outcome was the MI across the study groups.

Results: 169 experiments were done from samples obtained from 56 women. Fig 1 shows Control and Experimental groups: OT (n=24); ERG (n=26); CARB (n=23); ERG+LDOx (n=25); ERG+HDOx (n=26); CARB+LDOx (n=23); and CARB+HDOx (n=22). The MI of OT was significantly higher in Control vs. Experimental group ($p<0.001$). When all Control groups were compared, the MI of OT was higher than ERG ($p<0.001$), CARB ($p<0.001$), ERG+LDOx ($p<0.001$) and CARB+LDOx ($p<0.001$). However, in OT pretreated groups, all the combination groups exhibited significantly superior contractility response compared to OT alone.

Discussion: We observed attenuation of OT-induced contractility in OT pretreated myometrial strips, confirming the previously established OT-receptor desensitization phenomenon.1Among the three uterotonics, OT appears to be the most effective drug if the myometrium is not pre-exposed to OT. However, in the OT pretreated myometrium, a synergistic response is evident, and the combination of OT with either ERG or CARB produces superior response compared to OT alone. This implies that other uterotonics should be considered early in the event of poor responsiveness of myometrium to OT, especially if the uterus is preexposed to OT during labor.

Reference:

1. Balki M. Anesthesiology 2013;119:552-61

Abstract #: O2-04

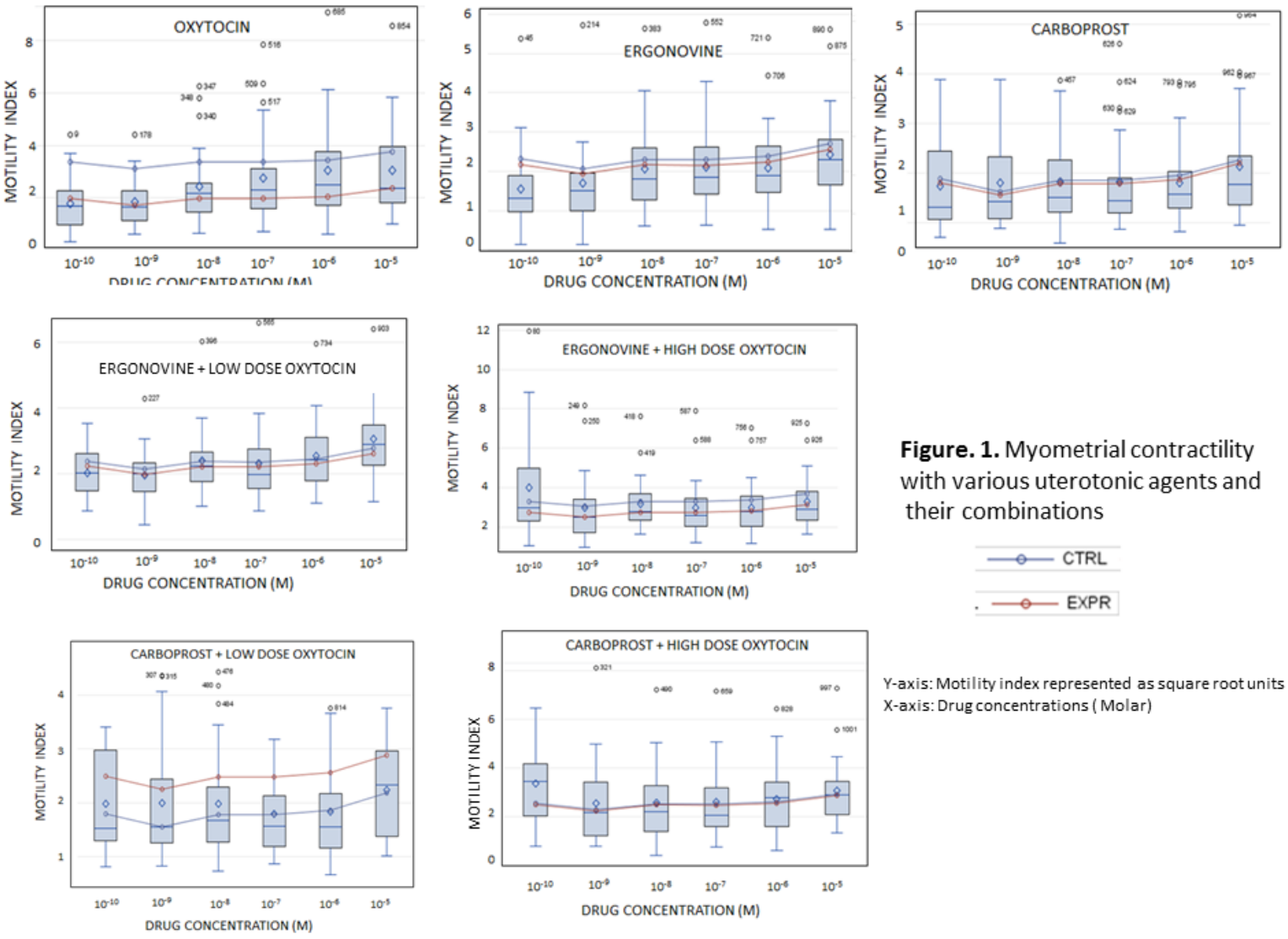

Figure. 1. Myometrial contractility with various uterotonic agents and their combinations

Y-axis: Motility index represented as square root units
X-axis: Drug concentrations (Molar)

Abstract #: O2-05

Patient Positioning does not Influence Inferior Vena Cava Diameter: An Observational Study with Ultrasound via Intercostal Window

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Co-Author: Cristian Arzola MD MSc - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
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Introduction: It has been recently suggested that the resuscitation of pregnant women should be performed in the supine position to optimize chest compressions, with alleviation of aorto-caval compression provided by manual left uterine displacement(1,2). It remains to be determined how the efficacy of manual uterine displacement compares to the traditional method of wedging/tilting. Measurements of the Inferior Vena Cava(IVC)diameter by ultrasound have been correlated with patient's volume status and preload,and may prove useful in answering that question(3). The objective of this study was to compare the IVC diameter in pregnant women using the two different methods of alleviation of the aorto-caval compression.

Methods: This was a prospective observational study. We enrolled term non-labouring pregnant women. We excluded women with cardiac disease, severe preeclampsia, multiple gestation and breech presentation. The IVC was visualized using the intercostal window (3) with women placed in 4 different positions: supine (S), left lateral (LL), 30-degree left lateral tilt (LLT), and supine with manual left uterine displacement (MUD) position. The IVC was measured approximately 2 cm distal to the branching of the hepatic vein in the short-axis. The maximum (max) IVC diameter was measured during expiration and minimum (min) IVC diameter during inspiration. The IVC index was calculated using the formula CI=(max−min)/max(4). Random effects models were used to compare mean diameters across the different positions.

Table 1. Overall means and p-values for differences across positions

	Supine	Left Lateral	Left Lateral Tilt (30 degree)	Supine with MUD	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
IVC max (cm)	2.01 (0.37)	1.94 (0.58)	1.76 (0.45)	1.96 (0.39)	0.016
IVC min (cm)	1.48 (0.38)	1.33 (0.48)	1.24 (0.39)	1.41 (0.38)	0.006
IVI	0.27 (0.11)	0.31 (0.11)	0.30 (0.10)	0.28 (0.10)	0.331

IVC = Inferior Vena Cava; IVI= Inferior Vena Caval Index

Results: 30 women were studied. No differences were observed in the IVC index across all positions. There was a significant difference in the IVC max and IVC min across the different positions; the diameter in LLT was smaller than in supine position. (Table 1)

Conclusion: Contrary to our hypothesis, the different methods of alleviation of aorto-caval compression did not produce favorable changes in IVC as compared to the supine position. Furthermore, the commonly used LLT produced the worst outcome. These findings are in keeping with those of Fields et al(3)who showed that the response of IVC diameter of pregnant women to positioning is unpredictable. These results suggest that IVC diameters at the measured site may not be reflective of the aorto-caval compression in term pregnant women.

References:

1. Circulation 2010;122(18 Suppl3:S829-61
2. Resuscitation 2010;81:1400–1433
3. Resuscitation 2013;84:304-8
4. Ann Emerg Med 2010;55:290–5.

Abstract #: O2-06

Sensory block levels during combined spinal-epidural for labor analgesia: influence of local anesthetic dose and lumbar spine dimensions-A randomized controlled trial.

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Co-Author: Rebecca Smith MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Mrinalini Balki MD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario
Xiang Y. Ye MD PhD - Maternal-Infant Care Research Centre, Mount Sinai Hospital - Toronto, Ontario
Jose CA Carvalho MD PhD - Mount Sinai Hospital, University of Toronto - Toronto, Ontario

Introduction: Lumbar cerebrospinal fluid volume measured by magnetic resonance imaging (MRI) bears an inverse correlation with the intrathecal spread of anesthetic solutions.[1] While MRI is a valuable research tool; it cannot be used at bedside to guide clinical practice. Ultrasound (US) is a practical bedside resource used to facilitate spinal and epidural anesthesia. A previous study using one standard dose of bupivacaine determined that US measurements contribute to predict the intrathecal spread during CSE analgesia for labor.[2] We hypothesized that the predictive model could be improved by studying a dose range of bupivacaine in conjunction with dural sac dimensions and patient's characteristics.

Methods: In this randomized, double blind, controlled trial, we recruited women with singleton term pregnancies requesting neuraxial analgesia while in labor. US imaging was performed with a 5-2 MHz curved array probe in the left paramedian sagittal plane at levels L5-S1 to L1-L2. We measured the dural sac width (DSW) at each lumbar interspace; the lumbar dural sac length (DSL: distance between L5-S1 and L1-L2 interspaces); and the vertebral column length (VCL: distance from C7 prominence to L5-S1 interspace). The lumbar dural sac volume (DSV) was subsequently calculated, assuming the spinal canal being a cylinder with a diameter equal to the mean value of the five DSW measurements. CSE analgesia was induced with one of three doses of 0.25% bupivacaine: 1.5 mg, 2 mg or 2.5 mg – in association with 15µg fentanyl. Sensory block levels (SBL) to ice and pinprick (60g Von Frey filament) were assessed at 5, 10, 20, and 30 min. We used mixed effect models for repeated measures to examine the association of SBL to ice or pinprick with dose, time and patient characteristics. Multiple linear regression models were used to examine the association of peak SBL with dose, patient characteristics, and US measurements

Results: We recruited 60 women (20/dose group). Height, weight, and BMI: mean (SD) of 161.8(6.5) cm, 75.5(11.2) kg, and 28.8(3.8) kg/m2. Mean DSW, DSL, VCL and DSV were 1.2 cm, 11.4 cm, 51.5 cm and 14.6 cm3 respectively. The median peak SBL for 1.5, 2.0 and 2.5 mg were reached at 20 min: T6, T5, T4 (ice) and T8, T7, T6 (pinprick), respectively. We found that the peak SBL positively associated with dose, while inversely correlated with DSW. Side effects: hypotension 6.9% (only in 2.5 mg); uterine hypertonus 10.3%; fetal bradycardia 18.9%.

Discussion: Although, we obtained a new model that includes the dose and the DSW, this could not improve the predictive value. Nevertheless, we found that higher peak SBL were associated with larger doses of bupivacaine, lower DSW, and higher risk of fetal bradycardia. These findings may assist in predicting block levels in patients undergoing CSE for labor analgesia.

References:

1. Anesthesiology 2004; 100:106-14

2. Reg Anesth Pain Med 2012; 37:283–8

The Gerard W. Ostheimer Lecture

What's New in Obstetric Anesthesia? 2013

Lisa Leffert, MD

Objective: The primary objective is to appraise and synthesize key concepts and novel research presented in the published literature from January to December 2013, on topics related to obstetric anesthesia, obstetric practice and maternal and perinatal health. Further, the goal is to identify strategies to impact future practice and research, highlight obstetric anesthesiologists' role as perioperative physicians and improve multidisciplinary coordination of care.

Summary: This endeavor features the relevant literature through an annotated syllabus and oral presentation of the most impactful articles published in 2013 for obstetric anesthesiologists and other related professionals. These articles are discussed in the framework of themes and trajectories for future medical practice and scientific exploration.

Methods: Article selection was derived primarily from a monthly, manual review of the tables of contents of a broad selection of relevant journals from January-December 2013 supplemented using key word searches performed via multiple search engines (e.g. Google Scholar, PubMed, Ovid Search, Lexis/Nexis), and electronic and print media including medical newsletters (e.g. MDlink, OB Div News (Joanne Douglas)), Obstetric Anesthesia Digest, general news outlets (e.g. Wall Street Journal), Faculty of 1000 and electronic RSS feeds. Accompanying editorials, replies and letters were included in the syllabus to supplement the primary article of focus.

Several types of research designs were included, with a focus on randomized controlled trials, observational studies, systematic reviews and investigations of diagnostic devices. Because of the need to be selective, case reports, articles not published in English, and most animal studies were excluded.

Over 1200 articles were then categorized in a citation manager (i.e., EndNote) using a pre-defined library of major topics and subtopics, and after vetting, were assigned variables and ranking. This method assisted in defining themes that were useful in determining which topics had ample research dedicated to it. A systematic approach highlighting each article's relevance, importance, clinical and research implications, novelty or uniqueness, validity, definitiveness and educational value was applied using criteria defined in the Systems to Rate the Strength of Scientific Evidence report (*West et al.*, The Research Triangle Institute–University of North Carolina Evidence-based Practice Center, commissioned by the Agency for Healthcare Research and Quality (AHRQ Publication No. 02-E016, Rockville, MD 2002; URL: http://www.thecre.com/pdf/ahrq-system-strength.pdf). Level of evidence was interpreted using the protocol from the Oxford Centre for Evidence-Based Medicine when appropriate (*Howick, et al*. Oxford Centre for Evidence Based Medicine, Oxford, UK: http://www.cebm.net/index.aspx?o=5653)

The speaker wishes to acknowledge that there were an abundance of excellent contributions that were not able to be included because of the scope of the project, and to express her admiration for the investigators and authors thereof.

Anesthesia Journals

Acta Anaesthesiologica Scandinavica
Anaesthesia
Anaesthesia and Intensive Care
Anesthesia & Analgesia
Anesthesiology
Anesthesiology Clinics of North America
ASA Newsletters
British Journal of Anaesthesia
Canadian Journal of Anaesthesia
Current Opinion in Anesthesiology
European Journal of Anesthesiology
European Journal of Pain
International Anesthesiology Clinics
International Journal of Obstetric Anesthesia
Journal of Clinical Anesthesia
Journal of Pain
Obstetric Anesthesia Digest
Pain
Regional Anesthesia and Pain Medicine
Trends in Anesthesia and Critical Care

General Medical/Science Journals

American Journal of Emergency Medicine
American Journal of Epidemiology
Annals of Internal Medicine
British Medical Journal
British Journal of Haemotology
Circulation
Cochrane Database of Systematic Reviews
Critical Care Medicine
Epidemiology
Heart
Journal of the American Medical Association
Journal of Clinical Epidemiology
Journal of Graduate Medical Science
Lancet
Nature
New England Journal of Medicine
Physiology
PloS One
Proceedings of the National Academy of Sciences
Resuscitation
Science

Obstetric and Gynecology Journals

Acta Obstetrica et Gynecologica Scandinavica
American Journal of Maternal/Child Nursing
American Journal of Obstetrics & Gynecology
Archives of Gynecology and Obstetrics
Best Practices and Research in Clinical Obstetrics
BMC Pregnancy and Childbirth
British Journal of Obstetrics and Gynaecology
Clinical Obstetrics and Gynecology
Current Opinion in Obstetrics and Gynecology
European Journal of Obstetrics & Gynecology and Human Reproduction
Hypertension in Pregnancy
International Journal of Gynecology & Obstetrics
Journal of Maternal-Fetal & Neonatal Medicine
Journal of Perinatology
Obstetric Medicine: The Medicine of Pregnancy
Obstetrical & Gynecological Survey
Obstetrics & Gynecology
Obstetrics & Gynecology Clinics of North America
Placenta
Pregnancy Hypertension
Reproductive Biology
The Australian and New Zealand Journal of

Pediatrics Journals

Archives of Disease in Childhood
BMC Pediatrics
Journal of Paediatrics and Child Health
Journal of Pediatrics
Journal of Perinatal Medicine
Pediatrics

Simulation Journals

Simulation Healthcare

Women's Health

Archives in Women's Mental Health

Other Specialties

Hypertension
Lancet- Neurology
Lancet- Obstetrics
Transfusion

Patient Safety/Health Policy

Academic Medicine
Applied Health, Economics and Health Policy
Health Affairs
Journal of Patient Safety
Morbidity and Mortality Weekly Report
Quality and Safety in Health Care

Glossary:

BMI: Body Mass Index (kg/m^2)
BP: Blood Pressure (mmHg)
CD: Cesarean Delivery
CI: Confidence Interval(s)
CSE: Combined Spinal-Epidural
HDP: Hypertensive Disorders of Pregnancy
HELLP: Hemolysis, Elevated Liver Enzymes and Low Platelets
HIV: Human Immunodeficiency Virus
HR: Hazard Ratio
HTN: Hypertension
ICU: Intensive Care Unit
IQR: Interquartile Range
LOS: Length of Stay
NICU: Neonatal Intensive Care Unit
OB/GYN: Obstetrics and Gynecology
OBs: Obstetricians
OR: Odds Ratio(s)
PDPH: Post Dural Puncture Headache
PPH: Postpartum Hemorrhage
PTD: Preterm Delivery
RCT: Randomized Controlled Trial
RF: Risk Factor(s)
RR: Relative Risk(s)
TAP: Transversus Abdominis Plane (Block)
TOLAC: Trial of Labor after Cesarean
VD: Vaginal Delivery

I^2 : A statistic that indicates the percentage of variance in a meta-analysis that is attributable to study heterogeneity

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QUALITY AND SAFETY

Background

(1) Gee RE, Winkler R: Quality Measurement: What It Means for Obstetricians and Gynecologists. *Obstet Gynecol* 2013, 121(3):507-510.

This discussion summarizes how the relevant national organizations (e.g. the National Quality Forum, the US Department of Health and Human Services) and the field of OB/GYN have embraced the Institute of Medicine's challenge to raise the bar for quality of medical care as articulated in their 2001 report entitled "Crossing the Quality Chasm". Key themes include minimizing elective deliveries < 39 weeks and CD without medical indication, treating both mothers and babies preemptively to reduce the morbidity associated with infection and premature delivery, identifying who is sick, and optimizing communication.

(2) Maxfield DG, Lyndon A, Kennedy HP, O'Keeffe DF, Zlatnik MG: Confronting safety gaps across labor and delivery teams. *Am J Obstet Gynecol* 2013, 209(5):402-408.e403.

This survey (N=3,282) addressed 4 safety concerns within labor and delivery teams: dangerous shortcuts, missing competencies, disrespect, and performance problems. Among participants, 92% of physicians, 93% of midwives, and 98% of nurses reported at least 1 concern within the preceding year. Most stated that these concerns undermined patient safety, harmed patients, or caused them to seriously consider transferring/leaving their positions. Only 9% of physicians, 13% of midwives, and 13% of nurses disclosed their concerns with the individuals involved, which suggests that organizational silence is prevalent among labor and delivery teams and requires substantial improvement. However, potential limitations of the study include convenience sampling and non-response bias among professionals.

Metrics/Severity of Illness

Patient Level

(3) Bateman BT, Mhyre JM, Hernandez-Diaz S, Huybrechts KF, Fischer MA, Creanga AA, Callaghan WM, Gagne JJ: Development of a comorbidity index for use in obstetric patients. *Obstet Gynecol* 2013, 122(5):957-965.

This study developed and validated a comorbidity index to predict severe maternal morbidity (i.e. the occurrence of acute maternal end-organ injury or mortality) using the Medicaid Analytic eXtract data set (N=854,823 pregnancies, 1.2% complicated by the primary study outcome; 2000-2007). Using the development cohort (2/3 sample), a logistic regression model predicting the primary outcome was created that ultimately included 20 -candidate comorbid conditions and maternal age. Each condition was then assigned a weight used to calculate a maternal comorbidity index. For predicting the primary outcome, the OR per point increase in the score was 1.37 (95% CI: 1.35 -1.39). The derived score performed significantly better than available comorbidity indices in predicting maternal morbidity and mortality, and may provide a simple measure for summarizing the burden of maternal illness.

Associated content: Editorial
Macones GA: Understanding and reducing serious maternal morbidity: a step in the right direction. *Obstet Gynecol* 2013, 122(5):945-946.

(4) Carle C, Alexander P, Columb M, Johal J: Design and internal validation of an obstetric early warning score: secondary analysis of the Intensive Care National Audit and Research Centre Case Mix Programme database. *Anaesthesia* 2013, 68(4):354-367.

This study developed and validated an aggregate obstetric weighted early warning scoring system (EWS) analyzing physiological variables collected in the first 24 hr on admission to the ICU. The area under the ROC was 0.995 and 0.957 for the statistical and

clinical score, respectively. By developing the model around the highest acuity patients (i.e. those who required admission to the ICU), there may be a missed opportunity to identify earlier, more subtle pathology.

(5) Hocking G, Weightman WM, Smith C, Gibbs NM, Sherrard K: Measuring the quality of anaesthesia from a patient's perspective: development, validation, and implementation of a short questionnaire. *Br J Anaesth* 2013, 111(6):979-989.

In part I of this study, a short psychometric instrument for assessing patient's perception of the quality of anesthesia (PQA) was developed and validated. Principle component analysis highlighted 5 key factors: attention/gentleness, pain management, information/confidence, postoperative nausea/vomiting, and concerns addressed, the last three of which were rated as being the most important by patients. Part II of this study demonstrated that when the anesthesia provider received feedback from this tool, there was a decrease in the number of patients reporting at least one unsatisfactory PQA factor (45.2% [95% CI: 43.1-47.4%] to 35% [32.6-37.6]) during the post-feedback period.

Hospital Level

(6) Snowden JM, Darney BG, Cheng YW, McConnell KJ, Caughey AB: Systems factors in obstetric care: the role of daily obstetric volume. *Obstet Gynecol* 2013, 122(4):851-857.

This population-based retrospective study (N=462,322) linked birth certificate data to hospital discharge records to compare quality of obstetric care (i.e. birth asphyxia and CD rates in nulliparous, term, singleton, vertex parturients) on high volume dates to low- or average-volume days (weekend vs. weekdays). In lower volume hospitals only, high-volume weekend days were associated with an elevated risk of asphyxia (P = 0.013), and significantly lower CD rates (P=0.009) vs. low- or average-volume days. The authors postulate that the lower weekend CD rate occurs in the context of a higher weekend staffing ratio and a higher threshold for intervention.

(7) Smithson DS, Twohey R, Rice T, Watts N, Fernandes CM, Gratton RJ: Implementing an obstetric triage acuity scale: interrater reliability and patient flow analysis. *Am J Obstet Gynecol* 2013, 209(4):287-293.

This study developed a 5-Category Obstetric Triage Acuity Scale (OTAS) and tested for subsequent inter-rater reliability and impact on patient flow. Using patient vignettes (N=110), the consistency of 8 triage nurses was measured and OTAS was found to perform with substantial (Kappa = 0.61-0.77, OTAS 1-4) and strong correlation (0.87, OTAS 5). Two-thirds of triage visits were found to be low acuity and LOS decreased (median [IQR]) from OTAS 1 (120 [156] mins) to OTAS 3 (75 [120.8] mins). Using OTAS, the % of patients admitted to the antenatal or birthing unit decreased from 80% (OTAS 1) to 12% (OTAS 5). Although the sample size is small, OTAS may provide reliable assessment of acuity and an opportunity to improve patient flow and to compare performance across organizations.

(8) Bailit JL, Grobman WA, Rice MM, Spong CY, Wapner RJ, Varner MW, Thorp JM, Leveno KJ, Caritis SN, Shubert PJ *et al*: Risk-adjusted models for adverse obstetric outcomes and variation in risk-adjusted outcomes across hospitals. *Am J Obstet Gynecol* 2013, 209(5):446.e1-446.e30.

This cohort study (N= 115,502 women and neonates) established risk-adjusted models for 5 obstetric outcomes (venous thromboembolism, PPH, peripartum infection, severe perineal laceration, and a composite of neonatal adverse outcome) and assessed 25 hospitals' performance. None of the comparisons of hospital risk-adjusted frequencies between outcomes were significantly correlated. The conclusion was that evaluations based on a single risk-adjusted outcome cannot be generalized to overall hospital obstetric performance, and thus multiple markers of quality of care are required.

Quality Improvement

Communication

(9) Arriaga AF, Bader AM, Wong JM, Lipsitz SR, Berry WR, Ziewacz JE, Hepner DL, Boorman DJ, Pozner CN, Smink DS *et al*: Simulation-Based Trial of Surgical-Crisis Checklists. *N Engl J Med* 2013, 368(3):246-253.

This randomized study compared the impact of an intervention (the use of a surgical crisis checklist) vs. no checklist on adherence to critical processes of care (primary outcome) and perceived benefit (secondary outcome). Seventeen operating room teams, 3 institutions and 106 surgical-crisis simulations were used. Failure to adhere to lifesaving processes of care occurred significantly less frequently with the tool than without (6% vs 23% missed steps, respectively, p <0.001), and these findings were sustained in multivariate model accounting for clustering, institution, scenerio and learning/fatigue effects. Almost all (97%) physicians reported that they'd desire the checklist in real-life events.

Associated Content: Letters to Editor
Watkins SC, Maruthappu M, Shalhoub J: A Simulation-Based Trial of Surgical-Crisis Checklists. *N Engl J Med* 2013, 368(15):1459-1460.

(10) Mohammed A, Wu J, Biggs T, Ofili-Yebovi D, Cox M, Pacquette S, Duffy S: Does use of a World Health Organization obstetric safe surgery checklist improve communication between obstetricians and anaesthetists? A retrospective study of 389 caesarean sections. *Br J Obstet Gynecol* 2013, 120(5):644-648.

This retrospective study (N= 389; 2009-2011) assessed the impact of the WHO Checklist on perioperative (written) communication between anesthetists and OBs in a UK-based teaching hospital. Specifically, concurrence of CD "grade" (i.e. urgency) in patient records was compared before and after checklist introduction: "communication failure"= disagreement of CD grades and "good communication"= agreement of CD grades. Grading differences were observed in 24.1% CD pre- checklist vs. 10.3% CD post-checklist (P <0.001), with smaller, statistically insignificant findings in emergency CD. These results suggest that the WHO checklist enhances the communication of CD urgency within the team.

Related Content
Cullati S, Le Du S, Raë AC, et al: Is the Surgical Safety Checklist successfully conducted? An observational study of social interactions in the operating rooms of a tertiary hospital. *Br Med J Qual Saf* 2013, 8: 639-46.

Training

(11) Crofts JF, Fox R, Draycott TJ, Winter C, Hunt LP, Akande VA: Retention of factual knowledge after practical training for intrapartum emergencies. *Int J Gynaecol Obstet* 2013, 123(1):81-85.

This study tested knowledge retention 1 year post training. Participants (22 junior and 23 senior physicians, 47 junior and 48 senior midwives) from 6 UK hospitals were randomly recruited to undergo practical training on site or at a simulation center, with or without additional teamwork training. Changes in factual knowledge were determined using a 185-item questionnaire before/after training. Mean scores at 6 (97.6 $\pm$ 23, N = 107) and 12 (98.2 $\pm$ 21.6, N = 98) months remained higher than those before training (79.6 $\pm$ 21.9, N = 133, both P < 0.001), but were lower than those immediately after training (101 $\pm$ 21.3, N = 133, P < 0.001 and P < 0.007 respectively). Training type, location or inclusion of teamwork training had no effect on knowledge retention.

Cost

(12) Huynh L, McCoy M, Law A, Tran KN, Knuth S, Lefebvre P, Sullivan S, Duh MS: Systematic Literature Review of the Costs of Pregnancy in the US. *Pharmacoeconomics* 2013, 31(11):1005-1030.

This systematic review analyzed pregnancy cost drivers using information from low-moderate bias pregnancy publications (N=40; 2000-2012) pertaining to costs (overall, unintended, planned, complications, facilities). Top cost drivers were inpatient

care, pregnancy delivery, multiple births and complicated CD. Overall mean cost/ hospital stay has increased from $3,306 (2008) to $9,234 (2012). The mean cost of pregnancy-related complications related to PTD was $326,953. Over 50% of live births were estimated to be unintended, with a difference in cost estimated at $536 million. A limitation of this review was the exclusion of model-based cost-studies due to high degree of variation.

(13) Carvalho B, Tan J, Macario A, El-Sayed Y, Sultan P: A cost analysis of neuroaxial anesthesia to facilitate external cephalic version for breech fetal presentation. *Anesthesia and analgesia* 2013, 117(1):155-159.

In this study using computer (cost) modeling and published data, the authors estimated the total expected delivery costs for breech presentation with external cephalic version (ECV) with/without neuraxial anesthesia. With a 60% average probability of successful ECV with neuraxial anesthesia vs. 38% without, the total cost of delivery may be decreased (~ $720) or increased (~$112) depending on its success. Overall, the increased ECV success with neuraxial anesthesia, coupled with the reduction in breech CD, rate may offset the costs of providing anesthesia to facilitate ECV.

Associated Content
Preston R, and Jee, R: Anesthesia-facilitated external cephalic version: pennywise or pound-foolish? *Obstet Anesth Digest*, 2013, 33(4), 191.

PREGNANCY: ANTEPARTUM

Maternal Comorbid Disease (Indirect Causes)

Obesity

(14) Morken N-H, Klungsoyr K, Magnus P, Skjaerven R: Pre-pregnant body mass index, gestational weight gain and the risk of operative delivery. *Acta Obstet Gynecol Scand* 2013, 92:809-815.

This is a prospective, population-based cohort (Norwegian Mother and Child Cohort Study; N = 50,416) that investigated the RR of operative VD vs. CD. Women with pre-pregnancy BMI > 40 had an increased risk for CD (RR = 3.4, 95% CI: 2.8-4.1) and vacuum extraction (RR = 1.5, 95% CI: 1.04-2.2). Women with gestational weight gain > 16 kg had increased risk across all operative interventions.

(15) Blomberg M: Maternal obesity, mode of delivery, and neonatal outcome. *Obstet Gynecol* 2013, 122(1):50-55.

A follow-up cohort study (Swedish Medical Birth Registry: N = 1,024,471; 1998-2008) to Dr. Blomberg's 2011 study investigating the association between birth injuries or newborn illness, maternal BMI and delivery mode. Women with BMI > 40 were at an increased risk of birth injury to the peripheral nervous system (PNS), skeletal birth injury, respiratory distress syndrome (RDS), bacterial sepsis, convulsions and hypoglycemia (OR 2.1 (95% CI: 1.9-2.3) for RDS to 3.8 (2.8-5.1) for PNS). For morbidly obese women, elective CD and VD were associated with twice the increased risk of adverse neonatal outcomes. However, preterm labor/delivery was not adjusted for as a confounder and several of the associated outcomes are related to preterm labor/delivery.

Respiratory/Pulmonary

Asthma

(16) Mendola P, Laughon SK, Mannisto TI, Leishear K, Reddy UM, Chen Z, Zhang J: Obstetric complications among US women with asthma. *Am J Obstet Gynecol* 2013, 208(2):127 e121-128.

A multicenter retrospective cohort study (N = 223,512) that characterized pregnancy and delivery complications associated with maternal asthma. Asthmatic women had higher odds of preeclampsia (OR = 1.1 [95% CI: 1.1-1.2]), superimposed preeclampsia (OR = 1.3 [1.2-1.6]), gestational diabetes (OR = 1.1 [1.0-1.2]), placental abruption (OR = 1.2 [1.1-1.4]), and previa (OR = 1.3 [1.1-1.6]). Asthmatic women had higher risk for PTD overall (OR = 1.2 [1.1-1.2]), medically indicated PTD (OR = 1.1 [1.0-1.3]), breech (OR = 1.1 [1.1-1.2]), hemorrhage (OR = 1.1 [1.0-1.2]), pulmonary embolism (OR = 1.7 [1.1-2.8]), and maternal ICU admission (OR = 1.3 1[1.0-1.7]), and were less likely to have spontaneous labor (OR = 0.9 [0.8-0.9]) and VD (OR = 0.8 [0.8-0.9]), even after adjusting for potential confounders.

(17) Murphy V, Wang G, Namazy J, Powell H, Gibson P, Chambers C, Schatz M: The risk of congenital malformations, perinatal mortality and neonatal hospitalisation among pregnant women with asthma: a systematic review and meta-analysis. *Br J Obstet Gynecol* 2013, 120(7): 812-822.

A meta-analysis of cohort studies (N=21 trials; 1975-2012) to illustrate the effect of maternal asthma on congenital malformations, neonatal complications or perinatal mortality. Maternal asthma was associated with a significant risk of congenital malformations (RR = 1.1 [95% CI: 1.0-1.2]), cleft lip (RR = 1.3 [1.0-1.7]), neonatal death (RR = 1.5 [1.1-2.0]), and neonatal hospitalization (RR = 1.5 [1.0-2.2]). There were no significant effects on major malformations or stillbirth, and neither exacerbations nor use of bronchodilators/inhaled corticosteroids were associated with congenital malformation risk. Heterogeneity (I^2) across subgroups ranged from very low (neonatal death, neonatal sepsis) to high (newborn transient tachypnea).

Infectious Disease

Influenza

(18) Martin A, Cox S, Jamieson D, Whiteman M, Kulkarni A, Tepper N: Respiratory Illness Hospitalizations Among Pregnant Women During Influenza Season, 1998–2008. *Matern Child Health J* 2013, 17(7):1325-1331.

This retrospective, population based study (NIS database; N= 17,548,022) examined the health care burden and pregnancy outcomes of respiratory vs. non-respiratory illnesses with hospitalization during influenza season. Among respiratory illness hospitalizations, there was an increased odds of intrauterine fetal demise (OR = 2.5 [95 % CI:2.0–3.2]), PTD (OR = 3.8 [3.5–4.1]), CD (OR = 3.5 [3.2–3.7]), and fetal distress (OR = 2.3 [2.2–2.5]). The presence of comorbid high risk medical conditions that confer higher risk for influenza complications did not significantly impact pregnancy outcomes. This study supports universal vaccination and early antiviral (flu) therapy in pregnant women.

HIV

(19) Briand N, Jasseron C, Sibiude J, Azria E, Pollet J, Hammou Y, Warszawski J, Mandelbrot L: Cesarean section for HIV-infected women in the combination antiretroviral therapies era, 2000-2010. *Am J Obstet Gynecol* 2013, 209(4):335.e331-e312.

This French Perinatal Cohort Study (N=8977; 2000-2010) investigated mother-to-child transmission (MTCT) of HIV in women with anti-retroviral therapy and low viral load (<400 copies/mL) in VD vs. CD. The mode of delivery in term deliveries did not effect the MCTC rate and rates of VD increased from 25-53% over the time period. The MCTC rates were higher with VD in PTD. Unfortunately, this analysis of transmission rates could not be compared between the French and U.S. standard acceptable viral load for VD (<400 copies/ml and <1000 copies/ml , respectively) because the subgroup sample size was too small.

(20) Calvert C, Ronsmans C: HIV and the Risk of Direct Obstetric Complications: A Systematic Review and Meta- Analysis. *PloS One* 2013, 8(10):e74848.

Using 44 trials, this systematic review and meta-analysis summarized the frequency of obstetric hemorrhage, HDP, dystocia, and intrauterine infections between HIV infected and uninfected women, unrestricted to language, international-region and study type. The risk of puerperal sepsis in HIV positive women was >3 (OR=3.4 [95% CI: 2.0 to 5.9], low heterogeneity) for all modes of delivery to almost 6 times (OR=5.8 [2.4 to 14.0], high heterogeneity) for CD compared with HIV negative women, supporting the use of antibiotic prophalaxis. Investigation of other potential associations was limited by a high risk of bias and high heterogeneity.

Diabetes

(21) Feig DS, Shah BR, Lipscombe LL, Wu CF, Ray JG, Lowe J, Hwee J, Booth GL: Preeclampsia as a Risk Factor for Diabetes: A Population-Based Cohort Study. *PLoS Med* 2013, 10(4):e1001425.

A retrospective, population-based, cohort study (N =1,010,068; 1994-2008) examined whether preeclampsia and gestational HTN were RF for postpartum diabetes. Preeclampsia, alone, (HR = 2.1 [95% CI: 2.0–2.2]) and gestational HTN, alone, (HR=2.0 [1.8–2.1]) were RF for developing diabetes in women followed for more than 15 years postpartum. Gestational diabetes mellitus (GDM), alone, conferred an elevated risk of postpartum diabetes (HR=12.8 [12.4–13.1]) and the additional presence of preeclampsia or gestational HTN further elevated this risk (HR=15.8, [14.5–17.1] and HR=18.5 [17.1-20.0], respectively). Longitudinal data on obesity, a potential confounder, were absent. A history of preeclampsia or GDM should alert clinicians to the need for preventative counseling and vigilant screening for future diabetes.

Cardiovascular Disease (Non-Hypertensive Disorders of Pregnancy)

(22) Kampman MAM, Balci A, van Veldhuisen DJ, van Dijk APJ, Roos-Hesselink JW, Sollie-Szarynska KM, Ludwig-Ruitenberg M, van Melle JP, Mulder BJM, Pieper PG *et al*: N-terminal pro-B-type natriuretic peptide predicts cardiovascular complications in pregnant women with congenital heart disease. *Eur Heart J* 2013. doi: 10.1093/eurheartj/eht526

This national, multicenter prospective cohort trial (N= 213, congenital heart disease patients) examined the role of N-terminal pro-B type natriuretic peptide (NT-proBNP) levels as a predictor of adverse cardiovascular outcomes in parturients with congenital heart disease. In the 10% of pregnancies with adverse outcomes, NT-proBNP >128 pg/mL at 20-weeks gestation, the presence of a mechanical valve, and subpulmonary ventricular dysfunction before conception were each independently associated with adverse events (OR=10.6 [P <0.039], OR=12.0 [P < 0.016], and OR=4.2 [P <0.041]), respectively. NT-proBNP >128 pg/mL at 20 weeks had additional benefit in predicting cardiovascular events in addition to other identified RF (P= 0.035). The negative predictive value of NT-proBNP < 128 pg/mL was 96.9%. It may be useful to pre-screen NT-proBNP levels in these parturients for risk stratification.

(23) Kao DP, Hsich E, Lindenfeld J: Characteristics, Adverse Events, and Racial Differences Among Delivering Mothers With Peripartum Cardiomyopathy. *JACC: Heart Failure* 2013, 1(5):409--416.

This multi-state retrospective study of peripartum cardiomyopathy (PPCM) compared maternal and fetal outcomes for "delivering mothers" with (N = 535) and without (N = 4,003,379) PPCM. Classical RF for PPCM (i.e. >30 years old, African American race, HTN, preeclampsia/eclampsia) and novel RF (i.e. anemia and asthma) were found to be significantly associated in the multivariate analysis. The rate of PPCM increased exponentially with each additional associated RF. The authors propose a "multi-hit" hypothesis for the observed associations between PPCM and autoimmune disease and PPCM and substance abuse. A composite of major adverse maternal events (i.e. death, cardiac arrest, heart transplantation, or mechanical circulatory support) were also significantly associated with PPCM (OR = 436, 95% CI 303.1-607.7).

Maternal Comorbid Disease (Direct Causes)

Hypertensive Disorders of Pregnancy

General

(24) American College of Obstetrics and Gynecology: Task force on hypertension in pregnancy. *Obstet Gynecol* 2013; 122: 1122-1131.

This publication provides evidence-based recommendations for clinical practice related to HDP according to the Grading of Recommendations Assessment, Development & Evaluation (GRADE) Working Group (http://www.gradeworkinggroup.org/index.htm). Overall, the diagnostic criteria from 2002 were continued with the following modifications: 1) If HTN and signs or symptoms of systemic disease are present after 20 weeks, proteinuria is not required for diagnosis of preeclampsia, 2) fetal growth restriction is no longer a signature finding indicative of severe preeclampsia, and 3) "mild" preeclampsia is removed from the nomenclature. Strategies for treating patients with HDP and insights into the available evidence on screening appropriateness, preventive strategies, and management of current and future disease in women with a history of HDP are also discussed.

Risk Factors

(25) Boyd HA, Tahir H, Wohlfahrt J, Melbye M: Associations of personal and family preeclampsia history with the risk of early-, intermediate- and late-onset preeclampsia. *Am J Epidem* 2013, 178(11):1611-1619.

This observational study (N = 1,377,479; 1978-2008) examined the recurrence and familial aggregation of preeclampsia by onset timing as a marker of severity, using personal and family histories of women delivering live singletons in Denmark. Primary results demonstrate that early onset preeclampsia (EO-PE) appears to have the biggest genetic component (strongest associations among female relatives, ranges from 24-163%), while late onset preeclampsia (LO-PE) is more susceptible to environmental factors. Previous EO-, intermediate-, or LO-PE increased the risk of recurrent preeclampsia with the same timing of onset 25.2 times (95% CI: 21.8- 29.1), 19.7 times (17.0-22.8), and 10.3 times (9.9- 10.9), respectively, vs. no such history. The role of paternal genes in the etiology of preeclampsia appears to be limited.

Eclampsia

(26) Fong A, Chau CT, Pan D, Ogunyemi DA: Clinical morbidities, trends, and demographics of eclampsia: a population-based study. *Am J Obstet Gynecol* 2013, 209(3):229.e221-227.

This state-based study describes the trends, demographics and morbidities of eclamptic (N = 1,888) compared to normotensive women (N = 2,768,983; 2001- 2007). The incidence of eclampsia has declined, from 8 to 5.6 cases per 10,000 deliveries. Antepartum morbidities positively associated with eclampsia include preexisting cardiac disease (OR 6.8 [95% CI: 5.4-8.7]), lupus (OR = 3.7 [1.5-8.9]), and twin gestation (OR = 3.3 [2.7-4.09]). Peripartum complications associated with eclampsia include cerebrovascular hemorrhage/disorders (OR = 112.2 [77.5-162.4]), cardiomyopathy (12.9 [6.1-27.3]), amniotic fluid embolism (OR = 11.9 [3.6-39.2]), and venous thromboembolism (OR = 10.7 [5.1-22.3]). While eclampsia is in temporal decline, it remains associated with severe morbidity.

(27) van Veen TR, Panerai RB, Haeri S, Griffioen AC, Zeeman GG, Belfort MA: Cerebral autoregulation in normal pregnancy and preeclampsia. *Obstet Gynecol* 2013, 122(5):1064-1069.

This prospective cohort study (N=40) queried whether preeclampsia is associated with dynamic cerebral autoregulation, by comparing measures of cerebral blood flow velocity of the middle cerebral artery (via transcranial Doppler), BP (via noninvasive arterial volume clamping), and end-tidal CO_2 during a resting period in women with preeclampsia and normotensive women. From these metrics, an autoregulation index was calculated between 0 (absent) to 9 (perfect). The autoregulation index was significantly reduced in women with preeclampsia (5.5$\pm$1.7 vs. 6.7$\pm$0.6, P = 0.004), as well as the resistance index, pulsatility

index, resistance-area product and cerebral perfusion pressure. There was no correlation between the autoregulation index and BP. This suggests that women with preeclampsia have impaired dynamic cerebral autoregulation, and may explain why cerebral complications (i.e. eclampsia) can occur without sudden or excessive BP spikes.

Therapy

(28) Churchill D, Duley L, JG T, Jones L: Interventionist versus expectant care for severe pre eclampsia before term. *Cochrane Db Syst Rev* 2013(7):CD003106.

This Cochrane meta-analysis (4 trials, N=425 women) included all adequately RCTs comparing interventionist ("aggressive") with expectant care ("delayed delivery") for women with severe early onset preeclampsia (24 to <34 weeks). There was insufficient data to compare maternal outcomes or effects on stillbirth or neonatal death after delivery. Neonatal outcomes for mothers with interventionist treatment included more intraventricular hemorrhage (RR = 1.8 [95% CI: 1.1- 3.1]), hyaline membrane disease (RR = 2.3 [1.4-3.8]) more ventilation requirement (RR = 1.5 [1.1- 2.0]), lower gestation at birth in days (average mean difference (AMD) = -9.9 [-16.4 to -3.5]), more NICU admissions (RR = 1.4 [1.2-1.6]) and longer NICU stays (AMD = 11.1 days [1.6-20.7]). The interventionalist group were more likely to have a CD (RR = 1.1 [1.0-1.2]). The expectant approach may be associated with decreased fetal morbidity but follow-up studies are needed.

(29) Duley L, Meher S, Jones L: Drugs for treatment of very high blood pressure during pregnancy. *Cochrane Db Syst Rev* 2013, 7:CD001449.

A Cochrane meta-analysis (35 RCTs, N=3,573 women) weighed the efficacy of 15 antihypertensive medications in women with severe HTN in pregnancy. The authors concluded that until better evidence is available, the choice of antihypertensive medication should depend on practitioner choice, adverse effects and patient preferences. They recommend avoiding nimodipine, diazoxide, ketanserin, and $MgSO_4$ (although indicated as an anticonvulsant for prevention/treatment of eclampsia).

(30) Shekhar S, Sharma C, Thakur S, Verma S: Oral nifedipine or intravenous labetalol for hypertensive emergency in pregnancy: a randomized controlled trial. *Obstet Gynecol* 2013, 122(5):1057- 1063.

This RCT (N=60) in women with severe preeclampsia and HTN examined time to achieve target BP <150 mmHg/100 mmHg using nifedipine oral (10 mg x 5 doses) and saline injections, or IV labetalol injections and placebo tablets. Median endpoint time to reach target BP was 40 mins (IQR = 20-60 mins) and 60 mins (IQR = 40-85 mins) for nifedipine and labetalol, respectively (P = 0.008). Median dose was a third less for nifedipine than labetalol (P = 0.008). Neither groups experienced drug-related adverse maternal or perinatal side effects. The labetalol group was marked with a higher failure rate requiring cross-over into the other group. These findings indicate that oral nifedipine lowers BP during a hypertensive emergency, and addresses concerns regarding overshoot hypotension in this population.

Fetal Outcomes

(31) Strand KM, Heimstad R, Iversen AC, Austgulen R, Lydersen S, Andersen GL, Irgens LM, Vik T: Mediators of the association between pre-eclampsia and cerebral palsy: population based cohort study. *Br Med J* 2013, 347:f4089.

This population-based cohort study (Norwegian Cerebral Palsy Registry and Medical Birth Registry; N=849 with CP and N=616,658 without CP) assessed the risk of developing cerebral palsy (CP) in relation to exposure to preeclampsia. The effect of preeclampsia on CP was found to vary with duration of pregnancy. At term, preeclampsia, alone, was not associated with increased CP but small for gestational age babies were three times more likely to have CP. Very preterm but appropriately grown and preeclampsia-exposed babies had half the risk of CP compared to unexposed babies. Overall, there was no evidence for a direct effect of preeclampsia on the risk of CP.

Related Content
Gibbins KJ, Browning KR, Lopes VV, Anderson BL, Rouse DJ: Evaluation of the clinical use of magnesium sulfate for cerebral palsy prevention. *Obstet Gynecol* 2013, 121(2, PART 1):235-240.

Future Disease

(32) Mannisto T, Mendola P, Vaarasmaki M, Jarvelin MR, Hartikainen AL, Pouta A, Suvanto E: Elevated blood pressure in pregnancy and subsequent chronic disease risk. *Circulation* 2013, 127(6):681-690.

This long-term, prospective study (Northern Finland Birth Cohort, N = 12,055; 1966 data) explored lifetime cardiovascular disease risk after pregnancy-related HTN (excluding preeclampsia). Average follow up time was 39.4 years. HTN during pregnancy was associated with an increased risk of future CVD and hypertension. Gestational HTN was associated with death from myocardial infarct, kidney disease, heart failure, myocardial infarcts, ischemic stroke, diabetes, and ischemic heart disease (HR ranging from 3.0 to 1.4). Isolated systolic HTN was associated with an increased risk of myocardial infarct death, heart failure, and diabetes (HR ranging from 2.2 to 1.4). Isolated diastolic HTN was only associated with an increased risk of ischemic heart disease (HR 1.3). These associations remained even in women without known classical RF. Isolated systolic/diastolic HTN was also associated with subsequent risk.

(33) Ranthe MF, Andersen EA, Wohlfahrt J, Bundgaard H, Melbye M, Boyd HA: Pregnancy loss and later risk of atherosclerotic disease. *Circulation* 2013, 127(17):1775-1782.

This retrospective cohort study (N= 1,031,279; 1977-2008) analyzed the relationship between pregnancy loss (stillbirth and miscarriage) and atherosclerotic disease (myocardial infarctions, cerebral infarctions, renovascular HTN). Compared to women without pregnany loss, the incidence rate ratio of women with stillbirth was 2.7 (95% CI; 2.1-3.5), 1.7 (1.3-2.3), and 2.4 (1.6-3.7) for myocardial infarction, cerebral infarction, and renovascular HTN respectively. Women with miscarriages had 1.1 (1.0-1.2), 1.2 (1.1-1.3), and 1.2 (1.1-1.4) times the rates of these same ordered outcomes. Each additional miscarriage increased the rates of the outcomes by 9-19%. The findings support a shared etiology of inflammatory pathology. Women with a history of pregnancy loss should be carefully monitored for risk of atherosclerotic disease.

PREGNANCY: INTRAPARTUM

Labor

Preterm Labor

Risks

(34) Chang HH, Larson J, Blencowe H, Spong CY, Howson CP, Cairns-Smith S, Lackritz EM, Lee SK, Mason E, Serazin AC *et al*: Preventing preterm births: analysis of trends and potential reductions with interventions in 39 countries with very high human development index. *Lancet* 2013, 381(9862):223-234.

This analysis of PTD in 39 countries was undertaken to identify a rate reduction target to accomplish previously identified WHO/multi-national organizational goals. The estimated 2010 PTD rate in high income countries varies from 5.3 per 100 (Latvia) to 14.7 per 100 live births (Cyprus). In the US, where the PTD rate is paradoxically increasing, half of the change is unexplained, although non-medically indicated labor induction and CD and assisted reproductive techniques are important drivers. A conservative target of a relative reduction in PTD rates of 5% by 2015 was put forth which projects to roughly 58,000 PTDs averted and total annual economic cost savings of about US $3 billion.

Associated Content: Comment on
Norman, J. E. and A. H. Shennan: Prevention of preterm birth--why can't we do any better? *Lancet* 2013, 381(9862): 184-185.

(35) Cnattingius S, Villamor E, Johansson S, Edstedt Bonamy AK, Persson M, Wikstrom AK, Granath F: Maternal obesity and risk of preterm delivery. *JAMA* 2013, 309(22):2362-2370.

This population-based cohort study (Swedish Medical Birth Register; N= 1.5 million; 1992-2010) analyzed the association of maternal obesity and risk of PTD. Risk of extremely, very, and moderately PTD increased with BMI, and the overweight and obesity related risks were greatest among extremely PTD (22-27 weeks). Risk of spontaneous extremely PTD increased with BMI ≥30, as did risks of medically indicated PTD. The authors posit that inflammatory mediators might be the cause.

Treatments

(36) Roos C, Spaanderman ME, Schuit E, Bloemenkamp KW, Bolte AC, Cornette J, Duvekot JJ, van Eyck J, Franssen MT, de Groot CJ *et al*: Effect of maintenance tocolysis with nifedipine in threatened preterm labor on perinatal outcomes: a randomized controlled trial. *JAMA* 2013, 309(1):41-47.

This double blind RCT (N=406) found that maintenance tocolysis with nifedipine does not reduce adverse perinatal outcomes related to PTD. However, more work is needed to draw definitive conclusions since the control arm had fewer adverse outcomes than anticipated. This research, combined with previous findings, suggests that the problem with nifedipine is not that it is ineffective as a uterine relaxant, but rather that treatment of uterine contractions to prevent PTD is an ineffective strategy.

(37) Crowther CA, McKinlay CJ, Middleton P, Harding JE: Repeat doses of prenatal corticosteroids for women at risk of preterm birth for improving neonatal health outcomes. *Cochrane Db Syst Rev* 2013, (6):CD003935.

This Cochrane meta-analysis (10 RCT: N= 4,730 women, N= 5,650 babies, low-moderate risk of bias) demonstrated that women who had already received a single course of corticosteroids ≥7 days previously and still had risk of PTD (23-34 weeks) benefited from an additional course in terms of reduced risk of the primary outcomes: respiratory distress syndrome (RR = 0.8, 95% CI: 0.8 -0.9, 8 trials, 3,206 infants, *numbers needed to treat (NNT*) 17) and serious infant outcome (RR 0.8 [0.8 -0.9], 7 trials, 5,094 infants, *NNT* 30). Treatment with repeat dose(s) of corticosteroid was associated with a reduction in mean birth weight (mean difference = -75.8 g [-117.6 to -34.0], 9 trials, 5,626 infants). However, outcomes that adjusted birth weight for gestational age did not differ between treatment groups. Also, at early childhood follow-up, no significant differences were seen for exposed or unexposed infants for the primary or secondary outcome growth assessments. The authors conclude that the short-term benefits for babies of less respiratory distress and fewer serious health problems in the first few weeks after birth support the use of repeat dose(s) of prenatal corticosteroids for women still at risk of preterm birth 7 days or more after an initial course.

Induction of Labor

Methods

(38) Jozwiak M, Ten Eikelder M, Rengerink KO, de Groot C, Feitsma H, Spaanderman M, van Pampus M, de Leeuw JW, Mol BW, Bloemenkamp K *et al*: Foley Catheter versus Vaginal Misoprostol: Randomized Controlled Trial (PROBAAT-M Study) and Systematic Review and Meta-Analysis of Literature. *Am J Perinatol* 2013. Advance publish online, doi: DOI: 10.1055/s-0033-1341573

This RCT (N=120 women) assessed differences in CD rate (primary outcome), maternal and neonatal morbidity and time to birth (secondary outcomes) in women with singleton term pregnancies randomized to 30-mL Foley catheter (N = 56) or 25-mcg vaginal misoprostol tablets (N = 64) for induction. CD rates did not differ significantly between groups. In the Foley catheter group, more CD due to failure to progress occurred (14% vs. 3%; RR = 4.6, 95% CI 1.0 to 20.6) and time from induction to birth was longer (36 hrs vs. 25 hrs; $p < 0.001$). Meta-analysis showed no difference in CD rate (moderate heterogeneity) and reduced instrumented VD (no heterogeneity) and hyperstimulation with FHR changes (low heterogeneity) in the Foley catheter group. All other outcomes were comparable. Overall, the authors support the use of the Foley catheter as an alternative cervical ripening agent to misoprostol.

Maternal and Fetal Effects

(39) Chen HY, Chauhan SP, Grobman WA, Ananth CV, Vintzileos AM, Abuhamad AZ: Association of labor induction or stimulation with infant mortality in women with failed versus successful trial of labor after prior cesarean. *J Matern Fetal Neonatal Med* 2013, 26(12):1162-1165.

This cohort study (N=164,113; 2000-2004) used linked birth and infant death data to investigate whether TOLAC at 34-41 weeks was associated with increased infant mortality. These women had "induction" or "stimulation" of labor. After adjustment for potential confounding factors, a failed TOLAC (which occurred 41% of the time) was found to be associated with a 1.4 fold (95% CI: 1.1-1.7) increased risk of infant mortality and this effect was true at virtually every gestational week assessed. Noted limitations included an inability to determine the events leading to fetal demise or the indications for CD and a lack of comparison data between women undergoing TOLAC vs. planned repeat CD. Although women who had a failed TOLAC had a statistically higher chance of infant mortality, the attributable risk was small (0.7 per 1000). What we cannot tell from this study is the optimal plan for a woman with a prior CD who requires delivery for fetal or maternal indications.

(40) Darney BG, Snowden JM, Cheng YW, et al: Elective induction of labor at term compared with expectant management: Maternal and neonatal outcomes. *Obstet Gynecol* 2013, 122(4): 761-769.

This retrospective state-based study (N=362,154) investigated CD rate, perinatal mortality and NICU admission rate for elective term induction vs. expectant management. The odds of CD were lower among women with elective induction vs. expectant management across all gestational age and parity: at 37 weeks OR = 0.4 (95% CI: 0.3-0.6); 38 weeks OR = 0.4 (0.4 -0.5), 39 weeks OR = 0.5 (0.4-0.5), 40 weeks OR = 0.6 (0.5-0.6). Elective induction was not associated with increased odds of severe lacerations, operative VD, perinatal death, NICU admission, respiratory distress, or macrosomia but was associated with increased odds of hyperbilirubinemia at 37 and 38 weeks and shoulder dystocia at 39 weeks.

(41) Gregory SG, Anthopolos R, Osgood CE, Grotegut CA, Miranda M: Association of autism with induced or augmented childbirth in north carolina birth record (1990-1998) and education research (1997-2007) databases. *JAMA Pediatrics* 2013, 167(10):959-966.

This retrospective review (North Carolina Detailed Birth Records; N=625,042) examined whether induced and/or augmented births were associated with a higher odds of autism by using school records with 5,500 documented autism cases. Roughly 1.3% of male and 0.4% of female children were diagnosed with autism. In successive statistical models, researchers found that children had an increased odds for autism if born to mothers who were induced only (1.1 [95% CI: 1.0-1.2]), or augmented only (1.2 [1.1 -1.2]) or induced and augmented (1.3 [1.0-1.5]). There are several limitations to this study, including the lack of control for important residual confounders (e.g. indications for induction, obesity), some of which have also increased over the time period, and the unexplained overall decrease in autism over the time in the dataset.

Associated Content: Editorial
Vintzileos AM, Ananth CV: Does augmentation or induction of labor with oxytocin increase the risk for autism? *Am J Obstet Gynecol* 2013; 209:502-4.

Other

(42) Balki M, Erik-Soussi M, Kingdom J, Carvalho JC: Oxytocin pretreatment attenuates oxytocin-induced contractions in human myometrium in vitro. *Anesthesiology* 2013, 119(3):552-561.

This *in vitro* interventional study measured the contractile response of human pregnant myometrium to oxytocin pretreatment (N = 62). Pretreatment with oxytocin 10^{-5} and 10^{-8} M significantly reduced motility index (P = 0.005 and P = 0.02, respectively) and area under the curve (AUC, P = 0.04 and P = 0.05, respectively), whereas pretreatment with oxytocin 10^{-10} M did not. Increase in duration of oxytocin pretreatment also significantly decreased amplitude (P = 0.003), motility index (P = 0.03), and AUC (P = 0.02), but not the frequency of contractions. These findings are clinically applicable to adverse obstetrical outcomes (e.g., PPH from uterine atony, uterine hyperstimulation) found in other studies of high-dose oxytocin induction methods.

PO Status During Labor

(43) Vallejo MC, Cobb BT, Steen TL, Singh S, Phelps AL: Maternal outcomes in women supplemented with a high- protein drink in labour. *Aust N Z J Obstet Gynaecol* 2013, 53(4):369-374.

This randomized interventional study (N=150) assessed whether a high protein drink supplementation (Group P; 325 ml) in labor affected nausea, emesis, patient satisfaction, and rate of gastric emptying. There were no differences in the overall incidence of nausea and emesis between groups. Median patient satisfaction scores were higher in Group P than in Group C (water/ice chips) (P = 0.007). To evaluate gastric emptying, 18 additional patients were added and ultrasound gastric emptying t½ rates were analyzed (PG = 25.5 ± 15.9 min [95% CI: 15.2 – 35.9] vs. CG = 20.0 ± 8.7 min [14.3 – 25.7], P = 0.2)]. Patient satisfaction in labor was improved with high-protein drink supplementation vs. ice chips/water with similar rates of side effects and gastric emptying.

Delivery Setting

(44) de Jonge A, Mesman JA, Mannien J, Zwart JJ, van Dillen J, van Roosmalen J: Severe adverse maternal outcomes among low risk women with planned home versus hospital births in the Netherlands: nationwide cohort study. *Br Med J* 2013, 346:f3263.

This Netherlands cohort study (N=92,333) investigated the morbidity associated with home births in low risk women. The rate of severe acute maternal morbidity (ICU admission, eclampsia, blood transfusion of four or more packed cells, and other serious events) among planned primary care births was 2.0 per 1,000 births. Low risk women in primary care at the onset of labor with planned home birth had lower rates of severe acute maternal morbidity, PPH, and manual removal of placenta than those with planned hospital birth. For parous women, these differences were statistically significant. Absolute risks were small in both groups. Ultimately, there was little evidence that planned home birth among low risk women leads to an increased risk of severe adverse maternal outcomes in a quality maternity care system.

Labor Analgesia

Neuraxial Anesthesia

Spinal vs. CSE

(45) Gambling D, Berkowitz J, Farrell TR, Pue A, Shay D: A randomized controlled comparison of epidural analgesia and combined spinal-epidural analgesia in a private practice setting: pain scores during first and second stages of labor and at delivery. *Anesth Analg* 2013, 116(3):636-643.

In this prospective, single-center RCT (N=800) investigators assessed verbal pain scores during the 1st and 2nd stages of labor and at delivery (primary outcome) in women receiving combined spinal epidural (CSE) or traditional epidural analgesia. The average "typical" verbal rating pain score during the 1st stage was lower in the CSE group (1.4 vs. 1.9; P < 0.001). Pain scores during the 2nd stage of labor and at delivery were the same between groups. Fewer patients received epidural top-up doses in the CSE group (16.4% vs. 25.6%; P = 0.002). Side effects (itching, fetal bradycardia) were more common in CSE group. There were no emergency CD in either group. Comparatively, CSE analgesia provided better 1st stage analgesia (although pain scores were low in both) and fewer epidural top-up injections by an anesthesiologist.

Associated Content: Editorial
Booth JL, Pan PH: Combined spinal epidural or traditional epidural technique: who wins? *Anesth Analg* 2013, 116(3):515-516.

Predictors

(46) Guglielminotti J, Mentre F, Bedairia E, Montravers P, Longrois D: Development and evaluation of a score to predict difficult epidural placement during labor. *Reg Anesth Pain Med* 2013, 38(3):233-238.

This study was designed to prospectively develop and validate a 3 risk group score to predict difficult epidural placement (DEP) during labor. Three independent RF for DEP were identified: difficult interspinous space palpation (OR= 6.1 [95% CI: 2.8-13.9]), spinal deformity (OR=2.4 [1.1-5.3]), and inability to flex the back (OR= 3.0 [1.2-7.8]). The C-index of the model was 0.81 (0.74-0.88) in the training set and 0.78 (0.70-0.86) in the validation set. A 5-point score was then created to define groups with low risk (score 0), intermediate risk (score 1-2), and high risk (score 3-4), with predicted rates of DEP of 9.7%, 30.3%, and 68.9%, respectively. The C-index of the score was 0.79 [0.72-0.86] in the training set and 0.76 [0.69-0.84] in the validation set. DEP frequency was 30%. Dural puncture was more frequent in DEP patients (4% vs. 0%, P = 0.007). This score may be useful in counseling patients about risk of inadvertent dural puncture and in planning which patients might particularly benefit from ultrasound guided placement.

Dosing

(47) Mhyre J, Hong R, Greenfield MH, Pace N, Polley L: The median local analgesic dose of intrathecal bupivacaine with hydromorphone for labour: a double-blind randomized controlled trial. *Can J Anesth* 2013, 60(11):1061-1069.

This double-blind RCT (N= 88 laboring parturients) tested the hypothesis that intrathecal hydromorphone (100 mcg) reduces the dose requirement for intrathecal bupivacaine to induce rapid analgesia for women in the 1st stage of labor. A decrease was observed in the median local analgesic doses (effective dose [ED50]) estimated according to the formulas of Dixon and Massey, with a between-group difference of −0.45 mg). However, since the estimate had a wide range (95% CI: −1.2 to 0.3), no definitive conclusion can be drawn.

(48) Morrison AP, Hunter JM, Halpern SH, Banerjee A: Effect of intrathecal magnesium in the presence or absence of local anaesthetic with and without lipophilic opioids: a systematic review and meta-analysis. *Br J Anaesth* 2013, 110(5):702-712.

This systematic review and meta-analysis (N=15 trials; N = 980 patients) included RCTs in patients undergoing all types of surgery and in women in labor that compared the effect of intrathecal Mg+/- local anesthetic (LA) +/- lipophilic opioid (experimental group) with the use of either intrathecal lipophilic opioids +/- LA or LA only (control group) on duration of spinal anesthesia (primary outcome), onset and time to maximal sensory blockade, onset of motor block, and duration of sensory and motor blockade (secondary outcomes). Increased duration of spinal anesthesia was seen in the experimental group in the non-obstetric studies (standard mean difference (SMD) = -1.4 [P = 0.0002]), but not in obstetric studies (SMD -0.6 [P = 0.41]). Onset of motor and sensory blockade and incidence of hypotension and pruritus was similar between groups. Unfortunately, heterogeneity was high in all outcome measures (I^2 = 88-94%).

(49) George RB, Allen TK, Habib AS: Intermittent epidural bolus compared with continuous epidural infusions for labor analgesia: a systematic review and meta-analysis. *Anesth Analg* 2013, 116(1):133-144.

This systematic review and meta-analysis of RCTs (N=9 trials; N = 694; all with low risk of bias) compared the performance of continuous epidural infusion (CEI) with intermittent epidural bolus (IEB) for labor analgesia. There was no statistical difference detected between IEB and CEI in the rate of CD or the need for anesthetic intervention. IEB did result in a weakly significant reduction in local anesthetic usage (MD, -1.2 mg bupivacaine equivalent per hr; [95% CI, -2.2 to -0.3]). Maternal satisfaction score (100-mm visual analog scale) was higher with IEB (MD, 7.0 mm; [6.2-7.8]). Heterogeneity was very low.

(50) Abdallah FW, Abrishami A, Brull R: The facilitatory effects of intravenous dexmedetomidine on the duration of spinal anesthesia: a systematic review and meta-analysis. *Anesth Analg* 2013, 117(1):271-278 .

This systematic review and meta-analysis included RCTs (7 trials, intermediate to high quality; N=364 patients) that investigated the effects of IV administration of dexmedetomidine on single-injection local anesthetic-based spinal anesthesia. Sensory block duration was prolonged by IV dexmedetomidine by 38% (P < 0.00001), motor block duration was prolonged by 21% (P < 0.00001), and time to first analgesic request was increased by 60% (P < 0.00001). The use of dexmedetomidine was associated with a 3.7-fold increase (P = 0.004) in transient reversible bradycardia and there was no difference in the incidence of hypotension or postoperative sedation, and none of the patients experienced respiratory depression.

(51) Sia AT, Leo S, Ocampo CE: A randomised comparison of variable-frequency automated mandatory boluses with a basal infusion for patient-controlled epidural analgesia during labour and delivery. *Anaesthesia* 2013, 68(3):267-275.

This RCT (N=102) compared the analgesic efficacy of administering variable-frequency automated boluses (5 ml 0.1% ropivacaine + fentanyl 2 mic/ml) at a rate proportional to the patient's needs with fixed continuous basal infusion in patient-controlled epidural analgesia during labor and delivery. The incidence of breakthrough pain requiring supplementation was significantly lower in the automated bolus group compared with the infusion group (5.9% vs. 23.5%, P = 0.023). The time-weighted mean (SD) hourly consumption of ropivacaine was similar in both groups. Parturients from the automated bolus group reported higher satisfaction scores compared with those in the infusion group (96.5 vs. 89.2/100, respectively [p < 0.001]). There was no difference in the incidence of maternal side effects or in obstetric and neonatal outcomes.

(52) **Sultan P, Murphy C, Halpern S, Carvalho B: The effect of low concentrations versus high concentrations of local anesthetics for labour analgesia on obstetric and anesthetic outcomes: a meta-analysis. *Can J Anaesth* 2013, 60(9):840-854.**

This meta-analysis of RCTs (11 trials; N= 1,997 women) examined whether low concentration (LC) local anesthetics (N= 1,145 patients) vs. high concentration (HC) local anesthetics (N=852 patients) were associated with a decreased incidence of assisted vaginal delivery. LC was defined as $\leq$ 0.1% bupivacaine or $\leq$0.17% ropivacaine. A reduction in the incidence of assisted VD was found for HC vs. LC (OR = 0.7, P < 0.001). Heterogenity was low for this outcome. There was no difference in the incidence of CD (OR 1.1, P = 0.7). The LC group also had significantly less motor block, greater ambulation, less urinary retention, and a shorter 2nd stage of labor compared with the HC group. There were no differences between groups in pain scores, maternal nausea and vomiting, hypotension, fetal heart rate abnormalities, 5-minApgar scores, and need for neonatal resuscitation. There was more pruritus in the LC group and greater odds of 1-min Apgar scores < 7 in the LC group, perhaps due to the higher concentrations of neuraxial fentanyl. Overall, LC local anesthetics are recommended for labor epidural analgesia to optimize obstetric outcome.

(53) Pratt S, Hess P, Vasudevan A: A prospective randomized trial of lidocaine 30 mg versus 45 mg for epidural test dose for intrathecal injection in the obstetric population. *Anesth Analg* 2013, 116(1):125-132.

This prospective, double-blinded RCT (N=100) evaluated whether lidocaine 30 mg epidural test dose was as effective as 45 mg epidural test dose in creating subjective or objective evidence of sensory or motor block within 3 mins. When administered intrathecally, both 30mg and 45mg produced rapid evidence of spinal sensory blockade at 3 mins (100% patients). Motor blockade was found in 83% of 30mg and 100% 45mg at 3 mins. When administered epidurally, at 3 mins, no patient in the 30mg and 2 patients in 45mg group had motor blocks; however several patients had subjective heavy or warm feelings in both groups. Side effects were not decreased with 30mg. On basis of a intrathecal catheter rate of 1:380, the negative predictive value of no sensory change at 3 mins was 100% for epidural 30mg (95% CI, 99.9-100.5) and 100% for 45mg (99.9-100.5) but the positive predictive value was low (specificity was 74% [55-88%] with epidural 30mg and 59% [41-74%] with epidural 45 mg). Ultimately, the authors were unable to confirm whether the 30mg test dose was a better discriminator because of the small sample size.

Associated Content: Editorial
Mhyre JM: Why do pharmacologic test doses fail to identify the unintended intrathecal catheter in obstetrics? *Anesth Analg* 2013, 116(1):4-5.

Evaluation

(54) Thangamuthu A, Russell IF, Purva M: Epidural failure rate using a standardised definition. *Int J Obstet Anesth* 2013, 22(4):310-315.

This study proposes a standardized definition of epidural failure using a modified Delphi approach. Using experts from the Obstetric Anaesthetists' Association (OAA) Executive Committee, anonymized and detailed data from 1,521 epidurals insertions were included. Epidural failure was defined as having one or more of the following characteristics: lack of adequate pain relief by 45 min, dural puncture, re-siting the epidural or abandoning the procedure, or maternal dissatisfaction at the follow-up visit. The overall failure rate was 23% (most commonly due to inadequate pain relief), but generally improved with training time (Year 2, 3, 4 vs.5). The re-site rate was significantly higher for Year 2 and Year 4 trainees vs. Year 5 and above. The accidental dural puncture rate was highest among Year 3 trainees (2.2%). Cervical dilatation, time of day, and position for insertion were not significantly associated with the failure rate. A standardized definition of epidural failure can be useful both in quality assessment and for consistency across research investigations.

Other Labor Analgesia

Hypnosis

(55) Werner A, Uldbjerg N, Zachariae R, Rosen G, Nohr E: Self-hypnosis for coping with labour pain: a randomised controlled trial. *Br J Obstet Gynecol* 2013, 120(3):346-353.

In this RCT (N=1,222), an intervention group of nulliparous women was provided a brief course in self-hypnosis (three 1-hr courses and audio-recordings) to ease childbirth pain. No differences in use of epidural analgesia (primary outcome) or self-reported pain experience (secondary outcome) were found across study groups. The authors comment that there may be particular patient subgroups or different training regimens that are more effective.

(56) Cyna AM, Crowther CA, Robinson JS, Andrew MI, Antoniou G, Baghurst P: Hypnosis Antenatal Training for Childbirth: a randomised controlled trial. *Br J Obstet Gynecol:* 2013, 120(10):1248-1259.

This RCT (N=448 women) tested whether antenatal hypnosis with or without accompanying compact discs (CD) vs. a control group without either reduced the need for pharmacological analgesia. No difference was found comparing hypnosis + CD with control, or comparing CD only with control. The Hypnosis Antenatal Training for Childbirth (HATCh) intervention with CD did not reduce the use of pharmacological analgesia during childbirth.

Reminfentanil

(57) Tveit TO, Halvorsen A, Seiler S, Rosland JH: Efficacy and side effects of intravenous remifentanil patient-controlled analgesia used in a stepwise approach for labour: an observational study. *Int J Obstet Anesth* 2013, 22(1):19-25.

In this prospective, observational study (N=41), pain scores were examined during the 1^{st} and 2^{nd} stages of labor using IV patient-controlled analgesia with remifentanil using stepwise bolus doses without background infusion. Pain scores were significantly reduced in the first 3 hr of patient-controlled analgesia compared to baseline, and at the end of the 1^{st} and 2^{nd} stages of labor ($P<0.05$). Maximal pain reduction was 60% ($P<0.01$). The mean highest dose of remifentanil was 0.7mcg/kg [range 0.3-1.0]. Ninety-three percent (93%) of patients were satisfied with their analgesia. The lowest O_2 saturation was 91%, the lowest respiratory rate was 9 breaths/min and 27% parturients received supplemental O_2 due to O_2 saturations <92%.

Monitoring (maternal O2 sat and heart rate) was considered to be mandatory as maternal sedation was moderate. Neonatal data was reassuring.

Associated content
Kranke P, Girard T, Lavand'homme P, Melber A, Jokinen J, Muellenbach RM, Wirbelauer J, Honig A: Must we press on until a young mother dies? Remifentanil patient controlled analgesia in labour may not be suited as a "poor man's epidural". *BMC pregnancy and childbirth* 2013, 13:139.

Cesarean Delivery

Malplacentation

(58) Weiniger CF, Einav S, Deutsch L, Ginosar Y, Ezra Y, Eid L: Outcomes of prospectively-collected consecutive cases of antenatal-suspected placenta accreta. *Int J Obstet Anesth* 2013, 22(4):273-279.

This prospective study developed a predictive score for antenatal diagnosis of placenta accreta via mathematical modeling using 3 clinical variables (placenta previa, number of previous CD and/or ultrasound suspicion of placenta accreta) followed by surgically confirmed diagnosis. 52/92 (56%) cases were confirmed surgically. From the ROC curve, a cut-point with 94.2% (95% CI: 84.1-98.8%) and 52.5% specificity (95% CI: 36.1-68.5%) was achieved, compared with 86.6% sensitivity (95%CI: 74.2%–94.4%) and 60.0% specificity (95%CI: 43.3%–75.1%) using ultrasound alone. As this was a proof-of-concept study, findings require further validation before clinical application.

(59) Kamara M, Henderson J, Doherty D, Dickinson J, Pennell C: The risk of placenta accreta following primary elective caesarean delivery: a case-control study. *Br J Obstet Gynecol* 2013, 120(7):879-886.

This retrospective case-control study (N=177) compared the risk of placenta accreta in subsequent pregnancies with placenta previa following a primary CD without labor vs. a primary emergency CD. Compared with primary emergency CD, primary elective CD significantly increased the risk of placenta accreta in a subsequent pregnancy in the presence of placenta previa (OR = 3.0; 95% CI 1.5-6.1; P = 0.025). This suggests that the active and inactive human uterus may represent two phenotypically distinct entities.

Cesarean vs. Vaginal Delivery

<u>General</u>

(60) Boyle A, Reddy UM, Landy HJ, Huang CC, Driggers RW, Laughon SK: Primary cesarean delivery in the United States. *Obstet Gynecol* 2013, 122(1): 33-40.

This retrospective cohort study (N=38,484 CD/228,562 total deliveries; 2002-2008) at participating sites in the Consortium on Safe Labor sought to identify strategies to promote VD. The most common indications for primary CD were failure to progress (35.4%), non-reassuring fetal heart rate tracing (27.3%), and fetal malpresentation (18.5%); frequencies for each indication varied by parity. In “failure to progress”, 42.6% of primiparous women and 33.5% of multiparous women never progressed beyond 5 cm dilation before delivery. In women who reached the 2nd stage of labor, 17.3% underwent CD for arrest of descent before 2 hrs, and only 1.1% was given a trial of operative VD. 45.6% of primary CD was performed on primiparous women at term with a singleton fetus in cephalic position. The authors recommend using 6 cm as the active labor cut off, allowing sufficient time for the 2nd stage of labo,r when appropriate, and encouraging operative VD to reduce the primary CD rate, particularly in the primiparous woman at term with a singleton fetus in cephalic presentation.

<u>Maternal Request</u>

(61) American College of Obstetrics and Gynecology: ACOG committee opinion no. 559: Cesarean delivery on maternal request. *Obstet Gynecol* 2013, 121(4):904-907.

The ACOG Committee on Obstetric Practice defines *CD on maternal request* as a primary prelabor CD (on maternal request) in the absence of maternal or fetal implications. The potential risks are said to include an increase risk of infant respiratory difficulties and greater complications in subsequent pregnancies. Potential short-term benefits of planned CD vs. planned VD (which could lead to unplanned CD) include decreased risk of hemorrhage, transfusion and urinary incontinence in the 1st year postpartum and fewer surgical complications. Overall, the committee concluded that VD is safe and appropriate in the absence of maternal or fetal indications for CD. When CD on maternal request is planned, delivery should not be performed before 39 weeks gestation or be motivated by the unavailability of effective pain management, or be undertaken in women desiring several children.

(62) Karlstrom A, Lindgren H, Hildingsson I: Maternal and infant outcome after caesarean section without recorded medical indication: findings from a Swedish case-control study. *Br J Obstet Gynecol* 2013, 120(4):479-486.

This retrospective case-control study (Swedish Medical Birth Registry; N=19,651) assessed women undergoing CD without medical indication (N= 5,877) and a control group (N=13,774) with spontaneous onset of labor (some of whom had VD and others who had unplanned CD) for maternal and fetal outcomes. Maternal complications were more common in women undergoing CD, specifically, bleeding complications, OR = 2.5 (95% CI: 2.1-3.0) for elective CD and 2.0 (95% CI: 1.5-2.6) for emergency CD group with OR = 2.6 in both groups for infection. Breastfeeding complications were most common in women having an elective CD, OR = 6.8 (95% CI: 3.2-14.5). Infants had higher incidence of respiratory distress (OR = 2.7 (95% CI: 1.8-3.9)) in the elective CD group vs. emergency CD group. Overall, CD was associated with higher incidence of maternal and fetal morbidity.

Associated Content: Comment On
Bhide, A: Commentary on Maternal and infant outcome after caesarean section without recorded medical indication: findings from a Swedish case-control study. *Br J Obstet Gynecol* 2013, 120(4): 486.

Infection

(63) Baaqeel H, Baaqeel R: Timing of administration of prophylactic antibiotics for caesarean section: a systematic review and meta-analysis. *Br J Obstet Gynecol* 2013, 120(6):661-669.

This systematic review and meta-analysis (6 RCTs; N= 2,313 women and N= 2,345 newborns) compared maternal and neonatal outcomes with preoperative vs. intraoperative administration of antibiotics. Preoperative antibiotic administration was associated with a significantly lower rate of endometritis compared with intraoperative administration (RR = 0.6 [95% CI: 0.4 - 0.9]). In the preoperative group, there were nonsignificant reductions in the rates of wound infection (RR = 0.7 [0.4-1.1]) maternal febrile morbidity (RR = 0.9 [0.5 -2.0]), neonatal sepsis (RR = 0.8 [0.5 -1.4]), neonatal septic work-up (RR = 0.9 [0.7-1.2]) and NICU admission (RR = 0.9 [0.7 -1.3]). There were nonsignificant increases in the rates of maternal pyelonephritis (RR = 1.1 [0.5 -2.4]) and neonatal pneumonia (RR = 3.4 [0.6 -20.5]). The analyses had minimal heterogeneity. However, the lack of neonatal adverse effects should be cautiously interpreted given the limited power of the trials to detect such effects.

Associated Content: Letter to the Author(s) and Reply
Jørgensen J, Hyldig N, Weber T and Lamont R: Timing of antibiotic prophylaxis for caesarean section. *Br J Obstet Gynecol* 2013, 120: 778.
Baaqeel H, and Baaqeel R: Timing of antibiotic prophylaxis for caesarean section. *Br J Obstet Gynecol* 2013, 120: 778–779.

(64) Duggal N, Poddatorri V, Noroozkhani S, Siddik-Ahmad RI, Caughey AB: Perioperative oxygen supplementation and surgical site infection after cesarean delivery: a randomized trial. *Obstet Gynecol* 2013, 122(1):79-84.

In this double-blinded, prospective RCT (N=831), investigators evaluated whether supplemental perioperative O_2 decreases surgical site wound infections or endometritis up to 6 weeks postpartum. The allocation was to either 30% $FI0_2$ or 80% $FI0_2$ O_2 during the CD and for 1 hr post-op. An intention-to-treat analysis found no significant difference in surgical site infection or in endometritis. Overall, administration of 80% vs. 30% supplemental O_2 did not confer a lower rate of a surgical site infection.

Related Content
Klingel ML, Patel SV: A meta-analysis of the effect of inspired oxygen concentration on the incidence of surgical site infection following cesarean section. *Int J Obstet Anesth* 2013, 22(2):104-112.

Other

(65) Rosseland LA, Hauge TH, Grindheim G, Stubhaug A, Langesæter E: Changes in blood pressure and cardiac output during cesarean delivery: The effects of oxytocin and carbetocin compared with placebo. *Anesthesiology* 2013, 119:541-551

This is a double-blinded RCT (N=77) comparing the effects of 100 mcg carbetocin (N = 26), 5 U IV oxytocin (N = 25), and placebo (N = 26) on hemodynamics, uterine tone, adverse events and blood loss after elective CD under spinal anesthesia. Heart rate and cardiac output increased in all groups, and stroke volume increased after oxytocin and carbetocin but remained unchanged for placebo. The hemodynamic side effects of the two intervention drugs were comparable, with modestly different time courses. The absence of stroke volume increase in the placebo group challenges the theory that uterine contraction causes autotransfusion of uterine blood, which, in turn, increases preload.

Cesarean Delivery Anesthesia

Neuraxial Anesthesia

(66) Jain K, Bhardwaj N, Sharma A, Kaur J, Kumar P: A randomised comparison of the effects of low-dose spinal or general anaesthesia on umbilical cord blood gases during caesarean delivery of growth-restricted foetuses with impaired Doppler flow. *Eur J Anaesthesiol* 2013, 30(1):9-15.

This prospective, RCT (N=40) explored the effects of low-dose spinal (LDSA) (8mg hyperbaric bupivacaine 0.5% with fentanyl 20 mcg) vs. standard general anesthesia (GA) on the umbilical cord gases of growth restricted fetuses for elective CD. Systolic BP was maintained between 80-100% of baseline. There was no difference in the primary outcome variables of mean umbilical cord arterial and venous base deficit. The mean umbilical artery pH was significantly lower in the LDSA group than in the GA group (7.2 +/- 0.1 vs. 7.3 +/- 0.04, P = 0.01). Higher partial pressures of O_2 occurred in the GA group (20.9 +/- 6.5 kPa) than in the LDSA group (13.6 +/- 6.1 kPa, P = 0.001). LDSA was associated with hypotension of short duration (0.7+/-1.1 min) and adequate surgical block. No difference was observed between groups in 1 and 5-min Apgar scores. Limitations of this study include small sample size, very low intrathecal dose, and mixed etiologies of growth restricted fetuses. Studies with larger sample sizes and more homogeneous patients are needed to confirm whether there are clinically important differences in neonatal acidosis in patients with vulnerable fetuses who receive LDSA vs. GA.

Associated Content: Comment On
Habib AS: Anaesthesia for caesarean delivery of growth-restricted foetuses: a bird in the hand is worth two in the bush. *Eur J Anaesthesiol* 2013, 30(1):5-6.

(67) Kathirgamanathan A, Douglas MJ, Tyler J, Saran S, Gunka V, Preston R, Kliffer P: Speed of spinal vs general anaesthesia for category-1 caesarean section: a simulation and clinical observation-based study. *Anaesthesia* 2013, 68(7): 753-759.

This simulation study addressed the question of whether effective spinal anesthesia can occur as quickly as general anesthesia (GA) for a category-1 CD (non-elective, emergency). To test this, 16 consultants and 3 fellows were timed performing spinal and GA for simulated category-1 CD. Time to spinal block attainment was estimated from 100 actual cases. The median (IQR

[range]) times for spinal procedure, onset of spinal block and GA were 2:56 min (2:32 - 3:32 [1:22 - 3:50]), 5:56 (4:23 - 7:39 [2:9 - 13:32]) and 1:56 min (1:39 - 2:9 [1:13 - 3:12]), respectively. The limiting factor in urgent spinal anesthesia was found to be the unpredictable time needed for adequate surgical block to develop.

(68) Beatty NC, Arendt KW, Niesen AD, Wittwer ED, Jacob AK: Analgesia after Cesarean delivery: a retrospective comparison of intrathecal hydromorphone and morphine. *J Clin Anesth* 2013, 25(5):379- 383.

This retrospective, comparative study (N=114) investigated analgesia and side effects of intrathecal morphine and intrathecal hydromorphone in patien0ts after elective CD. The authors found that among 38 patients who received intrathecal hydromorphone 0.04 mg, compared with 76 patients given 0.1 mg of intrathecal morphine, there were no significant differences in overall frequency of opioid-related complications (primary outcome), or 24-hr opioid consumption, or pain scores at any time point up to 24 hours (secondary outcomes). This study is timely given the relative lack of availability of intrathecal morphine.

(69) Subedi A, Biswas BK, Tripathi M, Bhattarai BK, Pokharel K: Analgesic effects of intrathecal tramadol in patients undergoing caesarean section: a randomised, double-blind study. *Int J Obstet Anesth*2013, 22(4):316-321.

This double-blind, RCT (N=80) evaluated the effect of adding intrathecal tramadol (10 mg) to intrathecal hyperbaric bupivacaine (10 mg) vs. intrathecal fentanyl (10mug) to the same local anesthetic dose for elective CD on the resulting block characteristics and neonatal outcome. Median [IQR] duration of postoperative analgesia in the tramadol and the fentanyl groups was 300 [240-360] min and 260 [233-300] min, respectively (P=0.02). The incidence of shivering was lower in patients who received tramadol than those who received fentanyl (5% vs. 32%, P=0.003). Apgar scores, umbilical cord acid-base measurement and neurologic and adaptive capacity scores were equivalent between the two groups. Adding intrathecal tramadol (10mg) instead of fentanyl (10 mcg) to spinal anesthesia for CD may increase duration and decrease maternal shivering.

(70) Singh SI, Rehou S, Marmai KL, Jones, M. P: The efficacy of 2 doses of epidural morphine for postcesarean delivery analgesia: A randomized noninferiority trial. *Anesth Analg* 2013, 117(3):677-685.

This double-blinded, noninferiority RCT (N= 90) investigated whether half the traditional dose of epidural morphine (EM, 1.5mg) was associated with noninferior analgesia and fewer side effects as part of multimodal therapy for pain relief after CD . Noninferiority was demonstrated as the difference in median 24-hr opioid consumption between groups less than the pre-specified 3.33 mg. No significant differences were found between the 3.0mg and 1.5mg EM groups in the median 24- to 48-hr additional opioid consumption or total opioid consumption within 48 hr. Pain scores, overall pain relief, and satisfaction at 24, 48-hr, and 12 weeks were also not significantly different. The 1.5 mg EM group had less moderate and severe pruritus at 6 and 12 hr (RR 0.4 [95% CI, 0.2–0.9] and RR 0.4 [0.2–0.8], respectively) and had less nausea and vomiting at 6 hrs (RR 0.2 [0.1–0.9]). When used as part of a multimodal analgesia regimen, the 1.5 mg of epidural morphine provided noninferior post-CD analgesia and caused fewer side effects.

General Anesthesia

Airway

(71) Quinn AC, Milne D, Columb M, Gorton H, Knight M: Failed tracheal intubation in obstetric anaesthesia: 2 year national case-control study in the UK. *Br J Anaesth* 2013, 110(1):74-80.

This case-control study (N = 57 completed reports [100% response]; 2008-2010) estimated the rate RF of failed intubation in OB anesthesia using the UK Obstetric Surveillance System. The incidence of failed intubation (defined as “failure to achieve tracheal intubation during a rapid sequence induction, thereby initiating a failed intubation drill”) was estimated to be 1 per 224 (95% CI: 179-281). Controls were GA’s administered to parturients without failed intubation. Multivariate analyses showed that age, BMI, and a recorded Mallampati score were significant independent predictors of failed tracheal intubation. The risk for failed intubation was greater for a junior trainee than when a consultant was present (2.4 [1.1-5.5], p=0.4). The classical

LMA was the most commonly used rescue airway. There was one emergency surgical airway but no deaths or hypoxic brain injuries. Gastric aspiration occurred in 8% of index cases. Index cases were more likely to have maternal morbidities.

(72) Apfelbaum JL, Hagberg CA, Caplan RA, Blitt CD, Connis RT, Nickinovich DG, Hagberg CA, Caplan RA, Benumof JL, Berry FA *et al*: Practice Guidelines for Management of the Difficult Airway: An Updated Report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology* 2013, 118(2):251-270.

Updated (and largely unchanged) recommendations on "Practice guidlines for postanesthetic care". Of note, it was determined that there is insufficient new literature to further assess and refine the general recommendations that "periodic assessment and monitoring of airway patency, respiratory rate and oxygen saturation" be done during emergence and recovery. One new RCT corroborates the original findings/guidelines that administration of supplemental oxygen during patient transportation or in the recovery room reduces the incidence of hypoxemia, although the experts were equivocal as to whether such oxygen administration should be routine for patients who are not deemed to be at high risk for hypoxemia

Related Content

Law JA, Broemling N, Cooper R, Drolet P, Duggan L, Griesdale D, Hung O, Jones P, Kovacs G, Massey S *et al*: The difficult airway with recommendations for management – Part 1 – Difficult tracheal intubation encountered in an unconscious/induced patient. *Can J Anesth* 2013, 60(11):1089-1118.

Law JA, Broemling N, Cooper R, Drolet P, Duggan L, Griesdale D, Hung O, Jones P, Kovacs G, Massey S *et al*: The difficult airway with recommendations for management – Part 2 – The anticipated difficult airway. *Can J Anesth* 2013, 60(11):1119-1138.

(73) Arenkiel B, Smitt M, Olsen KS: The duration of fibre-optic intubation is increased by cricoid pressure. A randomised double-blind study. *Acta anaesthesiologica Scandinavica* 2013, 57(3):358-363.

This study double-blind, cross-over RCT (N=50) evaluated the effect of cricoid pressure (CP) on the duration of fibre-optic intubation in non-obstetric patients. Three (3) intubations without CP and 13 with CP failed (i.e., were not completed in 180 s). The durations of intubation with/without CP were 59 s (34-144 s) and 75 s (43-179 s), respectively ($P < 0.001$). The study showed that CP prolongs the duration of fibre-optic intubation in patients with Mallampati grades 1-2.

(74) Yoo KY, Kang DH, Jeong H, Jeong CW, Choi YY, Lee J: A dose-response study of remifentanil for attenuation of the hypertensive response to laryngoscopy and tracheal intubation in severely preeclamptic women undergoing caesarean delivery under general anaesthesia. *Int J Obstet Anesth* 2013, 22(1):10-18.

This RCT (N=75 women with severe preeclampsia) assigned severe preeclamptic patients to 1 of 5 remifentanil dose groups (0.25, 0.50, 0.75, 1.0, or 1.25mcg/kg) given before induction of anesthesia with thiopental 5mg/kg and suxamethonium 1.5mg/kg, then measured hypertensive response. ED(50) and ED(95) were 0.6 (95% CI 0.5-0.7) mcg/kg and 1.3 (1.0-2.2) mcg/kg, respectively. Norepinephrine concentrations remained unaltered following intubation but increased significantly at delivery, with no differences between the groups. Apgar scores and umbilical arterial, venous pH and blood gas values were comparable among the groups. The determined ED(95) of remifentanil for attenuating the hypertensive response to tracheal intubation during induction of anesthesia in severely preeclamptic patients undergoing CD under GA was 1.34 mcg/kg.

<u>Postpartum Hemorrhage</u>

(75) Heesen M, Hofmann T, Klohr S, Rossaint R, M VDV, Deprest J, Straube S: Is general anaesthesia for caesarean section associated with postpartum haemorrhage? Systematic review and meta-analysis. *Acta Anaesth Scand* 2013, 57(9):1092-1102.

This meta-analysis of 18 articles (N=12,330 parturients) reviewed the effect of general (GA) vs. neuraxial anesthesia on estimated blood loss and transfusion requirements after CD. Analysis of non-randomized trials found a significantly higher transfusion requirement after GA (RR=5.1 [95% CI 2.5-10.3] P<0.00001) but the heterogeneity of the studies was very high. In the few RCTs, the difference was not statistically significant. As such, these findings are of unclear clinical significance.

Intraoperative Awareness

(76) Mashour GA, Kent C, Picton P, Ramachandran SK, Tremper KK, Turner CR, Shanks A, Avidan MS: Assessment of Intraoperative Awareness with Explicit Recall: A Comparison of 2 Methods. *Anesth Analg* 2013, 116(4):889-891.

This single institution patient cohort study (N=18,836) investigated the whether the modified Brice interview (MBI) was superior to quality assurance (QA) techniques for detecting intraoperative awareness with explicit recall (AWR) under GA. Review of completed MBIs, 28-30 days post-op, revealed a 0.1% incidence of AWR. A review of QA records for the same period revealed a 0.02% incidence of AWR reported on routine post-op for a statistically significant difference. The MBI provided a better detection of AWR (P<0.0001) suggesting that that prior data from QA measures may have underestimated rates due to methodological issues. Although variation in interview timing may have influenced results, previous research suggests that this would not account for the magnitude of difference demonstrated in this study.

TAP Blocks

(77) Singh S, Dhir S, Marmai K, Rehou S, Silva M, Bradbury C: Efficacy of ultrasound-guided transversus abdominis plane blocks for post-cesarean delivery analgesia: a double-blind, dose-comparison, placebo-controlled randomized trial. *Int J Obstet Anesth*2013, 22(3):188-193.

This double-blind, RCT (N=60) investigated the impact of adding either high-dose (HD) ropivacaine (3mg/kg), low-dose (LD) ropivacaine (1.5mg/kg) or no ultrasound-guided TAP block to standard multimodal therapy for CD. Neither HD nor LD TAP blocks as part of a multimodal analgesia regimen which included intrathecal morphine, improved pain scores with movement at 24 hr (primary outcome). The mean pain scores with movement at 6 hr and 12 hr were lower in the HD TAP group vs. the LD and placebo groups (P=0.009) and (P=0.011), respectively (secondary outcomes). There were no differences in pain scores at rest or in breakthrough opioid consumption.

(78) Griffiths JD, Le NV, Grant S, Bjorksten A, Hebbard P, Royse C: Symptomatic local anaesthetic toxicity and plasma ropivacaine concentrations after transversus abdominis plane block for Caesarean section. *Br J Anesth* 2013, 110(6):996-1000.

This interventional study (N=30) assessed total and free serum ropivacaine concentrations in parturients undergoing bilateral TAP blocks (2.5 mg/kg of ropivacaine diluted to 40 ml) and spinal anesthesia for CD. The mean [standard deviation] peak total concentration of ropivacaine occurred at 30 mins post-injection and was 1.8 (0.69) mcg/ml (max= 3.8 mcg/ml, at 10 mins post-injection). Three patients reported symptoms of mild neurotoxicity with elevated mean peak levels. TAP blocks can result in elevated plasma ropivacaine concentrations in patients undergoing CD which may be associated with neurotoxicity.

PREGNANCY: POSTPARTUM

Maternal Morbidity/Mortality

Postpartum Hemorrhage and Hemostasis

Epidemiology/Risk Stratification of Post Partum Hemorrhage

(79) Dilla AJ, Waters JH, Yazer MH: Clinical validation of risk stratification criteria for peripartum hemorrhage. *Obstet Gynecol* 2013, 122(1):120-126.

This retrospective cohort study (N= 10,134) aimed to validate the California Maternal Quality Care Collaborative (CMQCC) risk groups prediction of PPH and the need for peripartum pretransfusion testing. By identifying 5 novel RF for PPH not present in the preexisting CMQCC framework, investigators were able to re-categorize and capture 85% of the women who ultimately had PPH into a modified high- risk group. Women in this high-risk group are particularly suitable for peripartum pretransfusion testing.

(80) Mhyre, JM, Shilkrut A, Kuklina EV, Callaghan WM, Creanga AA, Kaminsky S, Bateman, BT: Massive blood transfusion during hospitalization for delivery in New York State, 1998-2007." *Obstet Gynecol* 2013, 122(6): 1288-1294.

This retrospective state-based review of delivery hospitalizations (N = 690,742) found that massive blood transfusion (MBT) complicated 6 per 10,000 deliveries, with cases observed even in the smallest facilities. RF having the strongest independent associations with MBT included abnormal placentation, placental abruption, severe preeclampsia, and intrauterine fetal demise. The most common etiologies of MBT were abnormal placentation, uterine atony, abruption, and PPH associated with coagulopathy (ranging 27% to 15%). A disproportionate number of women who received a MBT experienced severe morbidity including renal failure, acute respiratory distress syndrome, sepsis, and in-hospital death. In the presence of known RF, women should be duly informed, should ideally deliver in a well-resourced facility and receive appropriate blood product preparation and venous access before delivery.

(81) Kramer MS, Berg C, Abenhaim H, Dahhou M, Rouleau J, Mehrabadi A, Joseph KS: Incidence, risk factors, and temporal trends in severe postpartum hemorrhage. *Amer J Obstet Gynecol* 2013, 209(5):449 e441-447.

In this U.S. population-based retrospective study (N=8,571,209 deliveries), a growing rate of severe PPH from 1.9 to 4.2 per 1,000 deliveries was noted from 1999 to 2008. The increases included atonic and nonatonic PPH, in particular PPH with transfusion but also with hysterectomy. RF were CD, multiple pregnancy, fibroids, and advanced maternal age. Changes related to known RF accounted for only of the 5.6% increase. The contributions of labor augmentation, obesity, or stillbirth timing couldn't be assessed and may play a major role.

Associated Content: Clinical Opinion
Gibbins KJ, Albright CM, Rouse DJ: Postpartum hemorrhage in the developed world: whither misoprostol? *Amer J Obstet Gynecol* 2013, 208(3):181-183.

<u>Prevention/Management of Postpartum Hemorrhage</u>

(82) Tuncalp O, Souza JP, Gulmezoglu M: New WHO recommendations on prevention and treatment of postpartum hemorrhage. *Int J Obstet Gynecol* 2013, 123(3):254-256.

An overview of the most recent WHO guidelines for prevention and treatment of PPH, with an emphasis on key messages and changes aimed at achieving the Millennium Development Goal 5. Strategies include usual prevention and treatment of PPH (oxytocin 10 U IV/IM proceeding to 2nd and 3rd line agents, intrauterine balloon tamponade, uterine artery ligation, and surgical intervention if persistent) and, if needed, temporizing measures (e.g. bimanual uterine compression, external aortic compression, non-pneumatic anti-shock garments).

(83) Kozek-Langenecker SA, Afshari A, Albaladejo P, Santullano CA, De Robertis E, Filipescu DC, Fries D, Gorlinger K, Haas T, Imberger G *et al*: Management of severe perioperative bleeding: Guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol* 2013, 30(6):270-382.

These Guidelines from the European Society of Anesthesiology task force with graded evidence address the management of severe perioperative bleeding, reflecting research updates from 20,664 articles published between 2000-2012. Comprehensive sections are provided on gynecologic and obstetric bleeding which include the role of fibrinogen measurement in predicting PPH, transfusion thresholds, blood product and factor replacement, and the use of adjuncts (e.g. tranexamic acid and cell saver).

Associated Content: Editorial
Butwick AJ: Postpartum hemorrhage and low fibrinogen levels: the past, present and future. *Int J Obstet Anesth* 2013, 22(2):87-91.

(84) Abdel-Aleem H, Alhusaini TK, Abdel-Aleem MA, Menoufy M, Gulmezoglu AM: Effectiveness of tranexamic acid on blood loss in patients undergoing elective cesarean section: randomized clinical trial. *J Matern Fetal Neonatal Med* 2013, 26(17):1705-1709.

In this RCT (N=740, women for elective CD at term), the intervention group (N=373) that received 1 g tranexamic acid (TA) 10 min prior to CD were compared to a control group without TA (N= 367) for measured blood loss during and for two hr after delivery. Mean total blood loss was significantly less in TA vs. control group (241.6 [standard error = 6.8] vs. 510 [7.7]). Mild side effects (e.g. headache, nausea, vomiting) were more common in the TA group; however other complications, medications, and change in vital signs did not differ between groups. This intervention could prove particularly valuable to anemic women or those who refuse blood transfusion in the context of CD. We await the results of the WOMAN trial (an international randomized, double blind, placebo controlled trial [N>11,000] investigating TA for the treatment of PPH) for more definitive elucidation of this topic.

(85) Deneux-Tharaux C, Sentilhes L, Maillard F, Closset E, Vardon D, Lepercq J, Goffinet F: Effect of routine controlled cord traction as part of the active management of the third stage of labour on postpartum haemorrhage: multicentre randomised controlled trial (TRACOR). *Br Med J* 2013, 346:f1541.

This multicenter RCT investigated the impact of controlled cord traction (CCT) (N=2,005) and standard placenta expulsion (SPE) (N=2,008) on PPH outcome. The incidence of PPH and other markers of maternal blood loss did not differ between groups (9.8% vs 10.3% in the CCT vs SPE group, respectively), thus calling into question the appropriateness of routine CCT practice for PPH in high-resource settings. However, in the CCT group, the need for manual removal of the placenta was markedly less (RR = 0.7, 95% CI: 0.5-0.9), and those women also reported less pain/discomfort.

(86) Chen M, Chang Q, Duan T, He J, Zhang L, Liu X: Uterine massage to reduce blood loss after vaginal delivery: a randomized controlled trial. *Obstet Gynecol* 2013, 122(2 Pt 1):290-295.

This multicenter RCT compared whether random allocation of 10 U oxytocin immediately after VD of the baby's shoulder plus 30 mins sustained transabdominal uterine massage after delivery of the placenta (N= 1,170) vs. 10 U of oxytocin alone (N = 1,170) influenced blood loss. No difference was found in the primary outcome of blood loss $\geq$ 400 mL in 2 hrs, nor in any secondary outcomes. This result suggests that the routine practice of uterine massage as a preventative strategy for PPH may be ineffective and unnecessary, depending on available alternatives.

(87) Elagamy A, Abdelaziz A, Ellaithy M: The use of cell salvage in women undergoing cesarean hysterectomy for abnormal placentation. *Int J Obstet Anesth* 2013, 22(4):289-293.

This case series (N= 15) reports no amniotic fluid embolism, hypotension, sepsis or coagulopathy in women who received autologous blood after cell salvage in cesarean hysterectomy for placenta accreta and lends further support to its use.

(88) Rogers WK, Wernimont SA, Kumar GC, Bennett E, Chestnut DH: Acute Hypotension Associated with Intraoperative Cell Salvage Using a Leukocyte Depletion Filter During Management of Obstetric Hemorrhage Due to Amniotic Fluid Embolism. *Anesth Analg* 2013, 117(2):449-452.

This single case presentation describes an experience using of cell salvage in the resuscitation of a patient who had sustained an amniotic fluid embolus (AFE) during CD. Cell salvage with a leukocyte depletion filter was instituted at a time of relative hemodynamic stability, immediately after which the patient became profoundly hypotensive and desaturated. She was ultimately resusitated (rFVIIa was employed). This case raises the question of the safety of cell salvage in the setting of AFE.

Identifying Who's Sick

(89) Saucedo M, Deneux-Tharaux C, Bouvier-Colle MH, French National Experts Committee on *Maternal* Mortality: Ten years of confidential inquiries into maternal deaths in France, 1998-2007. *Obstet Gynecol* 2013, 122(4):752-60.

This retrospective review (French Confidential Enquiry into Maternal Deaths examined maternal deaths; N=660 maternal deaths; 1998-2007). Among maternal deaths identified, there was similar maternal mortality ratios in two 5-year periods: 8.8 per 100,000 live births (95% CI: 7.8-9.8) for 1998-2002 and 8.4/100,000 live births (95% CI 7.6-9.4) for 2003-2007. The distributions of maternal age, nationality, and of cause of death (COD) did not change: hemorrhage was the leading COD (18%), followed by amniotic fluid embolism, thromboembolism, HDP, and cardiovascular conditions (10-12%, each). Anesthesia complications accounted for 0.9 and 1.5 % of deaths during the two time periods. Suboptimal care decreased from 70% in 1998-2002 to 60% in 2003-2007 (P<0.03). Half of all deaths were considered avoidable and this proportion was unchanged. The most frequent contributory factor was inadequate management, calling for improvements in care by all of involved providers.

Associated Content: Editorial
Main EK, Menard MK: Maternal Mortality: Time for National Action. *Obstet Gynecol* 2013, 122(4):735-736

(90) Foo L, Bewley S, Rudd A: Maternal death from stroke: a thirty year national retrospective review. *Eur J Obstet Gynecol Reprod Biol* 2013, 171(2):266-270.

This retrospective study (UK confidential enquiries into maternal death; 1979-2008) investigated maternal mortality from stroke. Of 21,514,457 total maternities, there were 347 maternal stroke deaths (139 cases were “direct”, i.e., pregnancy-related). The incidence of fatal stroke was relatively constant at 1.61 per 100,000 maternities, with a 13.9% (95% CI: 12.6–15.3) mortality rate. Intracranial hemorrhage was the single greatest cause of maternal death from stroke. Sub-standard care involved poor management of dangerously high systolic BP levels. These findings highlight how improved education in managing rapid-onset hypertension and superimposed coagulopathies is paramount.

(91) Wanderer JP, Leffert LR, Mhyre JM, Kuklina EV, Callaghan WM, Bateman BT: Epidemiology of Obstetric-Related ICU Admissions in Maryland: 1999-2008. *Crit Care Med* 2013, 41(8):1844-1852.

This retrospective state-based study (N=2,927 ICU admissions; 1999-2008) examined the epidemiology of pregnancy-related ICU admissions. The rates of ICU utilization were 162.5, 202.6, and 54.0 per 100,000 deliveries for the antepartum, delivery, and postpartum periods, respectively. The leading diagnoses associated with ICU admission were HDP (29.9%), hemorrhage (18.8%), cardiomyopathy/other cardiac disease (18.3%), genitourinary infection (11.5%), complications from ectopic pregnancies and abortions (10.3%), non-genitourinary infection (10.1%), sepsis (7.1%), cerebrovascular disease (5.8%), and pulmonary embolism (3.7%). Assessment of changes over time found rising rates of sepsis (10.1 per 100,000 deliveries to 16.6 per 100,000 deliveries, p = 0.003) and trauma (9.2 per 100,000 deliveries to 13.6 per 100,000 deliveries, p = 0.026) with decreasing rates of anesthetic complications (11.3 per 100,000 to 4.7 per 100,000, p = 0.006). The overall frequency of obstetric-related ICU admission and the rates for other indications remained relatively stable.

(92) Bauer ME, Bateman BT, Bauer ST, Shanks AM, Mhyre JM: Maternal sepsis mortality and morbidity during hospitalization for delivery: temporal trends and independent associations for severe sepsis. *Anesth Analg* 2013, 117(4):944-950.

This retrospective population-based study (National Inpatient Sample; N=44,999,260 delivery hospitalizations; 1998 -2008) investigated peripartum sepsis. Sepsis complicated 1 per 3,333 (95% CI= 1:3,151-1:3,540) deliveries, severe sepsis (i.e. sepsis with acute organ dysfunction, hypotension, or hypoperfusion) complicated 1 in 10,823 (1:10,000-1:11,792) deliveries, and sepsis-related death complicated 1 in 105,263 (1:83,333-1:131,579) deliveries. While the overall frequency of sepsis was stable (P = 0.95), the risk of severe sepsis and sepsis-related death increased during the study period. Independent associations for severe sepsis, (with aOR and lower bound 95% CI > 3) include congestive heart failure, chronic liver disease, chronic renal disease, systemic lupus erythematous, and rescue cerclage placement. Since severe sepsis often occurs in the absence of recognized RF, we must develop systems of care that increase early disease detection as well as early treatment in patients with associated conditions and warning signs for sepsis.

(93) Lipman SS, Wong JY, Arafeh J, Cohen SE, Carvalho B: Transport decreases the quality of cardiopulmonary resuscitation during simulated maternal cardiac arrest. *Anesth Analg* 2013, 116(1):162-167.

This simulation study (26 teams, 2 providers) investigated whether the quality of CPR for maternal cardiac arrest suffered during transport to the operating room (OR). The median (IQR) % of correctly rendered compressions in the multidisciplinary OR "transfer group" was 32% (10%-63%) vs. 93% (58%-100%) in the labor room "stationary" group, (P = 0.002). Interruptions in CPR were observed in 92% of transport and 7% of stationary drills (P < 0.001). Median (IQR) tidal volume was 270 (166-430) mL in the transport group and 390 (232-513) mL in the stationary group (P = 0.03). These data suggest that transport negatively affects the quality of resuscitation and strengthen recommendations that perimortem CD should be performed at the site of maternal cardiac arrest.

(94) American College of Obstetrics and Gynecology: Practice Bulletin No. 138: Inherited Thrombophilias in Pregnancy. *Obstet Gynecol* 2013, 122(3): 706-716.

This document provided a review on common thrombophilias and their association with maternal venous thromboembolism risk, and accompanying guidelines for screening and managing these conditions across the pregnancy continuum. Highlights include detection methods for Factor V Leiden and Prothombin G20210A mutations as well as protein C and antithrombin deficiencies; suggested prophylaxis for high risk women including compression boots/stockings and substitution to unfractionated heparin at 36 weeks to permit neuraxial anesthesia; and recommendations for continued therapy and monitoring 6 weeks postpartum.

Anesthetic Complications/Side Effects

Respiratory Depression

(95) Crowgey TR, Dominguez JE, Peterson-Layne C, Allen TK, Muir HA, Habib AS: A retrospective assessment of the incidence of respiratory depression after neuraxial morphine administration for postcesarean delivery analgesia. *Anesth Analg* 2013, 117(6):1368-1370.

This single-center retrospective study (N= 5,036; mean BMI = 34) investigated respiratory depression events after neuraxial morphine administration for women undergoing CD. Most patients received either morphine 3 mg (epidural) or 1.5 mg (intrathecal). Patients also received non-steroidal anti-inflammatory drugs and Percocet (1-2 tablets) every 3-4 hr, as needed, for break-through pain. The majority of patients were obese. There were no instances of respiratory depression requiring naloxone administration or rapid response team involvement within 48 hr. Minor hypoventilation or desaturations were not measured. The upper 95% confidence limit for respiratory depression in this study was 0.07% (1 event per 1429 cases).

Local Anesthetic Toxicity

(96) Kuo I, Akpa BS: Validity of the lipid sink as a mechanism for the reversal of local anesthetic systemic toxicity: a physiologically based pharmacokinetic model study. *Anesthesiology* 2013, 118(6):1350-1361.

The authors generated a physiologically-based, pharmacokinetic model to quantitatively probe the merits of a lipid "sink" mechanism, exploring the binding action of plasma lipid. Lipid infusion after a simulated IV overdose was predicted to cause an increase in total plasma concentration, a decrease in unbound concentration, and a decrease in tissue content of bupivacaine. The model was validated in healthy human volunteers with nontoxic doses and then extended to the simulated conditions. Results suggest that the timescale on which tissue content is reduced varies among organs doesn't fully match the effects observed in practice. This preliminary study suggests that the lipid "sink" is insufficient to fully explain reversal of systemic toxicity. Other mechanisms may include a positive inotropic and/or metabolic effect of the lipid.

Epidural Hematomas

(97) Bateman BT, Mhyre JM, Ehrenfeld J, Kheterpal S, Abbey KR, Argalious M, Berman MF, Jacques PS, Levy W, Loeb RG *et al*: The risk and outcomes of epidural hematomas after perioperative and obstetric epidural catheterization: A report from the multicenter perioperative outcomes group research consortium. *Anesth Analg* 2013, 116(6):1380-1385

This multicenter retrospective observational study (Multicenter Perioperative Outcomes Group Consortium; N = 62,450) evaluated risks and outcomes for epidural hematomas in patients undergoing perioperative epidural catheterizations for OB or surgical indications. Seven (7) patients developed hematomas requiring surgical evacuation (event rate = $11.1x10^{-5}$ [95% CI: 4.5 $x10^{-5}$ to $23.1x10^{-5}$]); none were OB patients (upper 95% CI: 4.6 $x10^{-5}$ P = 0.003). This corresponds to a rate of neurological injury of 1 per 12,000 epidural catheterizations. Of note, 4/7 cases had anticoagulation/antiplatelet therapy deviating from American Society of Regional Anesthesia guidelines on safety for neuraxial anesthesia. Data are lacking on hematomas managed non-operatively or from failed/aborted epidural placement. Findings supports that epidural hematoma is a rare but serious complication, especially in the OB population, and is often associated with inappropriate perioperative anticoagulant management or high risk patients.

Associated Content: Editorial
Horlocker T, Kopp S: Epidural Hematoma After Epidural Blockade in the United States: It's Not Just Low Molecular Heparin Following Orthopedic Surgery Anymore. *Anesth Analg* 2013, 116(6):1195-1197

(98) Pumberger M, Memtsoudis SG, Stundner O, Herzog R, Boettner F, Gausden E, Hughes AP: An Analysis of the Safety of Epidural and Spinal Neuraxial Anesthesia in More Than 100,000 Consecutive Major Lower Extremity Joint Replacements. *Reg Anesth Pain Med* 2013, 38(6):515-519.

This retrospective study (N=100,027; 2000-10) analyzed the frequency of spinal/epidural hematomas in patients undergoing orthopedic joint arthroplasty under neuraxial anesthesia. Ninety-seven patients underwent imaging studies to evaluate perioperative neurologic deficits (1.0 per 1,000 [95% CI 0.8–1.2 per 1,000]). Eight patients were identified with findings of an epidural blood or gas collection (0.1 per 1,000 [0.02–0.1per 1,000]). No patients receiving only spinal anesthesia were affected. All patients diagnosed with hematoma took at least 1 anticoagulant. No patient incurred persistent nerve damage. The incidence of epidural/spinal complications found in this consecutive case series is relatively low but higher than previously reported in the non-OB population.

Post Dural Puncture Headache

(99) Heesen M, Klohr S, Rossaint R, Walters M, Straube S, van de Velde M: Insertion of an intrathecal catheter following accidental dural puncture: a meta-analysis. *Int J Obstet Anesth* 2013, 22(1):26-30.

This systematic literature search and meta-analysis (9 reports) pursued the efficacy of intrathecal catheter insertion after accidental dural puncture to prevent PDPH. Intrathecal catheter insertion reduced the risk for an epidural blood patch (RR=0.6 [95% CI 0.5-0.8], P=0.001), but not for developing a PDPH (P=0.06). However, there was high heterogeneity in the studies for the PDPH subgroup, and moderate heterogeneity for EBP subgroup. Additional benefits of intrathecal catheter insertion after accidental dural puncture include potentially avoiding a repeat dural puncture, rapid onset of action and use for anesthesia.

(100) Bradbury CL, Singh SI, Badder SR, Wakely LJ, Jones PM: Prevention of post-dural puncture headache in parturients: a systematic review and meta-analysis. *Acta Anaesth Scand* 2013, 57(4):417-430.

This systematic review and meta-analysis (40 RCTs; N = 11,536 CSE) evaluated 5 methods of reducing PDPH: prophylactic epidural blood patch (4 trials, median quality score = 2, risk difference (RD)= -0.5 [95% CI: -0.9 to -0.09]), lateral positioning of the epidural needle bevel upon insertion (1 trial, quality score = 1), Special Sprotte needles (1 trial, quality score = 5, RD = -0.44 [-0.67 to -0.21]), epidural morphine (1 trial, quality score = 4, RD = -0.36 [-0.59 to -0.13]), and cosyntropin [1 trial, quality score

= 5, RD = -0.36 [-0.55 to -0.16]). Special Sprotte needles, epidural morphine, and cosyntropin are thus far each supported by a single, good quality trial. Prophylactic blood patches are supported by 3 trials, but with flawed methodology. Most trials were of limited quality, and additional well-conducted, larger trials are needed.

(101) Basurto Ona X, Uriona Tuma SM, Martinez Garcia L, Sola I, Bonfill Cosp X: Drug therapy for preventing post-dural puncture headache. *Cochrane Db Syst Rev* 2013, 2:CD001792.

This Cochrane review with intention-to-treat analysis (10 trials; N=1,611; 72% parturients) addressed the efficacy and safety of drugs for preventing PDPH in adults and children. Meta-analysis was not performed because of the heterogeneity of the studies. Epidural morphine and IV cosyntropin (1 gm) showed some effectiveness for preventing PDPH, especially in patients at high risk (i.e. OB patients with inadvertent dural puncture) compared to placebo. IV Aminophylline also reduced PDPH severity after a lumbar puncture vs. placebo when compared in patients undergoing elective CD. Neuraxial morphine increased the number of participants affected by side effects (e.g., pruritus, nausea, vomiting). IV Dexamethasone increased the risk of PDPH after spinal anesthesia for CD and oral caffeine increased insomnia. These conclusions should be interpreted carefully given the small sample sizes and the inability to correct for risk of bias.

Nausea/Vomiting

(102) Du BX, Song ZM, Wang K, Zhang H, Xu FY, Zou Z, Shi XY: Butorphanol prevents morphine-induced pruritus without increasing pain and other side effects: a systematic review of randomized controlled trials. *Can J Anaesth* 2013, 60(9):907-917.

This systematic review (16 RCT; N=795 patients) investigated the efficacy of butorphanol for preventing neuraxial morphine-induced pruritus. IV (infusion) and epidural butorphanol reduced pruritus with RR=0.2 (95% CI 0.1-0.4) and RR=0.2 (0.2-0.4), respectively. Epidural butorphanol decreased the number of patients requesting rescue treatment for pruritus (RR=0.6 [0.4 to 0.8]) (low heterogeneity) and reduced postoperative nausea and vomiting (RR=0.4 [0.2 to 0.7]) (moderate heterogeneity). Butorphanol also decreased postoperative pain intensity without increasing respiratory depression, somnolence, or dizziness.

(103) Habib AS, George RB, McKeen DM, William D, Ituk US, Megalla SA, Allen TK: Antiemetics Added to Phenylephrine Infusion During Cesarean Delivery: A Randomized Controlled Trial. *Obstet Gynecol* 2013, 121(3):615-623.

This multicenter RCT (N=300) investigated whether the addition of metoclopramide (given before spinal placement) or its combination with ondansetron (given after cord clamping) to a prophylactic phenylephrine infusion provides improved intraoperative nausea and vomiting (IONV) prophylaxis during CD. Intra-operative nausea and vomiting (IONV) occurred in 49%, 31%, and 23% of patients in the placebo, metoclopramide, and combination groups, respectively (P =0.001). Postop nausea and vomiting were reduced in the combination (vs. placebo) at 2 hrs (39% vs. 20%; p<0.017) but not thereafter. Notably, surgical factors (e.g., exteriorization of the uterus, surgical duration) contributed to a significant difference in IONV between the 2 centers but the results were still significant.

Postoperative Pain

Predictive Tools

(104) Pan PH, Tonidandel AM, Aschenbrenner CA, Houle TT, Harris LC, Eisenach JC: Predicting acute pain after cesarean delivery using three simple questions. *Anesthesiology* 2013, 118(5): 1170-1179.

This study presented the development (N=200 women) and validation (N=151) of a predictive model of acute post-CD pain after spinal anesthetic for CD based a simple 3-item preoperative questionnaire documenting: 1) anticipated anxiety? (scale: 0-100), 2) anticipated pain? (scale: 0-100), and 3) anticipated pain medicine need? (scale: 0-5). Responses from these questions correlated moderately with 24 hr evoked pain intensity (r = 0.2-0.3, P < 0.001). Rating of intensity of audio tones contributed uniquely, but only minimally, and therefore was not included in the model. As constructed, the sensitivity and specificity for

identifying patients in the top 20% for activity associated pain were both 0.69. Given the large variability in pain with activity after CD and the tendency to use a standard postoperative pain regimen for all patients, having a simple, predictive tool may be clinically meaningful.

Associated Content: Editorial
Flood P, Wong CA: Chronic pain secondary to childbirth: Does it exist? *Anesthesiology* 2013; 118:16–8.

(105) Carvalho B, Zheng M, Aiono-Le Tagaloa L: Evaluation of experimental pain tests to predict labour pain and epidural analgesic consumption. *Br J Anaesth* 2013, 110(4):600-606.

This prospective, case-controlled study (N=50) determined whether experimental pain tests (EPTs) using heat, pressure, and IV cannulation (pre-induction of labor) reliably predicted epidural analgesic use and pain intensity during labor. Heat tolerance was significantly correlated with worst labor pain (r=0.3, P=0.025) and pain with IV cannulation was correlated with time to epidural request (r=0.33, P=0.025). Multiple linear regression analysis found that labor pain could be predicted with suprathreshold heat VAS, heat and pressure tolerance. Pre-labor EPTs were not reliable at predicting the labor pain experience, but pain rating during IV cannulation showed some utility as an EPT.

Related Content: Editorial
Carvalho B, Cohen SE: Measuring the labor pain experience: delivery still far off. *Int J Obstet Anesth* 2013, 22(1):6-9.

Biological Profiles

(106) Landau R, Liu SK, Blouin JL, Carvalho B: The Effect of OPRM1 and COMT Genotypes on the Analgesic Response to Intravenous Fentanyl Labor Analgesia. *Anesthesia and analgesia* 2013, 116(2):386-391.

This study (N=106) investigated whether Asn/Asn-Met/Met combination alters the analgesic response to IV Fentanyl compared to other combinations of these 2 genetic polymorphisms. The combined effect of the single-nucleotide polymorphisms rs1799971 (c.118A/G, p. 40Asn/Asp) of the micro-opioid receptor gene (OPRM1) and rs4680 (c.472G/A, p.158Val/Met) of the catechol-O-methyltransferase (COMT) gene are known from previous work to influence pain perception and opioid response in carriers. IV analgesic success was 6% in women with the combination Asn/Asn-Met/Met (n = 17) vs. 20% in all other women combined. Met/Met158 (n = 31) versus Met/Val or Val/Val of COMT was associated with a smaller decrease in Numerical Verbal Pain Scale (24 $\pm$ 18 vs. 37 $\pm$23; P = 0.005). Unfortunately, this study was underpowered to draw clear conclusions on the influence of OPRM1 and COMT genotypes on labor analgesia with IV fentanyl.

Chronic Pain

(107) Liu TT, Raju A, Boesel T, Cyna AM, Tan SG: Chronic pain after caesarean delivery: an Australian cohort. *Anaesth Inten Care* 2013, 41(4):496-500.

This prospective study (N=426) investigated the incidence of and RF for persistent pain after CD. The incidence of persistent abdominal wound pain at 2 months was 14.6% and decreased to 4.2% at 12 months. Whereas at 2 months, pain was constant or daily in 7.8% of patients, by 12 months, only 1.1% had constant or daily mild pain. There was no apparent increased incidence of persistent pain associated with type of anesthesia, emergency vs. elective procedure, higher acute pain scores, or history of previous CD. By 12 months, <1% of women had pain requiring analgesia or disrupting mood/sleep.

Related Content:
Landau R, Bollag L, Ortner C: Chronic pain after childbirth. *Int J Obstet Anesth* 2013, 22(2):133-145.

(108) Eisenach JC, Pan P, Smiley RM, Lavand'homme P, Landau R, Houle TT: Resolution of pain after childbirth. *Anesthesiology* 2013, 118(1):143-151.

This study (N=1,223, both CD and VD patients) investigated predictors of pain 2 months after CD, and the incidence of pain at 6 and 12 months. As documented by telephone interview, pain that began at delivery was present in 9.8% of participants in 2 months, but was rare 6 and 12 months later: 1.8% and 0.3% [upper 95% CI, 1.2%], respectively. Of note, the 3 patients with pain 12 months after delivery had all experienced VD and had an Edinburgh postpartum depression index consistent with depression. Past history of pain and degree of tissue damage at delivery accounted for 7.0% and 16.7%, respectively, of the variability in acute post-delivery pain and were not associated with incidence of pain 2 months later. Women appear to have a low incidence of new pain that begins at delivery that is still present 12 months later, despite the substantial degree of tissue trauma.

(109) Gutierrez S, Liu B, Hayashida K, Houle TT, Eisenach JC: Reversal of peripheral nerve injury-induced hypersensitivity in the postpartum period: role of spinal oxytocin. *Anesthesiology* 2013, 118(1):152-159.

This animal model (N=168 rats) explored pregnancy's effect on chronic pain by testing hindpaw hypersensitivity to mechanical stimuli induced by peripheral nerve injury after intrathecal oxytocin, atosiban, and naloxone administration during mid-pregnancy and 1 day postpartum. Pregnancy did not alleviate experimentally induced hypersensitivity but delivery and postpartum association with pups were shown to confer less hypersensitivity to painful stimuli. Separation of the pups from the mother on the first postpartum day interfered with this decrease in hypersensitivity. Reversal of this protective effect was achieved by intrathecal injection of an oxytocin receptor antagonist (atosiban) but not nalaxone. Supraspinal oxytocin increase after delivery may be at least partially responsible for prevention of chronic postpartum pain.

Associated Content: Editorial
Flood P, Wong CA: Chronic pain secondary to childbirth: Does it exist? *Anesthesiology* 2013; 118:16–8.

Other

(110) Chooi CS, White AM, Tan SG, Dowling K, Cyna AM: Pain vs comfort scores after Caesarean section: A randomized trial. *Br J Anaesth* 2013, 110(5):780-787.

This RCT (N=300 women) investigated whether language used by hospital staff influences the patient's pain experience after CD. The median (IQR) pain scores were higher than comfort scores at rest (p=0.001) and movement (p=0.001). The Group "P" women (where "0" was "no pain" and "10" was "worst pain imaginable") were more likely to be bothered by their CD, had greater 'Bother' scores (4 vs. 1, P<0.001), and perceived post-op sensations as 'unpleasant' (RR= 3.1, 95% CI 2.2-4.2, p<0.001) and a product of tissue damage rather than of healing and recovery (RR 2.0, 95% CI 1.3-3.2, p=0.001) compared with the Group "C" ("0" was least comfortable and "10" was most comfortable). These findings suggest that asking about pain and pain scores after CD adversely affects patient reports of their post-op experience, and staff and patients may benefit from using more positive language.

(111) Macintyre PE, Russell RA, Usher KA, Gaughwin M, Huxtable CA: Pain relief and opioid requirements in the first 24 hours after surgery in patients taking buprenorphine and methadone opioid substitution therapy. *Anaesth Inten Care* 2013, 41(2):222-230.

This retrospective cohort study (N=51) investigated pain relief and opioid requirements in the first 24 hrs post-operatively, in buprenorphine opioid substitution therapy (BOST) and methadone opioid substitution therapy (MOST) patients prescribed patient-controlled analgesia (PCA). There were no significant differences in pain scores, treatment-requiring nausea or vomiting, or sedation between patient groups or within groups whether they had or had not received BOST or MOST on the day after surgery. There were also no significant differences in PCA requirements between patient groups overall, or between MOST patients with or without postoperative therapy. However, BOST patients without BOST therapy the day after surgery (and in most cases, the day of surgery) used more PCA opioid than these patients with their BOST therapy (P=0.02) which

suggests that buprenorphine should be continued perioperatively.

FETAL COMPLICATIONS/OUTCOMES

Timing of Delivery

Guidelines

(112) American College of Obstetrics and Gynecology: Committee opinion no 579: definition of term pregnancy. *Obstet Gynecol* 2013, 122(5): 1139-1140.

In recognition that neonatal outcomes vary during the broad interval (37-42 weeks) that was once considered to be "term", this ACOG Consensus statement designates new nomenclature: "Early Term" (37 0/7 – 38 6/7 weeks); "Full Term" (39 0/7 – 40 6/7 weeks); "Late Term" (41 0/7 – 41 6/7 weeks); and "Postterm" (42 0/7 weeks – beyond).

(113) American College of Obstetrics and Gynecology: Committee opinion no. 561: Nonmedically indicated early-term deliveries. *Obstet Gynecol* 2013, 121(4): 911-915.

The ACOG Committee on Obstetric Practice and Society for Maternal-Fetal Medicine cites evidence to support the recommendation that nonmedically indicated early term delivery (<39 weeks) is not appropriate.

Fetal Outcomes

(114) Chiossi G, Lai Y, Landon MB, Spong CY, Rouse DJ, Varner MW, Caritis SN, Sorokin Y, O'Sullivan M J, Sibai BM *et al*: Timing of delivery and adverse outcomes in term singleton repeat cesarean deliveries. *Obstet Gynecol* 2013, 121(3):561-569.

This multicenter prospective study (N=23,794) examined composite maternal (pulmonary edema, cesarean hysterectomy, pelvic abscess, thromboembolism, pneumonia, transfusion, or death) and neonatal risk (respiratory distress, transient tachypnea, necrotizing enterocolitis, sepsis, ventilation, seizure, hypoxic-ischemic encephalopathy, NICU admission, 5-min Apgar of $\leq$ 3, or death) of elective repeat CD at different gestational ages. Elective delivery at 37 weeks of gestation had significantly higher risks of adverse maternal outcome (OR = 1.6 [95% CI: 1.1 -2.3]), whereas elective delivery at 39 weeks of gestation was associated with better maternal outcome vs. pregnancy continuation (OR = 0.5 [0.4 -0.7]). Elective repeat CD at 37 and 38 weeks of gestation had significantly higher risks of adverse neonatal outcome (37 weeks OR = 2.0 [1.7-2.4]; 38 weeks OR = 1.4,[1.2-1.5]), whereas delivery at 39 and 40 weeks of gestation presented better neonatal outcome as opposed to pregnancy continuation (39 weeks OR = 0.8 [0.7-0.9]; 40 weeks OR = 0.6 [0.4-0.8]). Thirty nine (39) weeks gestation is the optimal time for repeat CD for both mother and neonate, unless otherwise indicated.

(115) Serenius F, Kallen K, Blennow M, Ewald U, Fellman V, Holmstrom G, Lindberg E, Lundqvist P, Marsal K, Norman M *et al*: Neurodevelopmental outcome in extremely preterm infants at 2.5 years after active perinatal care in Sweden. *JAMA* 2013, 309(17):1810-1820.

This population-based prospective cohort (N=1157) evaluated the neurodevelopmental outcome of consecutive extremely preterm (EPT) infants born <27 weeks of gestation compared to matched full term controls. Overall, 42% (99% CI, 36%-48%) of EPT children had no disability, 31% (99% CI, 25%-36%) had mild disability, 16% (99% CI, 12%-21%) had moderate disability, and 11% (99% CI, 7.2%-15%) had severe disability. Moderate or severe overall disability decreased with gestational age at birth (22 weeks, 60%; 23 weeks, 51%; 24 weeks, 34%; 25 weeks, 27%; and 26 weeks, 17%; P for trend < 0.001). Thus, of children born EPT and receiving active perinatal care, 73% had mild or no disability and neurodevelopmental outcome improved with each week of gestational age. These results are relevant for clinicians counseling families facing EPT birth.

(116) Stenson BJ, Tarnow-Mordi WO, Darlow BA, Simes J, Juszczak E, Askie L, Battin M (BOOST Study) *et al*: Oxygen saturation and outcomes in preterm infants. *N Engl J Med* 2013, 368(22):2094-2104.

These 3 international RCTs (N= 2,448) evaluated the effect of targeting an O_2 saturation of 85-89% vs. 91-95% on disability-free survival at 2 yrs in infants born <28 weeks' gestation. There was a change in oximeter-calibration algorithm mid-study which resulted in heterogeneity for the mortality outcome. The rate of death was significantly higher in the lower-target group (LTG) than in the higher-target group (HTG) (23.1% vs. 15.9%; RR in LTG = 1.5; 95% CI: 1.2- 1.8; P=0.002). Recruitment was stopped early when interim analysis showed increase rate of death in the LTG group. In the larger sample, infants with LTG had significantly reduced rates of retinopathy of prematurity and increased rates of necrotizing enterocolitis. There were no significant between-group differences in other outcomes or adverse events.

Perinatal Exposures

Anesthetics

(117) Bong CL, Allen JC, Kim JTS: The Effects of Exposure to General Anesthesia in Infancy on Academic Performance at Age 12. *Anesth Analg* 2013, 117(6):1419-1428

In this pilot observational cohort study (N=100 subjects), researchers sought to determine whether children exposed to general anesthesia for minor surgery during infancy exhibited differences in academic achievement at age 12 years as evidenced by lower aggregate scores in the Singapore standardized Primary School Leaving Examination (PSLE) and formally diagnosed learning disability (LD) vs. unexposed children (N=106). There was no difference in mean PSLE scores between groups. The presence of formally diagnosed LD was 15% and 3.7% in the exposed vs. unexposed groups (P< 0.001). The OR for LD diagnosis if exposed to GA vs. controls = 4.5 (95% CI: 1.4–14.1)). The study's validity was challenged in the accompanying editorial due to the lack of rigor in the definition and verification of learning disabilities, gender differences between cases and controls, small sample sizes, and bias in parental recall.

Associated Content: Editorial
Crosby G and Davis PJ: General Anesthesia in Infancy Is Associated with Learning Disabilities—or Not. *Anesth Analg* 2013, 117(6): 1270-1272.

(118) Yonamine R, Satoh Y, Kodama M, Araki Y, Kazama T: Coadministration of Hydrogen Gas as Part of the Carrier Gas Mixture Suppresses Neuronal Apoptosis and Subsequent Behavioral Deficits Caused by Neonatal Exposure to Sevoflurane in Mice. *Anesthesiology* 2013, 118(1):105-113.

This mouse model assessed whether hydrogen gas attenuates neuronal apoptosis in response to sevoflurane exposure. Western blot analysis (N=3-6 per group) showed that hydrogen gas significantly reduced the level of neuronal apoptosis with neonatal exposure to 3% sevoflurane coadministered with 1.3% hydrogen gas to approximately 40% ($P < 0.001$), and immunohistochemical analysis (N= 8-10) showed that hydrogen reduced oxidative stress induced by neonatal sevoflurane exposure. Behavioral deficits were not apparent in mice co-administered hydrogen. There may potentially be a protective effect of hydrogen mixed in with the carrier gas for general anesthesia exposure in neonates.

(119) Dalal PG and Berlin C: Safety of the breast-feeding infant after maternal anesthesia. *Ped Anesth* 2013, Advanced publish online; doi: 10.1111/pan.12376.

This review addresses the available literature on the safety of breast feeding during the perioperative period in light of the American Academy of Pediatrics recommendations promoting increased breast feeding among mothers. It reiterates the recommendation to use regional anesthesia and short-acting agents when feasible, and to minimize agents with active metabolites. The conclusion is that although most drugs can transfer into the breast milk, the quantities are clinically insignificant and pose minimal risk to the full term, healthy infant.

Other Maternal Medications

(120) Orbach H, Matok I, Gorodischer R, Sheiner E, Daniel S, Wiznitzer A, Koren G, Levy A: Hypertension and antihypertensive drugs in pregnancy and perinatal outcomes. *Am J Obstet Gynecol* 2013, 208(4):301 e301-306.

This population based retrospective cohort study (N=100,029 deliveries, 1,964 pregnant women with chronic HTN and 620 neonates exposed to at least one antihypertensive) studied the fetal effects of *in utero* exposure to therapy (methyldopa or atenolol). Neonates exposed in the 3rd trimester had 2-4 times higher rates of IUGR, small for gestational age, and PTD. The findings were similar when comparing women with chronic HTN who were not treated during pregnancy vs. those with no chronic HTN and no medication exposure. However, chronic HTN with or without treatment is an independent RF for adverse perinatal outcomes and therefore represents an example of confounding by indication.

Associated Content: Discussion Article
Macones GA, Odibo A, Cahill A: Discussion: 'Hypertension and antihypertensives in pregnancy,' by Orbach et al. *Am J Obstet Gynecol* 2013, 208(4):e1-2.

(121) Stephansson O, Kieler H, Haglund B, Artama M, Engeland A, Furu K, Gissler M, Norgaard M, Nielsen RB, Zoega H *et al*: Selective serotonin reuptake inhibitors during pregnancy and risk of stillbirth and infant mortality. *JAMA* 2013, 309(1):48-54

This population-based cohort study from all Nordic countries (N=1,633,877; 1996-2007) explored the association between maternal SSRI use and risk of stillbirth and infant mortality. The risk of stillbirth and post-neonatal death were higher for the exposed group in the initial model; however all associations lost statistical significance in the multivariable models controlling for maternal characteristics and prior psychiatric hospitalizations. Thus, women exposed to an SSRI do not appear to be at higher risk for stillbirth, neonatal mortality, or post-neonatal mortality.

(122) Pasternak B, Svanstrom H, Hviid A: Ondansetron in pregnancy and risk of adverse fetal outcomes. *N Engl J Med* 2013, 368(9):814-823.

Using a historical cohort (N= 608,385 pregnancies) in Denmark, investigators compared the risk of adverse fetal outcome with women given ondansetron during pregnancy vs. those who were not (1:4 ratio), while accounting for nausea severity and use of other antiemetics. Findings show that ondansetron exposure was not associated with a significantly increased risk of spontaneous abortion, stillbirth, any major birth defect, PTD, delivery of a low-birth-weight infant or small-for-gestational age infant, and therefore should be considered safe during pregnancy regarding severe fetal outcomes.

(123) Yazdy, Mahsa M., et al: Periconceptional Use of Opioids and the Risk of Neural Tube Defects. *Obstet Gynecol* 2013, 122(4): 838-844.

This case-control study (Slone Epidemiology Center Birth Defects Study data; 1998-2010) investigated the relationship between periconceptional use of opioids and neural tube defects. Data was gathered from interviews of mothers with babies born with relevant defects. A higher percentage (3.9%, N=305) of mothers of babies with neural tube defects reported using an opioid medication than those in the non-malformed control group (1.6%, N=7,125) and those in the malformed control group (2.0%, N=13,405) with OR = 2.2 (95% CI 1.2-4.2) and 1.9 (1.0-3.4), respectively. However, there are concerns of recall bias which are addressed in this study.

Effect of Delivery Mode

(124) Barrett JFR, Hannah ME, Hutton EK, Willan AR, Allen AC, Armson BA, Gafni A, Joseph KS, Mason D, Ohlsson A *et al*: A Randomized Trial of Planned Cesarean or Vaginal Delivery for Twin Pregnancy. *N Engl J Med* 2013, 369(14):1295-1305.

This multicenter, international RCT (N=2,804 women) considered perinatal outcomes in planned VD vs. CD for twins (32 weeks 0 days-38 weeks 6 days). Rate of CD was 90.7% in planned CD group and 43.8% in planned VD group There was no significant difference in the primary outcome of composite fetal/neonatal death or serious neonatal morbidity between groups (2.2 vs. 1.9%, OR=1.16 for CD; 95%CI 0.7-1.7). This research expands the evidence that planned CD may not increase or decrease the risk of fetal/neonatal death or serious morbidity; however there was a high rate of CD in the planned VD group. There may be varying degrees of obstetric provider comfort with delivering second twins vaginally that have non-cephalic presentations.

(125) Werner EF, Han CS, Savitz DA, Goldshore M, Lipkind HS: Health outcomes for vaginal compared with cesarean delivery of appropriately grown preterm neonates. *Obstet Gynecol* 2013, 121(6):5.

This retrospective cohort study (N=20,231) compared the outcomes for preterm, appropriate for gestational age weight neonates and adverse neonatal outcome by mode of delivery. Of singleton, live-born, cephalic neonates, 69.3% had VD and 30.7% were delivered by CD. CD compared with VD delivery was associated with increased odds of respiratory distress (39.2% vs. 25.6%, OR = 1.7 [95% CI: 1.6-1.9]) and 5-min Apgar score < 7 (10.7% vs. 5.8%, OR = 2.0 [1.8 -2.4]). In this preterm cohort, CD was not protective against poor outcomes but rather increased risk of respiratory distress and low Apgar score compared with VD.

(126) Walsh CA, Robson M, McAuliffe FM: Mode of delivery at term and adverse neonatal outcomes. *Obstet Gynecol* 2013, 121(1):122-128.

This 10-year single center retrospective study (N=64,555) in term neonates reaching the 2ndstage of labor assessed the rate of peripartum death, neonatal encephalopahy, intracranial hemorrhage by delivery mode. Compared with neonates delivered by 2nd stage CD, there were no differences in the rates of peripartum neonatal death or neonatal encephalopathy after operative VD. No significant differences in adverse neonatal outcomes were demonstrated between vacuum-assisted and forceps-assisted deliveries, although sub-analysis is limited by the small numbers of serious adverse outcomes. The absolute risk of neonatal death secondary to intracranial hemorrhage is 3 to 4 per 10,000 operative VD for both instruments.

Fetal Heart Monitoring

(127) Alfirevic Z, Devane D, Gyte GM: Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour.[Update of Cochrane Database Syst Rev. 2006;(3):CD006066; PMID: 16856111]. *Cochrane Db Syst Rev* 2013, 5:CD006066.

This Cochrane meta-analysis (13 RCTs; N= 37,000 women) compares the efficacy of continuous cardiotocography (CTG) with and without fetal blood sampling with no fetal monitoring, intermittent auscultation, or intermittent cardiotocography. Only 2 trials were judged to be of high quality. Compared with intermittent auscultation, CTG showed no significant improvement in overall perinatal death rate or CP, but was associated with fewer neonatal seizures (RR=0.5 [95% CI: 0.3 to 0.8], N = 32,386; 9 trials). There was a significant increase in CD associated with CTG (RR=1.6 [1.3 to 2.1], N = 18,861; 11 trials and instrumented VD (RR=1.2 [1.0 to 1.3], N = 18,615; 10 trials). Access to fetal blood sampling did not appear to influence the difference in neonatal seizures nor any other pre-specified outcome.

(128) Clark SL, Nageotte MP, Garite TJ, Freeman RK, Miller DA, Ricesimpson K, Belfort MA, Dildy GA, Parer JT, Berkowitz RL *et al*: Intrapartum management of category II fetal heart rate tracings- Towards standardization of care. *Am J Obstet Gynecol* 2013, 209(2):89-97.

These authors propose an algorithm for the management of category II fetal heart rate patterns synthesized from the available evidence and current scientific thought. They highlight the timeliness of anticipated delivery, re-evaluation every 30 min, and re-application of algorithm if FHR parameters change significantly. Use of this algorithm may help clinician to comply with this standard of care, and may enhance the ability to further assess the implications of intrapartum fetal heart rate monitoring in research and clinical practice.

(129) Moaveni DM, Birnbach DJ, Ranasinghe JS, Yasin SY: Review article: fetal assessment for anesthesiologists: are you evaluating the other patient? *Anesth Analg* 2013, 116(6):1278-1292.

This review article outlined the current antepartum and intrapartum expert guidelines and fetal assessment modalities (nonstress test, biophysical profile, Doppler velocimetry, electronic fetal heart rate monitoring, fetal electrocardiogram (STAN-ST waveform analysis), and fetal pulse oximetry), their physiologic basis, and the available evidence regarding their utility in clinical practice. The authors empower the obstetric anesthesiologist to be an informed member of the perioperative, multidisciplinary care team.

TOOLS OF OUR TRADE

Technology

Ultrasound

(130) Arzola C, Carvalho JA, Cubillos J, Ye X, Perlas A: Anesthesiologists' learning curves for bedside qualitative ultrasound assessment of gastric content: a cohort study. *Can J Anesth* 2013, 60(8):771-779.

This cohort study (N=6 anesthesiologists, N=180 assessments) measured the amount of training necessary for an anesthesiologist to achieve competence in ultrasound (US) technique for assessing gastric content. Anesthesiologists underwent a teaching intervention (didactic and interactive workshop) followed by a formative assessment; learning curves were then constructed after diagnosis gastric content in healthy volunteers. Results imply that with appropriate training and supervision, it is estimated that anesthesiologists will achieve a 95% success rate in bedside qualitative US assessment after performing approximately 33 exams. As demonstration of competency has become an integral part of our specialty's credentialing process, studies such as these can serve as the basis for developing faculty education programs.

(131) Sahota JS, Carvalho JC, Balki M, Fanning N, Arzola C: Ultrasound estimates for midline epidural punctures in the obese parturient: paramedian sagittal oblique is comparable totransverse median plane. *Anesth Analg* 2013, 116(4):829-835.

This prospective study of term obese women (N=60; mean BMI=39.6) receiving labor epidural analgesia (LEA) or CSE anesthesia for CD investigated whether ultrasound (US) scanning in the paramedian sagittal oblique (PSO) plane vs. the transverse median (TM) plane yielded a more precise estimate of the actual skin-epidural space measurement. The estimated US needle depth in the PSO and TM planes and the actual needle depth were 6.5 (1.2) cm, 6.5 (1.1) cm, and 6.6 (1.3) cm with minimal skin compression. The quality of imaging was rated as good in the PSO and TM planes in 86.7% and 68.3% cases, respectively (P = 0.028). The estimates of the US-determined distance to the epidural space in the PSO and the TM planes in obese patients are comparable, but the option to use both views for midline punctures may prove useful in certain patients.

(132) Shaikh F, Brzezinski J, Alexander S, Arzola C, Carvalho JC, Beyene J, Sung L: Ultrasound imaging for lumbar punctures and epidural catheterisations: systematic review and meta-analysis. *Br Med J* 2013, 346:f1720.

This systematic review and meta-analysis (14 RCT; N=674 in the ultrasound (US) group and 660 in the control group) compared US imaging to standard palpation methods to reduce the risk of failed lumbar punctures or epidural catheterizations, traumatic procedures, insertion attempts, and/or needle redirections (included both obstetric and non-obstetric studies). US reduced the risk of failed procedures (RR=0.2, P<0.001, low heterogeneity): risk reduction was similar when subgroup analysis was performed for lumbar punctures (0.2, P=0.002) or epidural catheterizations (0.23, P=0.003). US also significantly reduced the risk of traumatic procedures (0.3, P=0.005, low heterogeneity) the number of insertion attempts (mean difference -0.4, P<0.001, high heterogeneity) and the number of needle redirections (mean difference -1.0, P<0.001, high heterogeneity).

Associated Content: Comment On
Rizzoli P: Taking the sting out of lumbar puncture. *Br Med J* 2013, 346:f1734.

Videotaping

(133) Friedman Z, Siddiqui N, Mahmoud S, Davies S: Video-assisted structured teaching to improve aseptic technique during neuraxial block. *Br J Anaesth* 2013, 111(3):483-7.

This interventional study (N= 29 residents, each videotaped 3-4 times) compared epidural aseptic technique performance by novice operators after a targeted teaching intervention that included a video assessment and demonstration. The median aseptic technique scores for the rotation period were significantly higher in the post-intervention group (27.6 [IQR: 22.3–29.5] vs. 16.6 [13.3–22.0], $p < 0.001$) with high inter-rater reliability. Similar results were seen when scores were analyzed for low, moderate, and high levels of experience. Video recording may provide a valuable tool for improving aseptic practice and other manual techniques by novice trainees as part of procedure-specific teaching, especially when based on commonly observed mistakes among the trainees.

Publications

(134) Vintzileos WS, Ananth CV, Vintzileos AM: External funding of obstetrical publications: citation significance and trends over 2 decades. *Am J Obstet Gynecol* 2013, 209(2):150 e151-156.

This retrospective study determined that 61% (27/44) of the research presented in the "citation classics" (100 most frequently cited articles) within *Obstet & Gynecol* and *Am J Obstet Gynecol* were externally funded (34% through the NIH). Relative to 1989, in 2012 there was a 34.8% decrease in the number of OB-related published manuscripts (10,175 manuscripts reviewed), a 59.6% decrease in the number of non-funded manuscripts, but a 6.8% increase in the number of funded manuscripts with an 8.2% increase in the number of NIH-funded publications. This highlights the importance for securing NIH-or other funding for academic physicians.

Fred Hehre Lecture

Introduction: Barbara M. Scavone, M.D.
Speaker: David J. Wlody, M.D.

Notes

Host's Panel - Getting New Moms Ready to Rock in the Post-Partum: Obstetric Anesthesia Beyond Labor and Delivery
Quality of Recovery in the Postpartum

Speaker: Jose C.A. Carvalho, M.D., Ph.D., FANZCA, FRCPC

Objectives: The objectives of this presentation are:
1. To highlight the concept of the Perioperative Surgical Home (PSH) Model of Care proposed by the ASA;
2. To suggest the potential for applying the PSH concept to Obstetrics and for Anesthesia-led programs;
3. To highlight the diversity of problems encountered by women in the postpartum period and the lack of a comprehensive program to support their recovery;
4. To review the current knowledge and future possibilities for optimal pain management in the postpartum

Summary:
The Perioperative Surgical Home (PSH) model of care has been proposed to address the problems originated in the fragmented perioperative care plans that are currently in practice, which consequences include suboptimal patient care, increased costs and patient dissatisfaction. The ASA has committed to the Perioperative Surgical Home (PSH) model of care to correct and improve perioperative services. ASA encourages Anesthesiologists to view becoming perioperative physicians as an expansion of the specialty by leading patient-centered continuity of care throughout the preoperative, intraoperative and postoperative periods. Although the concept of PSH seems to gain much popularity in many surgical subspecialties, little or nothing has developed in the obstetric area (1).

Childbirth has a major impact on women's lives and different from the clearly defined prenatal care plans and guidelines, the postpartum period is largely ignored by the health care system. Women face a diversity of physical, mental and emotional problems in the postpartum period, and it has been shown that 25% of women do not feel physically recovered at 6 months postpartum. A recent study has identified 3 major themes that illustrate the deficiencies of the health care system: a) lack of women's knowledge about postpartum and lack of preparation; lack of continuity of care and absence of maternal care during the early postpartum period; disconnect between health care providers and postpartum mothers. Most of the attempts to identify the complexity of postpartum care have been done by nurses and midwives. There is an absolute lack of physician-led initiatives in this area, thus the opportunities for Anesthesiologists' engagement are real and plenty. Some of many problems encountered by women after childbirth are intimately related to the Anesthesiologists' area of expertise, and include: pain management, prevention and treatment of anemia, prevention and treatment of infection and postpartum depression (2-5).

Labor analgesia and anesthesia for cesarean section have improved enormously in the last decades, to achieve a very sophisticated standard of care. While the need for surgical anesthesia for cesarean delivery is obvious, there is still debate amongst some groups of women and health care providers as to the need for labor analgesia. Anesthesiologists have given a great contribution to safe and comfortable childbirth, through advances in analgesic techniques and education of both health care providers and lay public. A new fascinating area of pain management has emerged in the last decade with the concept of persistent/chronic pain after childbirth. It has been consistently shown that a significant number of women will develop persistent pain after childbirth regardless of their mode of delivery – vaginal or cesarean section. It has also been consistently shown that the severity of the immediate postpartum pain is the most important predictor of persistent pain. Furthermore, it has been shown that severe postpartum pain increases not only the risk of persistent pain, but also of postpartum depression. New promising information suggests that delivery (and perhaps oxytocin) offers a protective effect against the development of chronic pain in women, so that by one year postpartum most of the persistent pain is resolved. The problem of prolonged pain after childbirth is however still a fact, as it is its relationship with postpartum depression, fatigue and lack of energy. One of the most exciting and promising areas in postpartum pain management is the development of strategies to identify women at high risk for severe postpartum pain, as well as strategies to individualize pain management in such cases. Anesthesiologists should recognize the limitations of our current practices for some patients and explore recent advances that while not useful in large scale (slow release epidural morphine, subfascial infusion of local anesthetics and NSAIDS, TAP blocks, intravenous ketamine, gabapentin), may be helpful in this subset of special women (6-9).

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4. Martin A, Horowitz C, Balbierz A, Howel EA. Views of women and clinicians on postpartum preparation and recovery. Matern Child Health J 2014;18:707-13.
5. Baghirzada L, Downey KN, Macarthur AJ. Assessment of quality of life indicators in the postpartum period. Int J Obstet Anesth2013; 22:209-16
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9. Pan PH, Tonidandel AM, Aschenbrenner CA, Houle TT, Harris LC, Eisenach JC. Predicting acute pain after cesarean delivery using three simple questions. Anesthesiology 2013;118:1170-9.

Host's Panel - Getting New Moms Ready to Rock in the Post-Partum
Obstetric Anesthesia Beyond Labor and Delivery – Hemoglobin Issues

Robin Russell MD FRCA
Nuffield Division of Anaesthetics, John Radcliffe Hospital, Oxford, UK
Editor in Chief, International Journal of Obstetric Anesthesia

Objectives
1. To examine methods of optimizing hemoglobin levels during pregnancy
2. To establish how intrapartum blood loss can be minimized
3. To explore ways of elevating hemoglobin levels after delivery

Summary
Depending on the definition used, anemia affects up to 40% of pregnant women worldwide and is associated with adverse outcomes for both mother and baby.[1] It may result from a number of causes most commonly iron deficiency and/or acute blood loss. A full blood count should be checked in early pregnancy and repeated at 28 weeks of gestation. Oral iron supplementation decreases the incidence of anemia at term but has a high incidence of gastrointestinal side effects. The benefit of routine iron supplementation is debatable.[2] For those with significant anemia who are unable to tolerate oral iron, intravenous therapy may be an alternative.[3]

Women at increased risk of intrapartum hemorrhage should be identified. Following vaginal delivery, active management of the third stage of labor with uterotonics reduces the incidence and severity of bleeding.[4] Cesarean delivery increases blood loss; the benefits of uterotonics must be balanced against the risk of hemodynamic instability and the dose and timing of administration carefully considered.[5] In cases of abnormal placentation, where major hemorrhage is likely, the use of interventional radiology and cell salvage has been recommended, although strong evidence of their benefit is currently lacking.

Postpartum Hb <10 g/dL is seen in up to 30% of women with more severe anemia (Hb<8 g/dL) observed in 10%. Anemia is associated with postpartum depression, cognitive impairment, poor mother-infant bonding and delayed infant development. Blood transfusion may be required but clear transfusion triggers are often lacking.[6] Iron deficiency is the principle cause of postpartum anemia but oral iron supplements are poorly tolerated by up to one third of new mothers. Intravenous iron preparations (ferrous sucrose and ferric carbxymaltose) appear more efficacious with a low incidence of side effects.[7,8] Recombinant erythropoietin may also be of some benefit, especially in severe anemia.[9]

Key Points
1. A full blood count should be performed at booking and repeated at 28 weeks
2. Dietary advice should be given to all pregnant women and oral iron given to those with evidence of anemia; parenteral iron is a second line where oral therapy is not tolerated.
3. Strategies for reducing intrapartum blood loss must be considered. New technologies require further evaluation.
4. Trigger for blood transfusion are often inappropriate and more formal assessment by senior staff is required.
5. For some postpartum women intravenous iron may be a suitable alternative to blood transfusion.

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3. Pavord S, Myers B, Robinson S, et al. UK guidelines on the management of iron deficiency in pregnancy. Br J Haematol 2012; 156: 588-600.

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Host's Panel - Getting New Moms Ready to Rock in the Post-Partum Mood Issues

Speaker: Beverly Young, M.D., FRCPC

Notes

Host's Panel - Getting New Moms Ready to Rock in the Post-Partum Infection Issues

Speaker: Allison McGeer, M.D., M.Sc., FRCPC

Notes

Pro-Con Debate: Remifentanil should be routinely offered for labour analgesia

Moderator: McCallum R. Hoyt, M.D., M.B.A.
Pro: David Bogod, M.B.B.S., FRCA, LLM

I do not wish to give my opponent in this debate too much foreknowledge of my intended argument, so I trust readers will forgive me if I am annoyingly vague. We take these debates very seriously on my side of the pond, and I intend to do my bit for the old country; if that means pulling the wool over Dr Zakowski's eyes, so be it!

However, I can reveal that my position will be a simple one. It will be based on the fact that women in labour are our partners, not our subordinates. They are going through perhaps the most intimate and personal experience of their lives, and while doing so, they need us to support them in their decisions, to provide them with our knowledge, to offer them our technology and drugs and perhaps even to try to persuade them with our recommendations, but they do not need us to patronise them, to deny them or to take control from them.

Globally, there is probably more variation in provision of pain relief in labour than in any other treatment in any other field of medical practice. Entonox is the most common form of labour analgesia in the UK, but is practically unheard of in the rest of Europe and the USA. The British midwives who routinely administer large doses of heroin in labour raise as many international eyebrows as their Scandinavian equivalents injecting intradermal blebs of sterile water over the iliac crests. In Paris, a woman is as likely to choose to labour without an epidural as she is to promenade along the Bois de Boulogne with her hair curlers in.

The fact that there is such variety, much of it apparently culturally driven, suggests that we are a long way from finding the ideal way of helping women through what is undoubtedly the most common form of human suffering. Different methods vary with respect to efficacy, adverse effects, impact on the progress of labour and infrastructural requirements, and all are far from perfect. Patient-controlled remifentanil is another one in a long line of sub-optimal ways of coping with labour, and we have a duty to offer it, with all humility and with full information about its benefits, risks, and limitations, to our patients. And then, to let them decide whether they want to use it or not.

David Bogod
Nottingham, UK

Pro-Con Debate: Remifentanil should be routinely offered for labour analgesia

Moderator: McCallum R. Hoyt, M.D., M.B.A.
Con: Markl Zakowski, M.D.

Objectives: Remifentanil PCIA has been proposed to be ROUTINELY offered for labor analgesia. The objectives of the CON side of the debate will be to learn why Remifentanil PCIA may not be the ideal agent for labor analgesia despite it's short plasma half-life. Concerns include lower quality pain relief, risk of respiratory depression/apnea in the parturient, lower oxygen saturations during labor, the need for supplemental oxygen and increased monitoring requirements as well as maternal and neonatal safety.

Introduction: Remifentanil PCIA use for labor analgesia has begun to spread across many labor units, especially in the UK. However, some fundamental questions remain unanswered. Offering remifentanil to parturients who cannot have an epidural for labor analgesia due to medical or technical reasons is quite reasonable. However, changing the recommendation to routinely offering to all parturients, while seemingly reasonable at first, crumbles upon deeper consideration.
Fundamental considerations:

Efficacy: Remifentanil PCIA provides inferior pain relief compared to epidural for labor analgesia at any time point.(1) At the peak effect at 30 min, VAS pain scores were significantly different 3.7 vs. 1.5, $P<0.009$ for the Remi PCIA and epidural groups respectively. While remifentanil decreases pain scores from baseline significantly for at most 1-2 hours, pain scores increase thereafter towards baseline. Although maternal satisfaction scores for Remi PCIA remain better then expected compared to the pain scores, this might be due to the euphoric effect of narcotics. The optimal PCIA regimen still remains to be determined, as pressing the bolus button at the onset of the contraction leads to the peak remifentanil effect AFTER the contraction has finished.

Side Effects: Maternal side effects: Nausea, vomiting, itching may (most studies) or may not be increased with remifentanil compared to epidural infusions. One would expect to see a difference depending on the amount of narcotic present in the epidural infusion mixture.

Sedation. Women on remifentanil PCIA have more sedation. Even in a study where 100% of parturients were at the maximum allowed dose of remifentanil PCIA (and thus may have wanted more), 15% reached the highest sedation score.(2)
Respiratory effects: Decreases in saturation as measured by pulse oximetry are common in women on Remi PCIA. Even women who had prophylactic 2 L/min oxygen via nasal cannula, decreases in oxygen saturation (<94%) were common (68%).(1)
Neonatal Side Effects: Remifentanil readily crosses the placenta. In one study, 2/19 (11%) of neonates required 'intervention' after delivery.(1) The FHR may be altered by fetal narcotics, including remifentanil.

Monitoring requirements: Most studies state the maternal monitoring requirements should include continuous pulse oximetry and the presence of a midwife continuously in the labor room with direct line of sight vision of the parturient. Recently, authors have also recommended the use of continuous capnography. Capnography may be a better technology to capture periods of apnea. Both pulse oximetry and capnography, as with any monitoring device, will have false positives. Thus, the continuous monitoring and workload requirements are greater for Remi PCIA.

Safety: Most studies examined remifentanil in healthy parturients.
In prospective study of healthy parturients on prophylactic 2 L nasal cannula oxygen receiving Remi PCIA, apnea occurred in 9/19 (47%) women and saturation decreased below 92% in 33% of apneic episodes.(1) With the more widespread use of Remi PCIA in the UK, reports of maternal cardiac or respiratory arrest have been published.(3,4) The basic dosing regimen, side effects and safety of remifentanil have not been studied in large enough numbers to safely offer routinely to all parturients.

More references and discussion points will be offered at the debate. Don't want to tip my hand too much!

Key points:

1. Remifentanil PCIA for labor analgesia may be a useful technique for parturients who cannot receive an epidural, but the data is lacking for overall safety to provide to all women.
2. Maternal side effects require increased monitoring – continuous pulse oximetry, continuous capnography and the presence 1:1 in the labor room of an individual trained to recognize and initiate treatment for problems.
3. Fetal/Neonatal effects – there may be changes in FHR and increased need for neonatal resuscitation ('interventions') at delivery

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PROGRAM MATERIAL

Sunday, May 18, 2014

Breakfast Panels

Legends Remembered
Speakers: Gerard M. Bassell, M.D.; Brenda A. Bucklin, M.D.; Patricia A. Dailey, M.D.; Robert R. Gaiser, M.D.; Richard M. Smiley, M.D., Ph.D.; Lawrence C. Tsen, M.D.

Publication in Obstetric Anesthesia
Speakers: Pamela Flood, M.D.; Robin Russell, M.D.; Cynthia A. Wong, M.D.

A Career in Obstetric Anesthesia
Speakers: Craig Palmer, M.D., Senior Career Member Perspective; Edward A. Yaghmour, M.D., Mid Career Member Perspective; Paloma Toledo, M.D., M.P.H., Junior Career Member Perspective

Practical Suggestions for Improving Safety in Your Unit

Safety Rounds Beyond Board Sign Out
Speaker: Yaakov Beilin, M.D.

Team Training: Emergency Manuals Implementation, Crisis Simulation & Critical Event Debriefing
Speaker: David L. Hepner, M.D., M.P.H.

Equipment Rounds: Ways to Be Sure the Suction Works When You Need It
Speaker: Edward McGonigal, M.D.

What's New in Neonatology? Avoiding Hypothermia/Hyperthermia in the Delivery Room in the Newly Born Infant has Significant Beneficial Downstream Consequences
Introduction: Klaus Kjaer, M.D.
Speaker: Jeff Perlman, M.B., Ch. B.

Breakfast Panel - Legends Remembered: Gertie Marx, M.D.

Gerard M. Bassell, M.D.

Notes

Breakfast Panel - Legends Remembered: David H. Chestnut, M.D.

Brenda A. Bucklin, M.D., University of Colorado School of Medicine

David H. Chestnut, M.D. is a recognized national and international expert in the field of obstetric anesthesiology. He received his medical degree magna cum laude from the University of Alabama School of Medicine, Birmingham, Alabama. After residencies in Anesthesiology and Obstetrics, he began his academic career at the University of Iowa College of Medicine and was rapidly promoted to the rank of Professor. From 1994-2005, David served as the Alfred Habeeb Professor of Anesthesiology and Chair of the Department of Anesthesiology at the University of Alabama at Birmingham School of Medicine. Beginning in 2005, Dr. Chestnut was the Associate Dean for the Western Academic Campus, University of Wisconsin School of Medicine and the Edwin L. Overholt Director of Medical Education at Gunderson Health System, La Crosse, Wisconsin. He is currently Professor of Anesthesiology and Chief, Division of Obstetric Anesthesiology at Vanderbilt University Medical Center, Nashville Tennessee. From 1997 to 2009, David served as an Examiner and Director for the American Board of Anesthesiology. During that time, he was President as well as Treasurer and also served in a variety of leadership roles for the American Board of Medical Specialties. David is the past Chair of the American Society of Anesthesiologists' Committee on Obstetrical Anesthesia and the Subcommittee on Obstetric Anesthesia and Perinatology. From 1999-2000, he was President of the Society for Obstetric Anesthesia and Perinatology. David is the author of nearly 100 peer-reviewed publications and more than 100 Book Chapters, Scholarly Reviews, and Invited Reviews. Most notably, he is the editor of the best-selling and comprehensive obstetric anesthesia textbook, Obstetric Anesthesia: Principles and Practice, now in its 6th edition. He and his wife Janet are the parents of 5 children.

Breakfast Panel - Legends Remembered: Sol M. Shnider, MD

Patricia A Dailey, MD
Anesthesiologist
Hillsborough, CA

Sol M. Shnider, MD (1929 - 1994) was a pioneer and visionary -- always on the cutting edge of obstetric anesthesia. He was a founding member of SOAP and its President in 1973. Canadian born, Columbia-Presbyterian trained, he spent most of his career at UCSF. Sol mentored 55 research fellows, authored 100+ papers, edited the textbook Anesthesia for Obstetrics, and in 1976 founded the UCSF Obstetric Anesthesia Meeting, now renamed the Sol Shnider MD Obstetric Anesthesia Meeting and coordinated by SOAP. He developed a chronic maternal-fetal sheep model to study the effects of anesthesia on uterine blood flow and fetal well-being. His other research interests included bupivacaine cardiotoxicity, chloroprocaine neurotoxicity, neuraxial opiates for labor and Cesarean section, and the development of a scoring system to evaluate obstetric medications in newborns.

Breakfast Panel - Legends Remembered: Brett B. Gutsche, M.D.

Brett B. Gutsche, M.D., is a leader in obstetric anesthesia, who has left his mark on the specialty. His undergraduate education was at Williams College while his medical education was at the University of Rochester School of Medicine. During medical school, he met his wife, Mary, whom he married and had three children, Marsha, Stuart, and Stephen. He completed his internship in Surgery (where he was granted 1 hour off to be with his wife during the delivery of their first child) but then switched to Anesthesia. He completed his residency and NIH Fellowship at Duke University. Following graduation, he worked for two years in the Alaska Public Health System and he was a volunteer physician who helped numerous soldiers and served his country during the Vietnam War. His first academic position was at the University of Tennessee. In 1969, he was recruited to the University of Pennsylvania where he rose to the rank Professor of Anesthesiology. He worked at the Hospital of the University of Pennsylvania until 2013. He introduced epidural analgesia to the hospital and one of his early patients was the daughter of his chairman, Robert Dripps, M.D. He was responsible for the introduction of ropivacaine into practice. He completed a sabbatical at Columbia University, working with Dr. June Morishima. He was president of SOAP and was present during its incorporation. In 2003, he was awarded the Distinguished Service Award from the society. While I could go on about his accomplishments, his most important contribution is the impact he had on numerous residents and fellows. The safe care of parturients as well as the professionalism his students exhibit will be his lasting tribute.

Breakfast Panel - Legends Remembered: Dr. Mieczyslaw Finster

Richard Smiley, MD, PhD
Virginia Apgar Professor of Anesthesiology
Columbia University College of Physicians and Surgeons

Mieczyslaw (Mike) Finster was born in Lwow, Poland, nd received his medical education at the University of Geneva, Switzerland. He emigrated to the United States in 1957 and trained in Anesthesiology at Columbia-Presbyterian Medical Center, serving on the faculty at Columbia for over 40 years 30 of them as Chief of Obstetric Anesthesia. Along with collaborators including L. Stanley James, June Morishima, Hilda Pedersen, Alan Santos and others, he investigated the pharmacokinetics and toxicity of local and general anesthetic agents in the pregnant sheep model, forming the basis of much of what we now understand about the disposition and effects of these drugs during pregnancy.

Breakfast Panel - Legends Remembered: Dr. Sanjay Datta, MBBS

Lawrence C. Tsen, MD
Associate Professor in Anaethesia
Harvard Medical School

Sanjay Datta (1941-2014) had a peripatetic education in India (MBBS, Calcutta University), England (Diplomate in Anaesthesia, Royal College of England), Canada (Research Fellow, McGill University) and the United States (Research Fellow, Harvard Medical School). Matriculating from Instructor (1975) to Professor (1992) in Anaesthesia, Harvard Medical School, Sanjay spent his career at the Brigham and Women's Hospital, where he produced clinical and basic research, wrote 4 textbooks, created the short-handled laryngoscope, served as the Director of Obstetric Anesthesia (1988-2000) and mentored and taught many medical students, residents and fellows.

Breakfast Panel- Publication in Obstetric Anesthesia: *From Idea to Completion*

Pamela Flood, M.D.
Stanford University, Department of Anesthesiology, Pain and Perioperative Medicine
Palo Alto, CA USA
Associate Editor, Anesthesiology

Objectives

1. To identify good research questions
2. To identify good research methodology
3. To learn practical aspects of completing a study

Summary

The sine qua non of a good research manuscript is starting with a good question. A useful test to identify a good question is first, if you really care about the answer to your question. If you don't really care about finding the answer, the rigor required to conduct a good clinical or basic scientific study cannot be worthwhile regardless of any other perceived benefit. The second point is if there are others in the clinical or scientific community that will care about the answer that you provide. If you address a question about which you care deeply, work hard to provide a concrete reliable answer, the next step is identifying the appropriate audience who will care about the issue as much as you. This will be covered by Dr. Russell in his section on writing a manuscript, but the potential audience should be considered from the beginning. Simply summarized, a good question is one that you can't wait to find the answer to and for which the answer will make a difference for others.

The question identified, it should be used to form a hypothesis based on currently available data. The clear statement of the hypothesis is of key importance. The study is then designed to either prove or disprove the hypothesis. The key emphasis is on the word disprove. A sample size estimation is required which normally includes the value which you will consider a difference significant or the percentage of false positives that is to be accepted (often 5%, but some study methodologies require much more stringent conditions). The second key consideration is the sensitivity or the percentage of false negatives that will be accepted. This value is traditionally accepted at 10 or 20%. This value is surprisingly high. This means that 10-20% of the time, your hypothesis will be true but your study will not detect a difference. As a result, studies are often underpowered to really be able to tell whether an effect is true or more often not. Many small studies are undertaken at great cost and effort without providing a clear answer to the question. In basic science studies, it is common to just keep adding animals, cells or assays until the result is statistically significant. This is an important source of bias and is reflected in the many treatments that work in basic trials but then fail to translate to clinical trials. If you have an important question, do a proper sample size calculation a priori. Don't skimp on specificity.

Keep careful records. Whether case report forms or entries into a lab notebook, the results of every study should be auditable, should it be called into question. Questions may arise from IRB, IACUC, during or after publication. Make a statistical plan in advance. This starts with the sample size estimation but a plan for data analysis should be documented before the study begins. Changes can be made but should be documented with rational to avoid concerns about data dredging.

Don't be afraid of a negative result. If the study is well planned with adequate specificity to make a negative result meaningful and the question is important, it should be publishable. Failure to publish negative results leads to bias. Hundreds of investigators may have conducted similar trials but if only the single trial that has a positive result is published, its importance is overstated.

Key Points

1. Look for an important tractable question.
2. Estimate the required sample size beforehand and avoid skimping on specificity.
3. Keep records that you are proud of.
4. Don't avoid publishing a negative result of a well done study addressing an important question.

Breakfast Panel - Publication in Obstetric Anesthesia: Writing Up Your Study for Publication

Robin Russell MD FRCA
Nuffield Division of Anaesthetics, John Radcliffe Hospital, Oxford, UK
Editor in Chief, International Journal of Obstetric Anesthesia

Objectives

1. To consider the most appropriate journal for publication
2. To discuss the best way to present the introduction, methods, results and discussion.
3. To examine why it is increasingly difficult to publish case reports

Summary

Having completed your research project it needs to be read by the appropriate people. Consideration should be given as to which journal is most likely to meet this need. Depending on the nature of the study, the choice is usually between a journal of general medicine, obstetrics, anesthetics or a subspecialty obstetric anesthetic periodical. It is vital that the journal's guide for authors section is read and the manuscript correctly formatted. Ethics in research and publication is increasingly important to journal editors: guidance for researchers is available on the Committee for Publication Ethics (COPE) website.[1]

Most journals require the same basic structure for scientific papers.[2] For randomized trials the CONSORT guidelines should be followed.[3] The *introduction* should state why the subject under investigation is important and the specific aims of the project. Only publications directly relevant to the current study need be cited. The *methods* should describe in sufficient detail what was done so that others could reproduce the study if so desired: details on statistical analysis should be included. The *results* should be clear and concise with appropriate statistical analysis. Data should not be replicated in tables and figures should make interpretation easier. In the *discussion* authors should summarize the main findings, compare them with others, discuss the implications, highlight the limitations and suggest further research. Many journals run manuscripts through anti-plagiarism software so do not copy and paste sentences from previous publications, even if they are your own!

Case reports not popular with some journals as they reduce their impact factor. A challenging case with a good outcome is not sufficient to warrant publication: the case needs to present something new or novel that is informative to the reader. Patient consent to publication is usually necessary and many journals will not consider review if evidence is not presented.

Key Points

1. Select the most appropriate journal and follow the guide for authors carefully
2. Most scientific studies required an introduction, methods, results and discussion
3. Keep your manuscript as short as possible
4. Be aware of the increasing importance of publication ethics
5. Patient consent is usually required for case report publication

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Breakfast Panel - Publication in Obstetric Anesthesia: Common Problems with Submissions

Cynthia A. Wong, MD; Northwestern University Feinberg School of Medicine

Objectives:

Upon completion of this presentation participants will be able to

1. describe the editorial process the occurs when a manuscript is submitted to a journal for publication and
2. cite tips/advise for replying to the reviewers and editor.

Summary:

The editorial process: The editorial process is similar for most medical journals. These steps include: 1) Electronic submission of the manuscript; 2) Review by the editorial office staff to make sure key components of the manuscript are included and correct; 3) Review by the Editor-in-Chief. He or she may return the manuscript without review or assign the manuscript to an Editor for further handling; 4) The handling editor reviews the manuscript. He or she may return the manuscript without review or send the manuscript to reviewers (usually 2-3); 5) The reviewers usually have 2-4 weeks to review the manuscript. They write a summary of comments to the authors, and usually also write private comments to the editor; 6) The handling editor reviews the reviewers' comments and makes a decision (e.g., Accept (really unusual for the first round), Accept with Minor Revision, Accept with Major Revision, Revise and Reconsider, Reject). [At *Anesthesia & Analgesia* less than 25% of submitted manuscripts are accepted for publication. Most manuscripts that are ultimately accepted undergo several rounds of review/resubmission before final acceptance.] The editor communicates the decision in a Decision Letter which is approved by the Editor-in-Chief and then sent to the corresponding author; 7) If the editor decides to provisionally accept the manuscript, a revision is usually requested, along with a response to the reviewers comments (rebuttal). Usually reviewers make helpful recommendations. If they ask questions, it is usually because the answer is not apparent from reading the manuscript, and the answer is important to understanding the investigation. Almost always, revision of the manuscript in response to the reviewers' comments results in a better manuscript; 8) The authors should revise the manuscript (journals may request authors somehow mark changes, e.g., use red font, "track changes." The authors should prepare a rebuttal. The easiest way to do this is to copy and paste each of the reviewer's comments into a Word document and respond to each comment below the pasted comment. The authors do not need to make every change recommended by the reviewers (indeed, some may conflict), but they should carefully consider why they do not agree with the reviewer's suggestion and write a cogent response explaining why they are not making the requested change; 9) The revised manuscript is resubmitted with a cover letter and the rebuttal. 10) The revised manuscript may be returned to the reviewers for review, or may be reviewed by the editor. 11) Many journals have statistical editors who review manuscripts for appropriate statistical analysis. Authors should pay particular attention to the comments of the statistical editor; 10) After the manuscript is accepted for publication it undergoes copy editing. The editorial office may contact authors for clarification during the copy-editing process. The copy-edited manuscript is submitted to the publisher; 11) The publisher prepares a "galley proof." This proof is sent to the corresponding author as a pdf link. Authors should carefully check these proofs as there are often errors, particularly in tables/headings/figure legends. "Author queries" should be answered and the proofs should be returned to the publisher in a timely fashion (usually within several days).

Red flags: Red flags are issues that are identified during the peer review process that raise suspicion of improper conduct. Many are the result of innocent errors, but some may represent unintentional or intentional misconduct on the part of the authors. Red flags include: 1) multiple publications derived from a single study or database, 2) extending a study, 3) failure to self-reference a recent publication, 4) failure to advise the editor and reviewers of concurrent publications, 5) changes in research methodology identified during peer review (often found because the manuscript has been submitted to another journal, or the methodology does not agree with that described in the registry), 6) request for manuscript withdrawal, 7) misrepresentation (e.g., authors' credentials, institution, source of funding), 8) failure to disclosure author affiliation with industry, 9) failure to identify other conflicts of interest. Other forms of misconduct include plagiarism (which is often unintentional, but is still plagiarism), duplicate publication, and data falsification (the journal make ask to review the raw data at any time).

Helpful Hints: 1) All successful researchers have had manuscripts rejected. It is often appropriate to resubmit a rejected manuscript to another journal. The authors should carefully read the reviewers' comments and make appropriate changes to the manuscript before resubmitting to a new journal. The new journal may send the manuscript to the same reviewer as the first journal (unknowingly). If the authors have ignored the reviewer's original comments, the reviewer is not likely to look favorably on the manuscript! 2) Follow the directions in the journal's Guide for Authors carefully. Editors and reviewers may associate a sloppy manuscript with sloppy research.

Key points:

1. Scientific manuscripts are peer-reviewed. Revision of the manuscript in response to comments by the peer reviewers almost always results in a better manuscript.

2. It is imperative that authors disclosure any potential conflicts or identify "red flags" in their cover letter to the editor. Uncovering of these red flags by the editor or reviewers gives the appearance that the authors are trying to hide something.

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3. A guide for writing for *Obstetrics & Gynecology*, 4th edition. American College of Obstetrics and Gynecologists. Washington, D.C. Available at https://www.editorialmanager.com/ong/. Accessed January 2014.

Breakfast Panel - A Career in Obstetric Anesthesia

Craig M. Palmer, M.D., University of Arizona, Tucson, AZ; Paloma Toledo, M.D., M.P.H., Northwestern University Feinberg School of Medicine, Chicago, IL; Edward A. Yaghmour, M.D., Northwestern University Feinberg School of Medicine, Chicago, IL

Objectives:

The objectives of this presentation are to:

1. To give the members an opportunity to meet and discuss how they can be involved in activities that promote patient safety, improve the quality of care for parturients and neonates, and influence health care legislation and public policy

2. To expose the members to individuals who have expanded their influence in obstetrical anesthesia on a national level, both in the field of anesthesiology and outside the field of anesthesiology

3. To demonstrate how one may become involve in the review and creation of the standards and guidelines of obstetric anesthesia

Summary:

Some of the panelists' experiences include: ASA Delegate, ASA Alternate Delegate, Chair ASA Committee on OB Anesthesia, Liaison to ACOG Committee on OB Practice, AWOHNN, Committee on Government Affairs, Committee on Professional Diversity, SOAP Committee on Economic & Government Affairs, MFM network, Patient Safety, Visiting Professorships.

Practical Suggestions for Improving Safety In Your Unit: Safety Rounds Beyond Board Sign Out

Yaakov (Jake) Beilin, MD – Professor of Anesthesiology and OB/GYN
Icahn School of Medicine at Mount Sinai, New York, NY

Objectives:

1. Recognize the importance of communication as a vehicle in preventing medical errors.
2. Describe how to embed a culture of safety on the labor and delivery unit.
3. Demonstrate practical examples used on the labor and delivery unit to improve communication and safety.

Summary:
Medical errors are ubiquitous and are the 8th leading cause of mortality in the United States. The number injured annually from a medical error is much greater numbering in the millions. High error rates with serious consequences are most likely to occur in fast pace, critical environments like intensive care units, emergency departments, operating rooms, and labor and delivery suites. Poor communication is a known contributor to medical errors and improving communication has been demonstrated to reduce errors. However, improving communication cannot be accomplished in a vacuum and by itself is insufficient. It is necessary to develop a culture of safety that includes a team approach along with team building to improve patient care. It is important for a high reliability organization to acknowledge risks, expect failure, analyze events, standardize procedures, and provide ongoing team training. On the labor and delivery unit, it is imperative for everyone to recognize that the team consisting of nurses, obstetricians, anesthesiologists, operating room technicians, and support staff are all critical to the delivery of safe care, and that everyone's input and concerns must be recognized and addressed. The goal of team building it to transform the team of experts into an expert team. In this lecture, we will discuss the key elements in developing a culture of safety and team building and how this culture can be rooted in all aspects of care for the parturient. [1-7]

"Quality is the result of a carefully constructed cultural environment. It has to be the fabric of the organization, not part of the fabric." *Philip Crosby*

Key points:

1. Medical errors are a leading cause of morbidity and mortality.
2. Poor communication is a leading cause of medical errors.
3. Developing a culture of safety and team building will provide a basis for improving care.

References:

1. Talmon G, Horn A, Wedel W, et al. How well do we communicate?: a comparison of intraoperative diagnoses listed in pathology reports and operative notes. Am J Clin Pathol 2013; 140:651-7.

2. Griffen FD. The impact of transparency on patient safety and liability. Bulletin of the American College of Surgeons 2008; 93:19-23.

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Practical Suggestions for Improving Safety In Your Unit: Team Training: Emergency Manuals Implementation, Crisis Simulation & Critical Event Debriefing

David L. Hepner, MD, MPH - Brigham and Women's Hospital, Boston, MA

Objectives:

The objectives of this presentation are to review

1. Crisis checklists development and implementation
2. Effective use of crisis resource management (CRM) in the labor floor
3. Appropriate use of simulator sessions to teach CRM and crisis checklists
4. Debriefing following simulation

Summary:

Obstetric crises are low frequency, high acuity events that require rapid and coordinated management. Crises in the labor and delivery floor and in the operating room are difficult to manage because they are often very complex and require knowledge of information that is rarely utilized. Clinicians may have never experienced a crisis in the labor and delivery floor. Therefore, a cognitive aid (e.g. checklist) with the most common clinical events in the labor and delivery floor would be beneficial during an unexpected and rare event. Simulation can help us design, test and teach cognitive aids. Furthermore, simulation can help train health care providers to utilize crisis resource management (CRM) appropriately.

Checklists:

Checklists in high-reliance fields have long been considered integral to safe and reliable operations. A set of checklists for use during crises in the operating room has been published in the literature recently. Use of these checklists in a randomized controlled trial demonstrates a six-fold greater adherence to critical processes when checklists are used. There was a 75% reduction in failure to adhere to critical steps in ACLS protocol. Checklists can then be considered beneficial tools in streamlining surgical and obstetrical operations and minimizing adverse events.

Cockpit resource management:

Some elements of CRM are traced back to the military in the 1950's and incident reporting monitoring of critical events. The true birth came from aviation. The majority of air crashes studied had elements of human error involving failures of interpersonal communication, decision-making, and leadership. The National Aeronautics and Space Administration (NASA) coined the term "Cockpit Resource Management" in 1979, as the process of training crews to reduce pilot error by making better use of the human resources of the flight deck.

Crisis resource management:

There was a quick realization that these principles applied outside the cockpit (i.e. cabin crews, flight dispatchers, maintenance personnel), and outside the airplane (high-risk fields: nuclear control rooms, petrochemical processes, medicine). The "Swiss Cheese" model illustrates the notion that harmful errors are not just caused by technical mishaps or clinical errors in judgment, but rather many failures that go through the holes of a complex system. Causes of medical complications involve not only patient factors (such as patient age and disease status), but also human factors (such as fatigue, poor communication, inadequate supervision) and equipment/system design.

Communication is the transfer of information between sender and receiver. Even though the concept appears to be simple, it is one of the most complex domains of CRM. One way to understand some of the complexities of communication is to look at communication when it goes wrong during an emergency. One way to reduce communication errors is to use closed loop communication. Assertiveness is a stance in behavior to relay a point. An example is during a crisis when the team leader relays the fact that they want to hear from team members for other ideas. It is also important that team members inform the team leader with assertiveness if they see something wrong.

It is essential during a crisis to have a leader that provides direction, guidance and instruction to team members. The ultimate goal is to work as a team where members are assigned specific roles or functions to perform. The group of individuals interacts dynamically, interdependently, and adaptively toward a common and valued goal. Teamwork has been demonstrated to improve patient outcomes.

Simulation

Unexpected events in labor and delivery lead to errors and often chaos, hence leaving the patient to suffer. While it appears cognitive aids are available for use, there has been little investigation as to the best method to incorporate them into regular practice. There is need for evaluation of the best use of an emergency manual in both the prevention of perioperative complications and in the management of unforeseen crises.

Simulations can help develop leadership, situational awareness, assertiveness, closed-loop communication and teamwork. Simulations are also helpful in learning how to appropriately utilize crisis checklists during an emergency by using all of these important characteristics.

Having a team leader during a crisis demonstrates situation awareness and leadership. Calling for help early in the process reflects situation awareness, communication and assertiveness. It is a crucial component that fosters teamwork and ensures that input is obtained from nursing, anesthesia and obstetrics in a time-critical setting. It is important to have closed loop communication by acknowledging and repeating orders.

Debriefing

It is well known that exposure to a simulated crisis without constructive debriefing offers minimal benefit to participants. Debriefing is important because it allows participants to share information between them. The person conducting the debriefing session helps the group process the information that is being shared.

Key points

1. A greater adherence to critical processes has been demonstrated when crisis checklists are used.
2. Crisis resource management helps train health care workers to reduce medical complications by making better use of communication.
3. Communication, assertiveness, leadership and teamwork are key components of crisis resource management.
4. Simulation helps develop important characteristics necessary during a crisis. Furthermore, it is the best way to develop and implement emergency manuals.

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Practical Suggestions for Improving Safety In Your Unit: Equipment Rounds—Ways to make sure the suction works when you need it

Edward McGonigal MD, Creighton University School of Medicine Omaha, NE

Objectives:

The objectives of this presentation are:

1)Be Prepared for Emergency Cesarean Section—In the labor and delivery operating room, Anesthesia machines and equipment should always be prepared and ready for Cesarean section

2) Be Prepared for a Difficult Airway—Have multiple airway devices available

3) Be prepared for Severe Hemorrhage—equipment, medications, and Massive transfusion protocol

Summary:

The Labor and Delivery Unit is a constantly changing environment. Emergencies can occur at any minute. The obstetricians, anesthesiologists, nurses and surgical technicians need to always be prepared to do an emergency cesarean section – it is not a theoretical possibility, it is an inevitable event on a Labor & Deliver Unit. The anesthesiologist (anesthesia team) needs to always have proper equipment available and ready (including the anesthesia machine checked) for emergency c-section. Additional airway equipment (other than laryngoscopes) should also be available to manage a difficult airway situation. Medications and equipment to treat hemorrhage need to be available. Your anesthesiology department can develop a massive transfusion protocol to steam line the process of obtaining blood when severe hemorrhage does occur.

Equipment and Machine

Basic equipment set up for all cesarean sections includes working suction, laryngoscope handle and blades, oral airways, endotracheal tubes and stylets, Anesthesia circuit with face mask. If regional anesthesia is planned, then spinal or epidural kit should be in the OR. The anesthesia machine should have circuit connected and the machine checkout performed. Commonly used drugs should be available in the OR. A temperature monitoring device should be available. A working nerve stimulator should be available and you should have a stethoscope in the OR. You should also have equipment available for invasive monitoring including transducers and insertion kits for arterial and central venous cannulas.

Airway and Difficult Airway

A laryngoscope handle and blade should be out on top on anesthesia machine and checked. An Endotracheal Tube with stylet should be ready and cuff checked. Oral and nasal airways should be available – either on top of machine or easily accessible. Additional airway equipment should be available in the event of an unanticipated difficult airway. This may include, but not limited to, multiple sizes of MacIntosh and Miller laryngoscope blades, Laryngeal Mask Airway (LMA), Intubating LMA, video laryngoscopes, bougies for intubation, and Cricothyroidomy kit. If difficult airway has been anticipated, then consider videolaryngoscopy or fiber-optic intubation depending on urgency (emergency) of the situation.

Hemorrhage – Severe Hemorrhage

Postpartum hemorrhage (PPH) is still a significant cause of maternal mortality, with the majority (75%) of obstetrical hemorrhage deaths being preventable. The following equipment should be setup or easily accessible (within the OR) – normal saline, blood tubing with extension with stopcocks, blood warmer, large bore IV (size 18 and 16). Uterotonic medications should be available and easily accessible – oxytocin (Pitocin), methylergonovine (Methergine) and 15-methyl Prostaglandin F2 alpha (Hemabate) .For severe hemorrhage, a massive transfusion protocol can prevent misinterpretation of blood orders and it can prevent delays in obtaining blood from the blood bank.

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Avoiding Hypothermia/Hyperthermia in the Delivery Room in the Newly Born Infant has Significant Beneficial Downstream Consequences.

Jeffrey Perlman, M.B., Ch.B., Weill Cornell Medical College

Objectives

1. To illustrate the vulnerability of the newborn infant to changes in body temperature out of the normal range
2. To describe the adverse consequences of early moderate hypothermia (temperature < 36.0^{O}C) in the premature infant.
3. To describe the adverse consequences of an early elevated temperature (temperature < 37.5^{O}C) particularly in the term infant
4. To describe strategies to avoid moderate hypothermia as well avoiding or minimizing exposure to an elevated temperature.

Summary

Moderate hypothermia (temperature < 36.0^{O}C) is common in the very low birth weight premature infant noted in up to 50% of infants < 30 weeks gestational age. It has been associated with increased mortality, respiratory distress syndrome, sepsis and intraventricular hemorrhage. An elevated temperature at birth has been associated with increased mortality, respiratory depression and the need for face mask ventilation in the delivery room, neonatal encephalopathy, neonatal seizures and cerebral palsy. Strategies to avoid hypothermia have included use of occlusive wrap, exothermic mattress, warm caps, raising the delivery and operating room temperature with varying success. Approaches to avoid maternal hyperthermia and hypothermia with corresponding neonatal elevated temperature and hypothermia have been attempted with varying success. Recognition of the need to maintain the newly born infant in a narrow range is important in order to avoid significant adverse downstream consequences.

ABSTRACTS- THURSDAY

Abstract #: T-01

A Novel Curriculum to Improve the Interdisciplinary Communication of Residents in Obstetrics and Anesthesiology

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The importance of effective communication in health care teams is well established, with links to outcomes ranging from patient safety to provider job satisfaction. Consistent with this, the ACGME expects residents to demonstrate competency working on health care teams and communicating with physicians and other health professionals, and proficiency in these areas will be assessed by the Next Accreditation System. However, the common practice of training residents in parallel, specialty-specific programs provides few educational opportunities for the cross-discipline interaction needed to establish the knowledge, skills, and perspectives that promote effective interdisciplinary collaboration.

To address this concern, our multidisciplinary team of obstetricians, anesthesiologists, and communication specialists developed a new curriculum that provides OB/GYN and Anesthesia residents with opportunities to develop their interdisciplinary knowledge, understanding, and communication skills.

Design: Building on Intergroup Contact Theory(1), which provides a model for diminishing intergroup barriers through structured collaborative task work, we scheduled monthly case-based learning discussions for mixed groups of 5 to 8 Anesthesia and OB/GYN residents. Each session was facilitated by attendings from both disciplines and by a communication specialist, all with the goal of promoting resident dialogue rather than providing direct instruction. In addition, an experienced RN attended each session to provide a nursing perspective.

Applying the Theory of Relational Coordination(2), the cases and discussion sessions were designed to improve residents' communication and shared decision making by elevating their appreciation of labor and delivery care team members' shared goals, independent areas of expertise, and interdependent responsibilities. Based on participant feedback and facilitator debriefings, we subsequently developed two standard case formats and several facilitation practices that effectively encourage session participants to interact, collaborate, and educate one another about their interdependent roles.

Feedback: Anonymous post-session questionnaires (N=97) were completed by 60 residents (33 Anesthesia, 27 OB/GYN) who participated in one or more of the initial 14 discussion sessions. Most of the responses indicated that the program was a valuable addition to the curriculum (88%), that it was "moderately" or "very" useful at expanding both the ability to collaborate across disciplines (90%) and medical knowledge (82%), and that the respondent would "probably" or "definitely" change their communication as a result of the program (85%).

Conclusions: This curriculum appears to successfully address a critical yet neglected requirement of graduate medical education. Further evaluation in other settings is warranted.

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Abstract #: T-02

A novel use of remifentanil for electroconvulsive therapy in a third trimester parturient

Presenting Author: Carrie M Polin MD
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Introduction: Psychiatric disorders in pregnancy can affect the safety of both mother and fetus(1). Their pharmacologic management can be challenging and requires weighing potential teratogenic risks to the fetus against possible benefits to the mother. Electroconvulsive therapy (ECT) has been found to be effective in the treatment of psychiatric disorders in pregnancy(2). Special considerations, however, must be taken in order to provide a safe anesthetic to a parturient for a procedure with potential wide hemodynamic changes. The use of remifentanil as part of the anesthetic management of ECT in the parturient has not been previously reported. We report the use of remifentanil for ECT in a third trimester parturient with prior significant hemodynamic responses to ECT.

Case: A 40 year-old G3P1 with history of bipolar disorder and diabetes mellitus was admitted at 30 weeks gestation for a manic episode. She was initially treated with antipsychotics, however did not improve. At 32 weeks gestation, she began a series of nine ECT treatments. For each treatment, the patient was given antacid prophylaxis prior to anesthesia induction with 30mg of sodium citrate PO as well as 20mg famotidine IV. She was positioned supine with left uterine displacement and her trachea was intubated using a video laryngoscope following a rapid sequence intubation technique with cricoid pressure. Anesthesia was induced for her first ECT treatment with 1mg/kg methohexital and 1mg/kg succinylcholine. This treatment was complicated by severe hypertension (BP 216/109) following the ECT stimulus, which was treated with IV labetalol. On subsequent ECT treatments, the patient received a bolus of 3mcg/kg remifentanil in addition to 0.9mg/kg methohexital and 0.9mg/kg succinylcholine for induction. The remifentanil successfully blunted the hyperdynamic response to the subsequent ECT treatments. No fetal or maternal complications were seen with the addition of remifentanil. Fetal heart rate was monitored with non-stress testing prior to and following each ECT treatment with no fetal heart rate decelerations seen. At 36 weeks gestation, the patient developed pre-eclampsia and underwent a cesarean section under spinal anesthesia. During placement of the spinal anesthetic the patient was anxious and exhibited signs of mania. Dexmedetomidine was given in 4mcg boluses for a total of 8mcg to achieve anxiolysis and sedation with good response. A live baby was born weighing 2210g with APGARS of 8 at 1 minute and 9 at 5 minutes.

Discussion: We report the anesthetic management of a series of ECT treatments and cesarean delivery in a manic parturient. Remifentanil successfully attenuated the hyperdynamic response following the ECT treatments. Dexmedetomidine also provided adequate sedation during cesarean delivery under spinal anesthesia in a manic parturient.

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2. General hospital psychiatry. Nov-Dec 2013;35(6):636-639.

Abstract #: T-03

A Qualitative Survey of Women's Experiences of Pain Management during First Labor and Delivery: Patient Centered Outcomes

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Background: Randomized clinical trials and observational studies of the outcomes of specific methods of labor pain management have primarily focused on the pain relief effectiveness of specific treatments. However, little research has investigated what matters to patients when considering their labor pain management choices.

Methods: We conducted a qualitative survey of 226 women after first childbirth at hospitals in Pennsylvania. Participants were asked several open-ended questions, including "When you were thinking about your labor pain management choices, which outcomes for you and your baby did you consider to be most important?", "How did you decide what pain management to use in labor?", "Did you feel that you were adequately informed about your pain management choices and the potential harms and benefits of these choices?", and "What would you have liked to have known more about?" Results: In response to the question "When you were thinking about your labor pain management choices, which outcomes for you and your baby did you consider to be most important?" the most common answer (31.1%) was "safety for the baby", the second most common (27.5%) was "safety for me and the baby", and the third most common (14.4%) was "pain relief". In response to the question "How did you decide what pain management to use in labor?", the most frequent answer was that she did not decide ahead of time but wanted to wait to see how painful labor would be (33.0%), the second most frequent answer (22.0%) was that she decided what pain management to use based on her childbirth education classes and other educational efforts and the third most frequent (19.3%) was that she decided ahead of time that she wanted an epidural. A close fourth most frequent (17.4%) was that she decided ahead of time that she wanted to deliver naturally. The majority of the women (82.4%) felt that they were adequately informed about their pain management options and often mentioned having met with an anesthesiologist at their hospital ahead of time. Nearly half of the women (49.3%) said there was nothing that they would have liked to have known more about and 12.1% reported that they would have like to have known more about possible side effects of the both epidural and non-epidural drugs for themselves or their baby.

Conclusion: When thinking about labor pain management options, the outcome of most concern for nulliparous women was safety for the baby, followed by safety for themselves and the baby. While some women decided ahead of time that they definitely wanted an epidural, or definitely wanted to deliver naturally, the women in this study most commonly waited to decide in labor how to manage their pain, based on the severity of the pain. The majority of the women felt they had been adequately informed about their pain management options and often mentioned having met with an anesthesiologist during their pregnancy and having been well-informed by this meeting.

Abstract #: T-04

A STOPBANG Score ≥ 3 is not associated with adverse pregnancy outcomes: A Retrospective Study

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Background: Limited data suggest an association between obstructive sleep apnea (OSA) and gestational diabetes (GDM), preeclampsia, hypertension (HTN), preterm delivery, and maternal morbidity. It is established that a STOPBANG score of ≥ 3 is predictive of OSA. The primary objective of this study was to assess whether a STOPBANG score ≥ 3 is associated with adverse pregnancy outcomes.

Methods: A retrospective chart review was completed for patients who delivered at the University of Virginia between July and November of 2012 (n=397). Data systematically collected from chart reviews included age, pre-pregnancy height and weight, weight at delivery, race and ethnicity. Information about GDM, Type I DM, Type II DM, GHTN, chronic HTN, preeclampsia, preterm labor, preterm premature rupture of membranes, placental abruption, gestational age at delivery, and birth weight was also collected. The presence or absence of OSA was not confirmed with pletysmographic studies. Analyses used Fisher exact and Kruskal-Wallis tests with alpha=0.05.

Results: Our patient population was predominantly Caucasian 69%; 25% of women were African American, 6% Asian and 20% were Hispanic. Preliminary data analysis suggests that a STOPBANG score ≥ 3 is not associated with adverse pregnancy outcomes although a borderline p value (p=0.057) was found for GDM. Patients with a STOPBANG score ≥ 3 are likely to have Type II DM (p=0.000), chronic HTN (p=0.000), and a higher pre-pregnancy body mass index (p=0.0001).

Discussion/Conclusion: In our study an association between a STOPBANG score ≥ 3 and adverse pregnancy outcomes could not be found. This study also indicates that patients with diabetes (Type II) and hypertension are likely to have a STOPBANG score ≥ 3. Future analyses will investigate potential differences by race-ethnicity.

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Abstract #: T-05

Acute postpartum headache due to Sheehan's syndrome: a case report

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Introduction: Postpartum headache is a common occurrence with a broad differential diagnosis. With the increased use of neuraxial techniques, the obstetric anesthesiologist is frequently involved in the work up of postpartum headache. Sheehan's syndrome, or postpartum pituitary necrosis, is not typically recognized as a cause of postpartum headache and is not listed in the differential diagnosis of this condition in major obstetric anesthesia textbooks. We present a case of Sheehan's syndrome that initially presented as severe headache after vaginal delivery complicated by retained placenta and postpartum hemorrhage.

Case Report: A previously healthy 31 year old G1P0 at 40w3d presented for post-dates induction of labor. An epidural was placed uneventfully for labor analgesia. Spontaneous delivery occurred 23 hours labor. This was complicated by a retained placenta requiring manual extraction and postpartum hemorrhage of 1500 ml. During the procedure the patient experienced a brief episode of hypotension with systolic blood pressure in the 70s mmHg, persistent tachycardia with heart rate of 100-150 beats per minute, a short period of nausea and mild headache. She was adequately resuscitated with crystalloids, colloids, and packed red blood cells with temporary improvement in headache. A few hours later, the patient had return of severe headache. The anesthesia team was called twice to evaluate for possible postdural puncture headache, but symptoms were not consistent with this diagnosis. The patient was discharged home on postpartum day 3 but continued to have headaches and returned on postpartum day 6 with severe headache, failure to lactate, edema, dizziness, fatigue, nausea, and emesis. Head MRI revealed pituitary infarction consistent with the diagnosis of Sheehan's syndrome. Laboratory evaluation revealed hypoosmolar hyponatremia and hypochloremia, low-normal thyroid-stimulating hormone, free thyroxine, and free triiodothyronine, and low random cortisol, adrenocorticotropic hormone, follicle-stimulating hormone, luteinizing hormone, and prolactin. Eight weeks later, she developed diabetes insipidus.

Discussion: Sheehan's syndrome is pituitary necrosis after postpartum hemorrhage and hypovolemia. It is rarely diagnosed within the acute peripartum period and often presents months to years after delivery with symptoms of hypopituitarism. Only a few cases of Sheehan's syndrome have been reported in the literature as presenting with severe headache suggestive of acute onset pituitary apoplexy. Thus, Sheehan's syndrome is not typically considered in the differential diagnosis of postpartum headache. Early diagnosis and treatment is important in preventing or at least minimizing associated morbidity and mortality, particularly adrenal insufficiency crisis, myxedematous coma, and severe hyponatremia. Early imaging should be considered in the work up of refractory postpartum headache.

Abstract #: T-06

Anaesthetic management of placenta accreta – a nine year experience in a tertiary obstetric centre

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Background: Placenta accreta is associated with significant maternal morbidity and mortality. Traditional management involved massive blood transfusion and performing a Caesarean hysterectomy, with implication on future fertility. Current management of placenta accreta focuses on a multidisciplinary approach, minimizing haemorrhage and facilitating uterine conservation. The aim of this retrospective study is to report the incidence, anaesthetic management and outcomes of parturients with placenta accreta at a tertiary obstetric hospital over a nine-year period.

Methodology: After approval from the institutional review board, parturients diagnosed with placenta accreta in the period 1 Jan 2004 to 31 Dec 2012 were identified from hospital records using the relevant ICD codes and their case records reviewed retrospectively to extract the following details: demographic data, antenatal diagnosis of placenta accreta, choice of anaesthetic technique for Caesarean delivery, intraoperative blood loss, transfusion requirements, duration of surgery, Caesarean vs delayed hysterectomy and duration of ICU and hospital stay. Data was analysed using Microsoft Excel 2010 software. Subgroup comparison was made between parturients who were managed before and after introduction of a multidisciplinary management protocol.

Results: Over the nine-year period, 78 patients were diagnosed with placenta accreta, giving an incidence of 1 in 1414 births. Data was eventually analysed from 72 patients, due to missing records. Majority of accreta were diagnosed intraoperatively. Twenty-four parturients underwent femoral artery catheter insertion preoperatively. GA was the predominant anaesthetic technique utilized. Mean blood loss was 3716 ml. Median red cell: plasma: platelet utilization was 10:6:4 units. All parturients required hysterectomy – 61 Caesarean vs 7 delayed hysterectomies. Mean length of stay in ICU and hospital were 1.6 days and 4.4 days respectively. After introducing protocolised multidisciplinary management, there is a trend towards improved antenatal diagnosis, increased radiological interventions (45.5% vs 24.6%) and reduction in blood loss (2120ml vs 4106ml).

Discussion: Effective diagnosis and multidisciplinary involvement, including a detailed surgical plan and planned post operative care, are the key changes in our institution's management protocol, with a trend towards improved outcomes.

	All Patients	Before protocol	After protocol
No of Cases	72	61	11
Age	34.5(4)	34(4.2)	35(3.9)
Gravidity	3(1.6)*	3(1.6)*	3(1.6)*
Parity	2(1)	2(1)*	2(1.1)*
No of previous Caesarean	2(1)*	2(1)*	1(1.4)*
No of previous uterine surgery	2(1)*	0(1)*	0(0.8)*
Antenatal Diagnosis			
USG/MRI confirmed	29 (40.2%)	24 (39.3%)	5(45.5%)
Diagnosed as PPM	8	8	0
Undiagnosed	35	29	6
Mode of delivery			
Elective Caesarean	33	26	7
Emergency Caesarean	34	31	3
Others	5	4	1
Radiological intervention			
Elective	20	15	5
Emergency	4	4	0
Mode of anaesthetic			
GA	51(70.8%)	44(72.1%)	7(63.6%)
Regional to GA	14(19.4%)	11(18%)	3(27.3%)
Regional	7(9.7%)	6(9.8%)	1(9.1%)
Duration of surgery (min)	170.7(77.8)	175(75)	159(93)
Blood loss (ml)	3716(2214)	4106(2096)	2120(1419)
Blood products			
Packed RBCs	10(5)*	10(4.4)*	8(5.9)*
FFP	6(3.1)*	6(3)*	4(3.2)*
Platelet	4(3.7)*	4(3.7)*	4(4.2)*
Cryo	0(5.4)*	0(5.6)*	0(3.2)*
Factor VII	used in only one patient	one patient	0
Cell Saver	used in 3 patients	0	3 patients (Mean - 425ml)
ICU admission			
Planned	22	17	4
Unplanned	49	43	7
Duration of stay (days)	1.6(0.8)	1.6(0.8)	1.6(1)
Secondary haemorhhage	14	10	3
Secondary haemorrhage requiring surgical intervention	12	9	2
Duration of stay in post surgical ward (days)	4.4(2.1)	4.5(2.1)	5(2.3)
Hysterectomy	72	61	11
Histopathology			
Placenta accreta	30	26	4
Placenta increta	26	21	5
Placenta percreta	16	14	2

figures given in Mean(SD), * Median (SD)

Abstract #: T-07

Anesthesia management of a parturient with pulmonary Kaposi Sarcoma and AIDS

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This is a 30 yo g2p1, EGA 33 weeks woman presented to us with non-reassuring fetal heart rate therefore an urgent C-section was called. The patient's history was significant for AIDS with pulmonary Kaposi Sarcoma (KS), bilateral pleural effusion (multiple thoracentesis) and severe right lung infiltration. She developed fever, dyspnea the day before and was diagnosed with influenza and on OSELTAMIVIR. The respiratory distress got worse on the day of cesarean and the patient could only tolerate the sitting position. Her CXR showed complete opacification on the left hemithorax (pleural effusion) and increased infiltration on the right. Anesthesia preop examination revealed a diaphoretic, frail woman in considerable respiratory distress. She had difficulty to talk due to severe tachypnea. There were diffuse rales and crackles and decreased breath sound on left side. Oxygen saturation was above 90% on face mask oxygenation. Her respiratory function was near failure and clearly required mechanical ventilation. General anesthesia was discussed with the patient. However, the patient had a strong desire to have spinal anesthesia and refused general anesthesia due to the fear that she might never wake up again. A team meeting between obstetric and the anesthesia teams had approached a plan to grant the patient's wish. We placed combined spinal-epidural anesthesia and the obstetricians were able to operate with the patient in a semi-sitting position. The patient did relative well intraoperatively with T6 level and her symptom was slightly improved during immediate postpartum in the OR. The patient expressed her appreciation of our efforts and was extreme happy to be able to see her baby. Patient was transported to ICU and her condition worsened on the post-op day 3 when she developed respiratory failure and eventually agreed to be intubated, but refused chest compression. She soon developed multiple organ failure and on the post-op day 8 her family decided to withdraw her life-support and the patient passed away.

Discussion: First, respect the patient's autonomy. This patient's condition clearly required ventilator. However, with her end-stage AIDS and her desire to be awake, we planned well with obstetric team and earned the patient's satisfaction. Second, spinal anesthesia for the patient with respiratory failure is a challenge. Balance has to make to provide adequate block without further impairment of respiratory function. Last, airway obstructions exist in some patients with KS (1). Bronchoscopy of our patient showed many "heaped up" lesions on the airway walls. From this case we also learned the KS in pregnant women with AIDS has an aggressive clinical course, with high rates of visceral involvement and decreased survival (2). We will provide the complete data and the figures for this case at the SOAP meeting in May 2014.

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Abstract #: T-08

Anesthetic management for transcatheter coil embolization in a parturient with hereditary hemorrhagic telangiectasia (HHT)

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HHT is an uncommon genetic condition characterized by epistaxis, telangiectasias and arteriovenous malformations (AVMs) of various vascular beds. We present the anesthetic management of a parturient undergoing transcatheter coil embolization of several pulmonary AVMs.

Case report: 23yo, G4P2Ab2 at 23 weeks gestation presented with worsening dyspnea and poor exercise tolerance. After having an ischemic CVA, she was recently diagnosed with HHT with multiple pulmonary AVMs and a PFO. Upon admission her room air (RA) SpO2 was 91% sitting and 96% supine. After placing venous and arterial lines, standard ASA monitors and noninvasive cardiac output (CO) monitor (ICON™, Osypka medical) were applied. Oxygen was delivered by face mask and moderate sedation was achieved with 1mg of midazolam and dexmedetomidine infusion at 0.2-0.4 mcg/kg/h. Phenylephrine infusion was titrated to keep MAP >70mmHg. CO ranged from 4.1-5.3 L/min. Pulmonary MAP was 20mmHg and the pressure inside the largest AVM was 23/15mmHg. The procedure was staged due to concerns of excessive radiation and contrast exposure to fetus, with a 2nd procedure 4 weeks later. A similar anesthetic was used except CO was measured with Nexfin™ (Edwards Lifesciences) and moderate sedation was achieved with dexmedetomidine 0.4-0.8 mcg/kg/h. CO ranged from 4.3-7.2 L/min. Initial RA ABG showed PO2 of 79.9mmHg and post procedure RA PO2 was 87.7mmHg. Patient's symptoms improved and she delivered at 38 weeks via cesarean section.

Discussion: The increased blood volume and CO that accompanies pregnancy may predispose parturients to deterioration in the setting of PAVMs. Additionally, high progesterone and increased venous distensibility may further worsen the clinical picture. Potentially lethal complications such as hemorrhage may occur, requiring emergent surgical treatment. Also, the hypercoagulable state of pregnancy increases risk of thrombus formation with subsequent pulmonary embolism or paradoxical emboli. Symptomatic PAVM during pregnancy can be managed successfully using transcatheter coil or balloon embolization, which usually resolve hypoxemia and high-output cardiac failure. The procedure can be done under local anesthesia however our patient requested sedation. Dexmedetomidine was chosen because of its analgesic and sedative properties with minimal respiratory depression. Avoidance of general anesthesia was preferred due to risk of increased pulmonary shunt with positive pressure ventilation. Limited literature is available on the anesthetic management of HHT in pregnancy. Most of the case reports discuss anesthesia for delivery, where regional anesthesia is preferable.

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Abstract #: T-09

Anesthetic Management of a Parturient With Noncompaction Cardiomyopathy

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Co-Author: Katherine Hoctor MD - University of Miami - Miami, Florida
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Jayanthie S Ranasinghe MD - University of Miami - Miami, Florida

Left ventricular noncompaction cardiomyopathy (LVNC) is a rare cardiomyopathy that results from arrest of the normal compaction process of the myocardium during embryogenesis. Also known as spongy myocardium, it leads to extensive myocardial trabeculations and deep intra-trabecular recesses of the left ventricular cavity. It can be genetically sporadic or familial and can exist as an isolated disorder or occur with other congenital cardiac malformations or neuromuscular disorders.1,2,4,5 Patients most commonly present with symptoms of heart failure and are at increased risk for arrhythmias, thromboembolic events and sudden death.5,6 Only limited evidence in the form of case reports exists in the literature regarding management of LVNC in pregnancy.1-3 We report a favorable outcome in a parturient with LVNC who underwent cesarean delivery with neuraxial anesthesia.

A 28 yo G1P0 was transferred to our institution at 24 weeks in CHF. She denied any past medical history. Echocardiogram revealed an EF of 10-15% with increased trabeculations in the lateral and apical wall of the left ventricle suggestive of LVNC. She was started on carvedilol, furosemide, digoxin and enoxaparin and was discharged home with a wearable automatic defibrillator (LifeVest). The patient was readmitted at 33 wks with progressive SOB and mild hemoptysis. A repeat echo showed severely increased pulmonary artery pressures (PAP) of 60-80 mmHg with an EF of 25-30%. A pulmonary artery catheter was placed and she was transitioned to a heparin drip in preparation for cesarean delivery. At 33 5/7 wks, she was taken to the OR with cardio-pulmonary bypass on standby. A radial A-line was placed, and a low dose combined-spinal epidural with placed with 0.3ml of 0.75% bupivacaine, 15mcg of fentanyl and 0.2mg of preservative free morphine given intrathecally. The epidural catheter was incrementally dosed to achieve a T6 level with a total of 9 ml of 2% lidocaine. She remained hemodynamically stable with no changes in PAP and no need for medical intervention.

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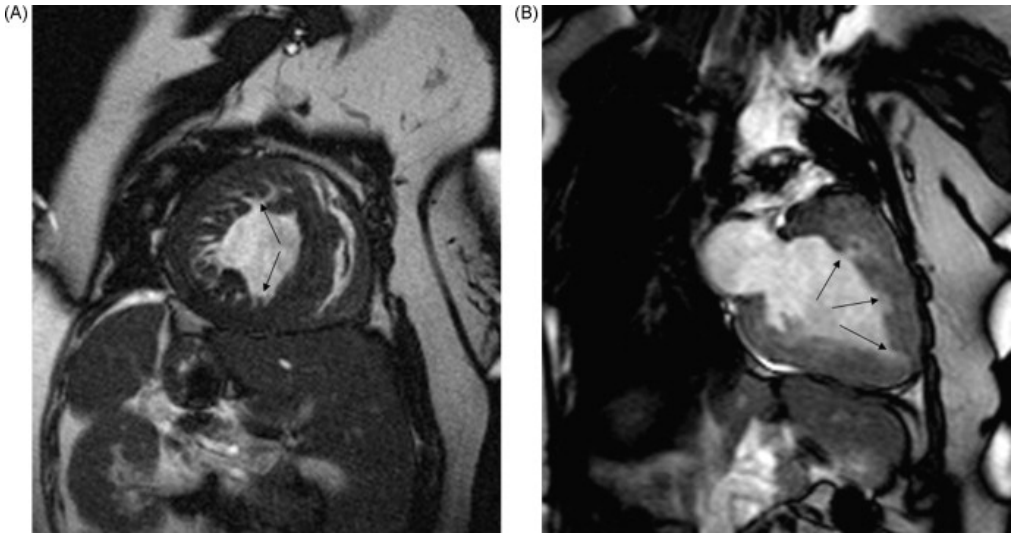

Abstract #: T-10

Anesthetic Management of Marfan Syndrome in Parturients

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Introduction: Marfan syndrome is an autosomal dominant connective tissue disorder that can predispose patients to aortic root dilation and risk of aortic dissection. Parturients with Marfan syndrome with an aortic root diameter < 4 cm typically tolerate pregnancy well, although the hemodynamic challenges of labor and delivery pose substantial risk for cardiovascular complications. For parturients allowed a trial of vaginal delivery, neuraxial techniques during labor may help to lower risk of dissection. However there is concern regarding the existence of dural ectasia in this patient population and risk of cerebrospinal fluid (CSF) leak in cases of inadvertent dural puncture (1,2). For Marfan patients undergoing cesarean delivery, the potential for dural ectasia causing erratic spread of spinal anesthesia is a concern. The optimal mode of analgesia and anesthesia for parturients with Marfan syndrome is not clearly established.

Methods: We retrospectively evaluated the anesthetic management of parturients with Marfan syndrome who delivered at our institution during the past six years.

Results: Six pregnancies in 5 parturients were identified. Four of 6 cases (67%) had an antepartum anesthesia consultation. The planned mode of delivery was vaginal for 3 of the pregnancies which resulted in 2 vaginal deliveries in the same patient and another cesarean delivery for failure to progress with epidural analgesia/anesthesia. Three more cesarean deliveries were performed; 2 for dilated aortic root diameter, and 1 for active herpes simplex virus lesions. Of the 4 cesarean deliveriess that were carried out, 2 were performed under spinal anesthesia and 2 were under epidural anesthesia. One cerclage placement was performed under spinal anesthesia. All epidural and spinal anesthetics provided adequate analgesia/anesthesia. Four of the parturients had aortic root diameter < 4 cm (2.6 - 3.96 cm); two had aortic root diameter >4 cm (4.15 - 4.2 cm). All of the births occurred at term gestation. Only one parturient had previous imaging of the spine, which did not show any evidence of dural ectasia. Four parturients were managed on beta blocker; one refused. No aortic dissection or other complications occurred during their pregnancy or postpartum.

Discussion: Early literature on Marfan syndrome in pregnancy recommended general over spinal anesthesia for cesarean delivery due to the high prevalence of dural ectasia in this patient population (63-92%) (2,3). However, the use of combined spinal epidural techniques have more recently been advocated to mitigate hemodynamic shifts (2). Our experience managing 6 pregnancies in patients with Marfan syndrome further validate the use of neuraxial techniques for vaginal and cesarean delivery in women with Marfan syndrome.

References:
1. Fattori, et al. Lancet 1999
2. Kim G, et al. Korean J Anesthesiol 2011
3. Allyn, et al. Anesth Analg 2013

Abstract #: T-11

Approaches and Barriers to Building Collaborative Practice Competencies of Anesthesiology and Obstetrics Residents

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Graduate medical education is highly successful at producing physicians who are excellent individual performers and masters of independent learning. Unfortunately the mastery of solo strategies is insufficient preparation for the increasingly team-oriented and multidisciplinary demands of perinatal care. To develop physicians capable of meeting these demands, it is important to examine how residency programs can both encourage and obstruct the development of collaborative practice competencies.

Methods: To promote collaborative learning and communication among obstetrics and anesthesiology residents, we introduced an interdisciplinary case-based learning program into the obstetrics service curriculum at a large teaching hospital. Each month we sent a new case to the residents on this service and advised them to review the case in collaboration with a resident from the other discipline. Small interdisciplinary case discussions were then facilitated by attendings from both disciplines. In the first 7 months, 60 residents (33 Anesthesia, 27 OB/GYN) participated in one or more sessions and submitted a total of 97 anonymous post-session questionnaires.

Results: In 92% of the questionnaires, the participant indicated that the new program was "moderately" or "very" valuable to their overall development as a physician. Responses to other feedback items reinforced this overall evaluation. However, 83 of the 97 responses also indicated that the participant had failed to consult a colleague from the other discipline when preparing to discuss the case. Of those who had not collaborated, 41 believed that it would have been "moderately" or "very" helpful to have done so. A brief explanation for the lack of collaboration was provided in 33 of these 41 responses. Four themes emerged: busyness or overall lack of time, a lack of overlapping available time, social or physical barriers separating the disciplines, and misunderstanding of the instructions.

Discussion: The very positive response to the overall program suggests that both the obstetrics and anesthesiology residents benefited from the new interdisciplinary curriculum. However, the explanations for failing to collaborate suggest critical questions about underlying organizational and cultural issues: Does the program culture teach residents that interdisciplinary learning is a low priority on their busy schedules? What organizational practices create the lack of overlapping availability between the disciplines, and is this obstructing residents' ability to practice in a collaborative context? Do social norms and physical structures that separate the disciplines prevent collaboration and impede patient care?

Conclusion: Improving residents' collaborative practice competencies requires new approaches to graduate medical education; however, adding new curriculum may not be enough. Underlying factors embedded in an institution's organizational structures, culture, and history may also need to be addressed.

Abstract #: T-12

Atrial Thrombectomy Requiring Heparinization and Cardiopulmonary Bypass Post-Partum Day Two

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Background: Cardiopulmonary bypass (CPB) during pregnancy and postpartum (PP) has been described in the literature.1 It is recommended that timing of the cardiac operation be in the 3rd trimester and that delivery of the fetus should occur prior to CPB.1 CPB necessitates an extreme state of anticoagulation, and therefore concerns exist regarding its safety and risk of hemorrhage in the immediate PP period; however, no specific recommendations exist. We present a case of a patient in her 3rd trimester with an atrial thrombus prompting fetal delivery, and thrombectomy with CPB PP day 2.

Case: A 33 year old G5P2022 patient at 30 5/7 weeks gestation presented with a history of Crohn's disease, and a previous peripherally inserted central catheter (PICC)-associated deep vein thrombosis. Her current pregnancy was complicated by malnutrition and hyperemesis requiring total intravenous nutrition (TPN) through a central venous catheter (CVC).

Throughout the pregnancy, the patient had multiple CVCs complicated by thrombosis and infection. She was admitted to the medical intensive care unit (MICU) at 30 2/7 weeks gestation for treatment of a suspected CVC- associated infection and sepsis.

The patient was transferred from the MICU to Labor and Delivery (L&D) for tocolysis due to preterm labor. She remained on antibiotics for her infected tunneled CVC (tip in the superior vena cava) so that TPN could be continued. In L&D, an acute decrease in hemoglobin from 8.2 to 5.8 g/dL prompted a transthoracic echocardiogram to evaluate whether there was expansion of a previously imaged pericardial effusion since the patient was not demonstrating any active signs of bleeding.

A multilobulated right atrial thrombus was visualized adherent to the CVC. A multidisciplinary team convened and implemented a plan that called for delivery of the fetus at 31 weeks gestation under general anesthesia in the cardiac operating room with cardiothoracic surgery and CPB on standby. Following the uneventful delivery, a heparin drip was started 10 hours PP, and a successful thrombectomy with heparinization and CPB was performed PP day 2.

Discussion: CVCs have been associated with a complication rate of 66.4% (infection, thromboembolism).2 Turbulent flow at the catheter tip, and endothelial damage contribute to CVC thrombus formation. Isolated case reports exist describing CPB as early as 2 hours PP without hemorrhagic complications from the hysterotomy site. The continuation of oxytocin and the addition of aprotinin have been successfully used to prevent significant bleeding when cardiac surgery with CPB and heparinization is necessary immediately PP.3

Parry AJ. Cardiopulmonary bypass during pregnancy. Ann Thorac Surg 1996; 61:1865-9
Holmgren C. Hyperemesis in pregnancy: an evaluation of treatment strategies with maternal and neonatal outcomes. Amer J Obstet Gynecol 2008; 198:56.e1-4
Lamarra M. Cardiopulmonary bypass in the early puerperium. Ann Thorac Surg 1992; 54:361-3

Abstract #: T-13

Balanced transfusion in the setting of massive placenta percreta hemorrhage

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Placenta percreta presents a unique challenge to the obstetric team. We present a case of massive hemorrhage due to percreta with successful transfusion of an approximate 6:6:6:1 ratio of pRBCs, FFP, platelets and cryoprecipitate. (1)

A 32 year-old G5P2 presented at 31 weeks gestational age with known placenta percreta for Cesarean/hysterectomy. She had 2 previous Caesarean deliveries. Her history and physical exam were unremarkable. At 24 weeks in the current pregnancy she developed vaginal bleeding and was diagnosed with placenta accreta. She was admitted for prolonged bed rest, remained stable for seven weeks, but a placenta percreta was confirmed. In the 24 hours prior to surgery her bleeding worsened. Preoperative planning included a multidisciplinary collaboration between obstetrics, urology, gyn/onc, anesthesiology, blood bank and interventional radiology. Concurrent with the patient's wishes the anesthetic plan was to begin with neuraxial anesthesia with likely conversion to general after delivery.

Pre-operatively, 2 16-gauge IVs were placed, and a radial arterial line inserted. A CSE was admistered. While the surgical team prepped, a long 20 gauge antecubital IV was placed. Cystoscopy prior to Cesarean incision was normal. Prophylactic bilateral ureteral stents were placed.

After delivery of a 1.7 kg male (APGARs 8/9), hemorrhage occurred and the obstetricians proceeded to hysterectomy. We converted to general anesthesia and began resuscitation with pRBC's, FFP and a phenylephrine infusion. Her 20 gauge IV catheter was changed to a 7 Fr. rapid infusion catheter. Placental vessels had invaded deep into the retroperitoneum and the bleeding was very difficult to control. Trauma and vascular surgery were called but blood loss persisted for hours, at times as rapidly as 1 liter/minute.

The anesthesia team was divided into roles - one assigned to each of the three IV's, one charted and sent labs every 30 minutes, one checked and distributed blood products and one communicated with the OB team, administered miscellaneous medications (calcium, antibiotics, muscle relaxant, narcotics, anti-fibrinolytics). A dedicated nurse made trips to the blood bank with coolers.

After approximately 7 hours the bleeding was controlled enough with packing and ligation to travel to interventional radiology and branches of the left internal iliac and inferior epigastric arteries were embolized.

Labs upon arrival in the ICU showed a pH of 7.53, a normal ionized Ca++ (nadir was 0.26), lactate was 3 mmol/L (peak = 8.3), Hct was 25% (nadir was 21%). Coagulation profile demonstrated an INR of 1.3 (peak = 1.5), fibrinogen of 203 and platelets of 79,000 (nadir 62 K).

Final totals included EBL > 60 liters, transfusion of 73 units of pRBC's, 72 units of FFP, 66 units of platelets, 12 units of cryoprecipitate, ten liters of crystalloid and a liter of cell saver.

1) Lal DS, Shaz BH. Massive transfusion: blood component ratios. Curr Opin Hematol. 2013 Nov;20(6):521-5.

Abstract #: T-14

Bleomycin induced Pulmonary Toxicity in a Pregnant patient

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Introduction: We present a case of a parturient with history of Hodgkin's lymphoma treated with Bleomycin, who manifested with hypoxia while undergoing C-Section.

Case Report: 37 years female,G3P1,at 37 weeks,with past medical hx of Hogdkin's lymphoma s/p ABVD treatment,on chronic steroids for ITP,GDMA2 and prior C-Section presented to L&D with rupture of membranes. Initial platelet count was 33,000 with giant platelets. Hematology consult recommended to continue steroids during hospitalization and transfuse one unit of single donor platelets prior to C-Section. Patient was transfused one unit of single donor platelets and transferred to OR. Plan was to proceed with GA. Patient was induced with propofol and succinylcholine with rapid sequence induction and intubated for the procedure uneventfully.

At the end of the procedure, patient was spontaneously breathing on 100% oxygen. Desaturation to low 80s was noted. Lungs were auscultated(bilat. Breath sounds),SpO2 monitor was repositioned, ETT was suctioned the patient was positioned head up. Patient continued to desaturate on 100% oxygen but had adequate tidal volumes over 500 ml, was able to sustain a 5 second head lift and had adqueate grip strength. Oxygen saturation improved to mid 90s prior to extubation. Patient was extubated. In PACU patient continued to have oxygen saturations in the mid 80s. Stat chest X-ray, blood gas and CT scan of the chest were ordered. Patient denied chest pain or shortness of breath. Pulmonary consult suggested that hypoxia was probably secondary to basal atelectasis, possible pulmonary toxicity because of bleomycin, supplemental oxygen for SpO2<95% with 2 liters of oxygen via nasal cannula. ABG showed pH of 7.44, PCO2 32, PaO2 126, and oxygen saturation 99%. CT chest showed minimal bibasilar atelectasis and minimal bilateral pleural effusions. Chest X-ray showed increased opacity at medial base. Patient continued to have oxygen saturation of upper 90's throughout this hospital stay.

Discussion: Pulmonary toxicity is well described in patients treated with bleomycin containing regimens for the treatment of Hodgkins lymphoma. Bleomycin binds to DNA and forms a complex with ferrous iron whcih is then oxidized to ferric iron, which results in free radicals leading to cell death. Bleomycin is inactivated by bleomycin-hydrolase, which has markedly decreased activity in skin and lung tissue. The mechanism of lung injury remains unknown. The most common distinct pulmonary syndrome, interstitial pneumoniits, ultimately progresses into pulmonary fibrosis. Clinical features include: nonproductive cough, exertional dyspnea, tachypnea, and cyanosis. Beacause of the resemblance of symptoms to other disease entities, the diagnosis is one of exclusion. Limiting supplemental oxygen is one of the key factors. Although anecdotal,exposure to high inspired oxygen concentrations, even many years following exposure to bleomycin, may increase the risk for pulmonary toxicity.

Abstract #: T-15

Carbs aren't always bad....Starvation ketoacidosis in a parturient with pneumonia.

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Introduction: Anesthesiologists increasingly work as part of a multidisciplinary team caring for medically complex parturients. This requires a greater awareness of medical issues. Metabolic disease was cited in the latest CMACE as one of the causes of indirect maternal mortality.
Starvation ketoacidosis occurs most commonly in the third trimester. Abrupt reduction in carbohydrate intake, coupled with placentally mediated increased insulin resistance, can lead to alternative metabolic pathway activation and severe ketoacidosis with potential for maternal and fetal morbidity. Increased awareness and appropriate treatment of this phenomenon can reduce the risk to both mother and fetus. We present a case of starvation ketoacidosis related to pneumonia.

Case report: A 27 year old G10P1 presented at 36+6 weeks with a 24 hour history of vomiting and anorexia for a week. She complained of recent fever, reduced fetal movements and abdominal pain. She was febrile, tachycardic, tachypnoeic and hypoxic. Arterial blood gas analysis showed metabolic acidosis with pH 7.23 and BE -22, lactate 1.1mmol/l and blood glucose 3.4mmol/l. Blood ketones were 4.6mmol/l. The patient had a radiologically confirmed pneumonia. Alongside fluid resuscitation and antibiotic administration, treatment was with 20% intravenous dextrose and if BMs >8, an insulin infusion. The patient was admitted to the intensive care unit for observation and ongoing fetal monitoring. 7 hours after treatment commenced, the acidosis markedly improved and within 24 hours had completely resolved with normal blood ketones. The patient was discharged on antibiotics and delivered spontaneously at 38 weeks.

Discussion: Starvation ketoacidosis is rare and may not be familiar to the labour ward anesthesiologist. In the absence of glucose as a substrate, there is a switch to free fatty acid production, but accumulation of ketones can lead to metabolic acidosis. Placental glucagon and human placental lactogen cause insulin resistance and therefore increase susceptibility to starvation ketoacidosis in pregnancy, particularly in the third trimester. Diagnosis is made on history, examination and investigations. Ketosis should be considered in the presence of an increased anion gap and normal lactate. Blood glucose should exclude diabetic ketoacidosis. Treatment focuses on providing carbohydrate as a substrate and insulin if needed, alongside necessary fluid resuscitation.

Early recognition is paramount to reduce the risk to both the mother and fetus. In many cases, delivery of the fetus and placenta is required to overcome the acidosis. This case demonstrates that timely management with carbohydrate and insulin can arrest ketogenesis and avoid the need for early delivery.

References:
1. IJOA 2011; 20/3:253-6
2. European Journal of Obstetrics, Gynaecology & Reproductive Biology 2013;167/1:1-7
3. Science 1970; 170:990-992
4. Lancet 1982; i:588-592

Abstract #: T-16

Catheter Replacement Rates In Labor; Combined Spinal-Epidural Versus Epidural technique

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Introduction: The combined spinal-epidural (CSE) technique for labor analgesia possesses several advantages over the traditional epidural (EPI) technique, including faster onset, greater maternal satisfaction, and decreased need for physician boluses.1 We have compared the failure rates between techniques in our tertiary care academic practice.

Methods: Information about failed catheters (FCs) from CSE and EPI techniques was collected prospectively from Oct. 2012-Sept. 2013 as part of our Quality Assurance program. IRB approval was obtained for analysis. FCs were defined as those replaced for being: intravascular (except those noted immediately at placement), one sided, inadequate to provide maternal analgesia or inability to extend the epidural for cesarean delivery (CD). Once a FC was identified, the following information was obtained: age, height, weight, BMI, gravity, parity, skin to epidural space depth, catheter mark at skin, number of physician boluses and time elapsed between placement to identification. Fishers exact test was used to examine the difference in failure rate between the techniques during labor and CD.

Results: During the study period 2780 neuraxial techniques were performed (853 Epi; 1927 CSE), with no demographic differences between the groups (Table 1). A total of 38 CSE (1.97%) and 40 Epi (4.69%) catheters were replaced during labor ($P < 0.001$). 488 patients (310 CSE; 178 Epi, $P=0.002$) required extension of the epidural for CD. FCs during CD were 26 CSE (8.4%) and 18 Epi (10.1%) catheters, $P = 0.314$. CDs that were classified as stat/emergent with insufficient time to allow epidural catheter dosing were excluded from the CD FC analysis.

Conclusion: Reported FC rates vary from 1.6%1 to up to 6.8%2 or higher, depending on physician experience and practice setting. Our data demonstrates that failure rates during labor are lower with CSE than with traditional EPI. The confirmation of needle location with cerebrospinal fluid backflow via the spinal needle after using a loss of resistance (LOR) technique is less subjective than the LOR technique alone. This may be particularly true when procedures are performed by residents. Limitations of our study and analysis include that technique was not randomized, and that we did not collect data regarding the level of experience of the physician performing the technique.

1. Gambling D. Anesth Analg 2013;116:636–43.
2. Pan PH. Int J Obstet Anesth 2004;13:227–33.

Table 1. Demographic/Clinical comparison (expressed as mean (SD) or counts (nulliparous)

	EPID	CSE	Overall	P
n	40	38	78	
Age (yr)	30.6 (6.3)	30.7 (5.3)	30.6 (5.8)	.49
BMI (kg/m^2)	32.2 (8.2)	33.4 (6.9)	32.7 (7.6)	.24
Time until replacement (min)	405 (341) (n=38)	370 (295) (n=33)	389 (318) (n=71)	.68
LOR (cm)	5.75 (1.1)	5.96 (1.35)	5.86 (1.25)	.78
# nulliparous	20	22	42	.50

Abstract #: T-17

Cesarean Delivery During Maternal Sepsis After Platelet Transfusion: Timing is Everything

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Introduction: Platelets (PLTs) are transfused in the US at a rate of 7 million units each year (1), and account for the highest incidence of transfusion-related bacteremia (1 in 100,000 units, compared to 1 in 5,000,000 for packed red blood cells)(2).

Case: A 29 y.o.G2P1 presented at 38 weeks' gestation with a history of chronic thrombocytopenia (PLT count 12-20K) and anemia from primary bone marrow suppression. A multidisciplinary delivery plan was made for PLT transfusion to a goal of 70 x 103 x uL-1, induction of labor, and epidural analgesia. She received a single-donor PLT transfusion just prior to her scheduled induction; while being transfused complained of shortness of breath, chest tightness and back pain. The transfusion was discontinued and the PLT bag sent for analysis. The patient became somnolent, tachycardic and febrile. Blood cultures were drawn and broad-spectrum antibiotics were started. Analysis of the transfusate revealed that it was day 5 of storage and contained gram-positive cocci in chains. Intravenous cefteroline was chosen as an agent that may cross the placenta and provide coverage of presumed, and later confirmed, staphylococcus bacteremia. She required admission to MICU for hemodynamic monitoring. The FH was category I with the exception of fetal tachycardia during maternal fever. Fluid resuscitation for sepsis had caused increased airway edema, with a Mallampati score from 2 to 4 and restricted mouth opening. Her PLTs and hematocrit were 25K and 20%, respectively. A decision was made to postpone cesarean delivery (CD) for time to mitigate airway edema. The patient developed severe preeclampsia after 36 hrs and underwent CD under general anesthesia. Her intubation was performed with a video laryngoscope, grade 1 view. She received PLT and blood transfusions prior to incision. After an uncomplicated CD, the patient was transported to the surgical ICU, and extubated without difficulty several hours later. Clinical status improved, suggesting that the placenta and fetus may have been a nidus for bacteria. However, placental pathology did not reveal infected tissue and the neonatal blood cultures were negative.

Discussion: Transfusion-associated sepsis is a serious complication most commonly attributed to PLTs (1). The risk of sepsis can be lowered through use of single-donor PLTs and shorter storage intervals (3). The altered immune state in pregnancy may render greater risk for developing sepsis after contaminated PLT transfusion. The onset and etiology of sepsis can guide timing of delivery: while worsening chorioamnionitis triggers immediate CD, cases of abrupt bacterial load can be managed differently. Allowing time for this patient to stabilize with antibiotic coverage and diuresis facilitated a favorable outcome after CD under general anesthesia.

1. Breecher et al. Clin Micro Rev 2005
2. Kuehnert et al. Transfusion 2001
3. Morrow et al. JAMA 1991

Abstract #: T-18

Combined Spinal-Epidural: The "Untested Catheter"?

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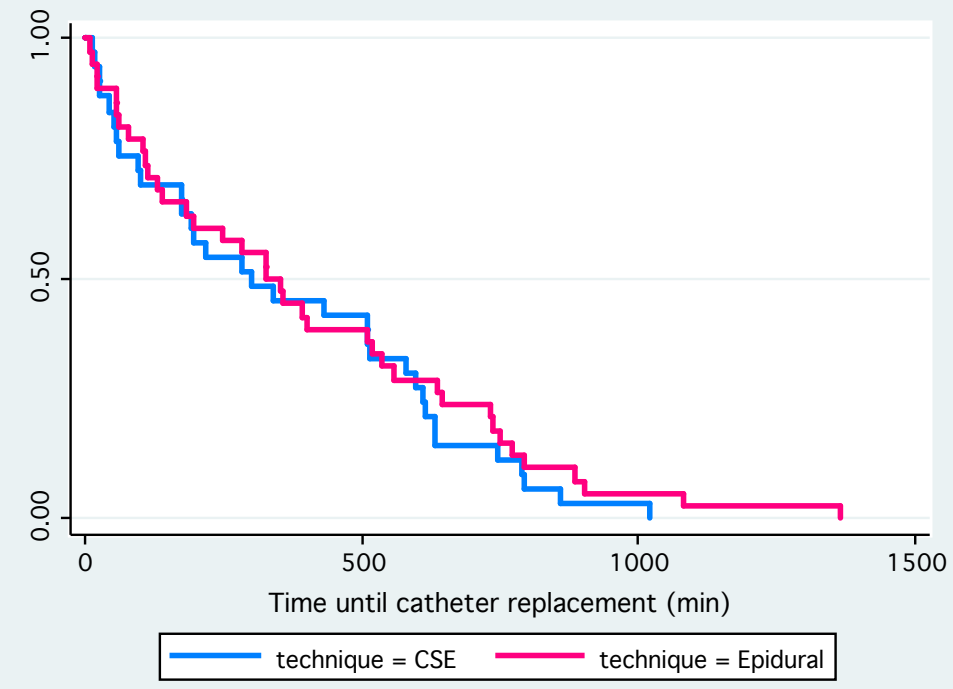
Introduction: Proponents of traditional epidural labor analgesia (EPI) commonly criticize the combined spinal epidural (CSE) technique using the argument of the "untested catheter."1 This historical, unproven theory and belief has limited the use of this technique in some practices. We evaluate the theory of the "untested catheter" in our tertiary care academic practice.

Methods: Information about failed catheters (FC) placed via CSE and EPI techniques was collected prospectively from Oct. 2012-Sept. 2013 as part of our Quality Assurance program. IRB approval was obtained for analysis. FC was defined as any catheter that was replaced after being determined to be: intravascular, one sided or resulting in poor maternal analgesia after appropriate dosing based on the judgment of the attending obstetric anesthesiologist. Once identified, the following information was collected: age, height, weight, BMI, gravity, parity, skin to epidural space depth and catheter mark at skin, number of physician boluses, and time elapsed between placement to the identification of a FC. Kaplan-Meier surivival curves and Cox proportional hazards analysis was performed to determine if a difference exists between the times needed to recognize FC with CSE vs EPI.

Results: During the study period a total of 2780 neuraxial techniques were performed (853 Epi; 1927 CSE). A total of 38 CSE (1.97%) and 40 Epi (4.69%) catheters were replaced during labor (P< 0.001). The mean time to detect failed catheters was 405 min and 370 min for the Epi and CSE respectively, with no statistical difference. Survival analysis (Fig 1) demonstrates that the time course for detection of failure did not differ between CSE and EPI groups.



Conclusion: We were able to demonstrate that there was no difference in time elapsed between placement of catheters and detection of FC using CSE or EPI technique. The mean time for the recognition of a failed catheter was much more than the 1-2 hr period during which the catheter from a CSE could correctly be viewed as "untested." On the other hand, catheters placed using a CSE technique were less likely to fail during labor. These results are consistent with those of Norris et al2 and Gambling et al1. Our findings validate CSE as a reliable technique for labor analgesia and tend to refute the theory of the "untested catheter."

1. Gambling D, Anesth Analg 2013;116:636–43.
2. Norris MC. Int J Obstet Anesth 2000;9:3–6.

Abstract #: T-19

Comparative Effectiveness of Lower Leg Compression Devices Versus Sequential Compression Devices to Prevent Post-Spinal Hypotension during Cesarean Delivery.

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Introduction: Thromboembolic deterrent hose stockings (TEDs) and sequential compression mechanical devices (SCDs) both reduce the incidence of maternal hypotension during cesarean delivery (CD).(1,2) However, the comparative effectiveness of these modalities on preventing post-spinal hypotension has not been investigated. The aim of this retrospective study was to compare the vasopressor requirements and maternal hemodynamics of women who received TEDs vs. SCDs during CD.

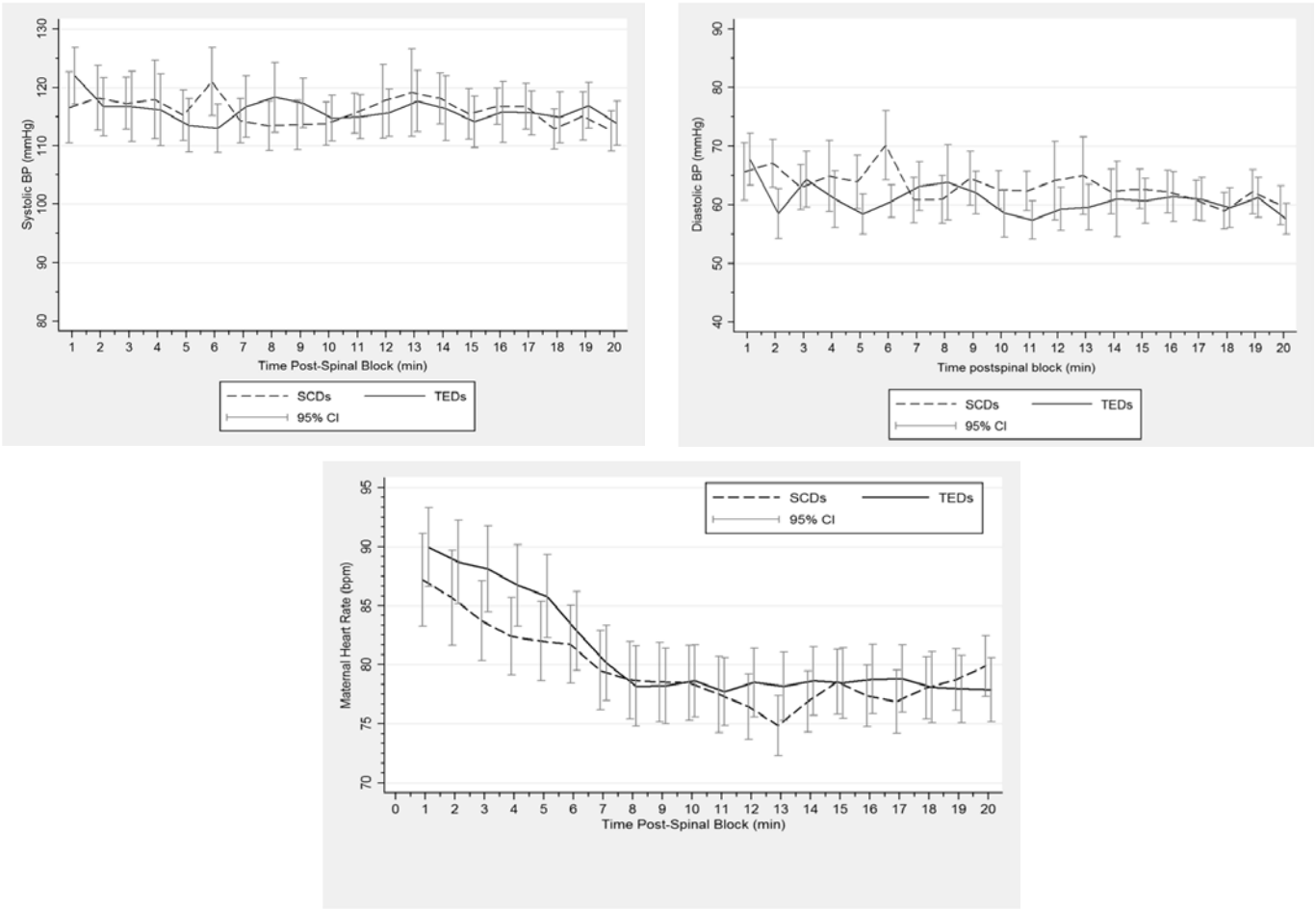
Methods: After IRB approval, we reviewed the electronic medical records of a cohort of women undergoing elective CD under spinal anesthesia before and after we changed our departmental protocol from intraoperative TEDs to SCDs. All patients received a spinal anesthetic (12 mg hyperbaric bupivacaine, fentanyl 10 mcg and morphine 200 mcg), and a fluid preload (500 ml 6% hetastarch+1000 ml lactated ringers). Phenylephrine (PE) boluses were administered to treat post-spinal hypotension. Our primary outcomes were: (i) the incidence of PE use within each group, and (ii) the total PE dose given during CD. Secondary outcomes were: maternal hemodynamic indices (HR, SBP, DBP). We used Mann-Whitney test and Chi-squared/Fisher's tests for continuous and categorical data. Longitudinal analyses of HR, SBP, and DBP were performed using a linear mixed-effects regression model with study group and time as fixed effects. Data presented as median [IQR], n (%); $P<0.05$ as statistically significant.

Results: We extracted perioperative data on 210 women who used SCDs (n=105) or TEDs (n=105). We found no between-group differences in demographic or obstetric characteristics. Within each group, the incidence of intraoperative PE use was high (SCDs=95% vs. TEDs=94%; P=1.0). The median total dose of intraoperative PE given intraoperatively was similar in both groups (SCDs=300 mg [100-450] vs. TEDs=300 mg [100-450]; P = 0.9). We found no between-group differences in maternal HR, SBP and DBP over time. (Figure)

Discussion: Patients receiving SCDs or TEDs have similar pressor requirements and hemodynamic indices during CD. The very high incidence of intraoperative PE use in both groups provides further evidence to substantiate the limited efficacy of pre-spinal interventions (SCDs or TEDs combined with colloid/crystalloid preload) in preventing spinal hypotension during CD.(3)

References:
(1) Cochrane Review 2006, Issue 4: CD002251
(2) Int J Obstet Anesth. 2012;21:140-5
(3) Anesth Analg. 2010;111:1093-5

Figure: Maternal Systolic BP, Diastolic BP and Heart Rate for First 20 minutes After Spinal Anesthesia for Cesarean Delivery



Abstract #: T-20

Comparison of Upper Arm and Wrist Non-invasive Blood Pressure Measurements in Elective Cesarean Delivery under Spinal Anesthesia. Prospective Observational Study.

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Background: Shivering during cesarean delivery (CD) can interfere with upper arm non-invasive blood pressure (NIBP) measurements (1). An audit revealed failure of NIBP measurement to be 38% after epidural top-up and 9% after spinal anesthesia during deliveries in the operating room (2). NIBP measured at the wrist may suffer less shivering interference. We hypothesized that wrist systolic blood pressure (sBP) would accurately trend with upper arm sBP measurements in parturients undergoing elective CD under spinal block.

Methods: After obtaining ethics board approval and signed informed consent, 49 patients were approved on the eligibility criteria and completed the study. After neuraxial anesthesia, sBP measurements were obtained simultaneously from both upper arm and wrist on opposite limbs, using 2 monitors from the same model (Carescape V100, GE Healthcare, Finland). Interval between measurements was 1-2 minutes and data was collected for 20 minutes or until delivery.

Results: Bland-Altman Plots indicating the level of agreement between the methods were drawn for baseline measurements, over multiple measurements and over multiple measurements on percentage change from baseline (20% change in sBP was considered to be clinically significant, as this change normally triggers treatment by the anesthesiologist).
Overall, the wrist NIBP tended to overestimate the upper arm NIBP both for baseline data (sBP bias = 13.4 mmHg; 95% CI = 10.4 – 16.4 mmHg) and for data obtained over multiple measurements (sBP bias = 12.8 mmHg ;95% CI = -11.4 and 36.9 mmHg).

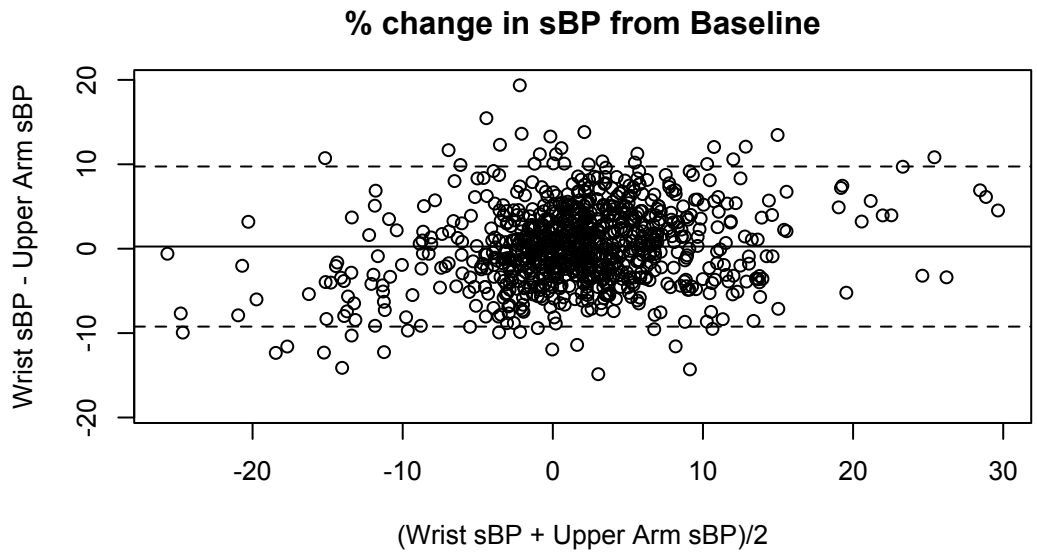
Nevertheless, when we analyzed percentage change, up and down, from baseline over multiple measurements, the mean difference between the wrist and arm sBP was 0.26%, with the limits of agreement between -9.3 and 9.8%.

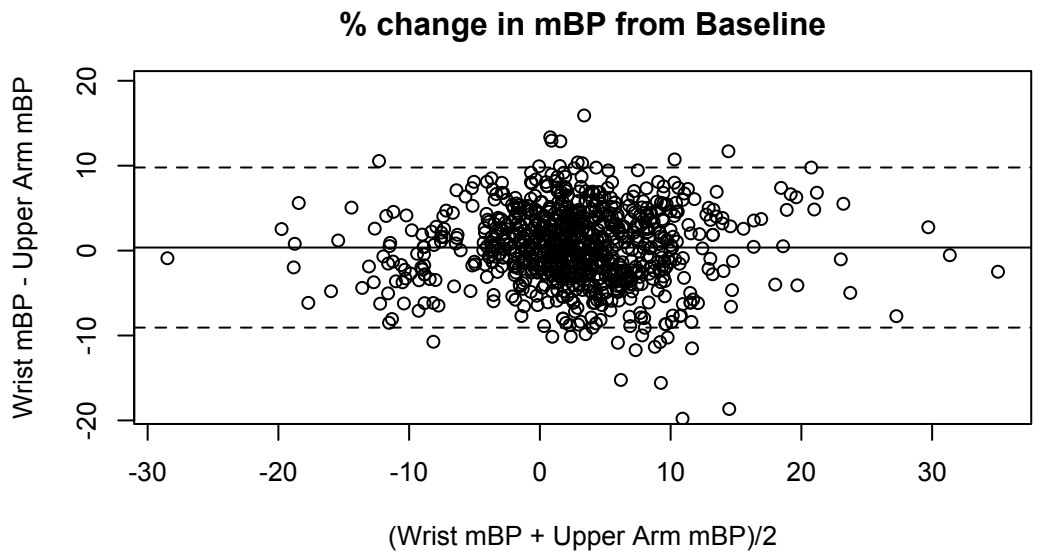
Conclusion: When data was analyzed for agreement of baseline measurements and over multiple measurements, the wrist measurement overestimated the reading on average relative to the upper arm measurement. This was expected, as demonstrated by previous studies (3).

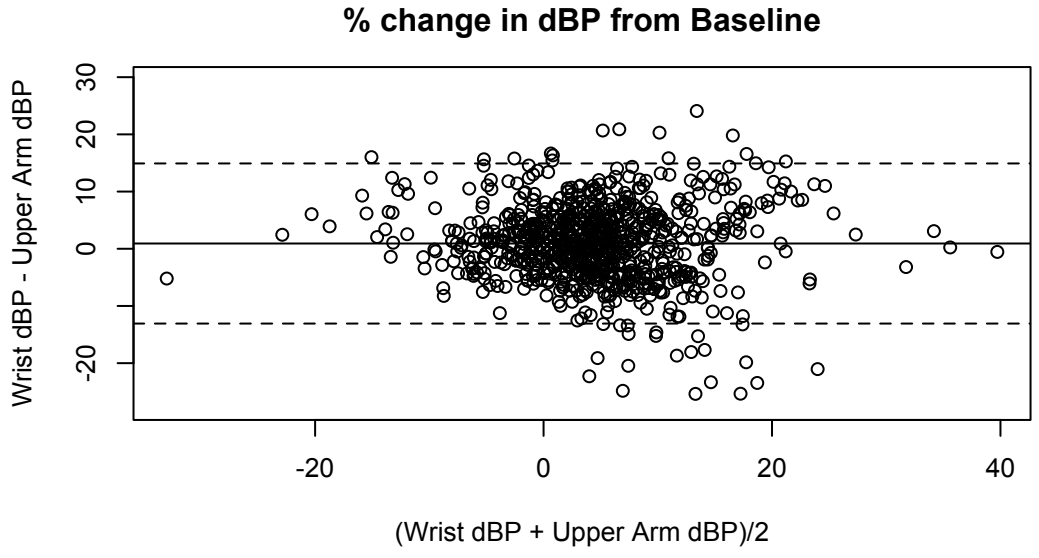
However, when the time-series for each subject is examined for percentage change from baseline, it is clear that the two methods track each other quite well.

This suggests that tracking percentage change of wrist NIBP from baseline may be an adequate substitute for tracking percentage change from upper arm NIBP.

References:
1) Reg Anesth Pain Med 2007, 33, 241-5.
2) SOAP Annual Meeting 2013, S1.
3) Blood Press Monit, 9, 77-81


% change in sBP from Baseline
Wrist sBP - Upper Arm sBP
(Wrist sBP + Upper Arm sBP)/2
-20
-10
0
10
20
30


% change in mBP from Baseline
Wrist mBP - Upper Arm mBP
(Wrist mBP + Upper Arm mBP)/2
-30
-20
-10
0
10
20
30


% change in dBP from Baseline
Wrist dBP - Upper Arm dBP
(Wrist dBP + Upper Arm dBP)/2
-20
0
10
20
30
40

Abstract #: T-21

Description of the Variability in Physical Pain Patterns During Labor and Their Relationships with Fetal Position, Pain Severity, Epidural Use, and Delivery Mode:A Mixed Methods Study

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Introduction: Little published information is currently available related to the nature of physical pain patterns during childbirth or their relationship with birth outcomes. This 2 phase mixed methods study explored and described these relationships during Labor Pain Questionnaire (LPQ) development.

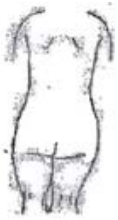
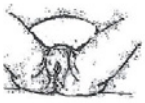
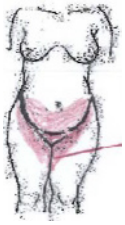
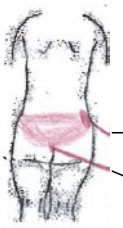
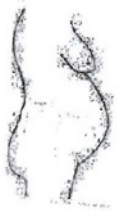
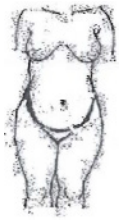
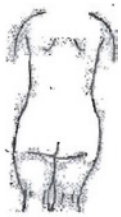
Methods: Following REB approval, healthy, native English-speaking women of mixed parity with term gestations were recruited. Sampling was purposeful and by maximum variation. Phase 1 included 25 women with(n=15) and without(n=10) pain relief delivering by all modes. Phase 2(n=14) explored/described pain associated with fetal malposition and/or pain refractory to epidural analgesia(PREA). Following completion of a survey, women were interviewed using a Pictorial Pain Mapping Tool (PPMT) during which they drew their pain in pictures at 4 time points over labor and delivery and mapped words from a list (or generated new words) to describe their pain. Interviews were conducted during labor and/or postpartum. Details related to pain relief, obstetrical management and delivery were recorded. Qualitative analysis of pain pictures and Number of Words Chosen (NWC) were grouped by parity, delivery mode, epidural use and evidence of fetal malposition or PREA.

Results: Primiparas used > NWC and distress words to describe pain than multiparas. Pain pictures in women with au naturale SVDs, regardless of parity, demonstrated consistent patterns of uterine(UC) and rectal pain over time without the additional forms of pain described by other women (eg back pain, hip pain, electric shocks, neck, shoulder and/or inter-scapular pain). Primiparas with SVDs who used epidurals typically described back pain in addition to UC pain as a prominent early feature of early labor prior to epidural receipt. Women delivered by mid-forceps or c-section and those with fetal malposition received epidural analgesia and described very high levels of breakthrough pain despite frequent, heavy top ups using otherwise normally functioning epidural catheters. Women with persistent occiput posterior (OP) or occiput transverse (OT) fetal head positions described fairly typical patterns of physical pain (OP mid back, OT-hip, Figure 1) in addition to interscapular, shoulder and/or neck pain. This pain was relieved by rotation of the fetal head to occiput anterior or caesarean delivery and worsened by re-rotation of the fetal head and in some women, by injection of epidural solutions. This pain disappeared completely after delivery.

Discussion: Understanding the nature and variability of women's pain experiences, including physical pain patterns, provides important insights into fetal position as a contributor to pain and epidural use. Findings suggest that pain patterns may be prognostic for delivery mode in some women. Findings also provide a framework within which research findings using the Labor Pain Questionnaire may be interpreted and applied to clinical care.

Abstract #: T-21

Pain Diagrams for Primipara, Mid-Forceps Rotation, Occiput Posterior Fetal Head Position

	Uterine Contraction	Back Pain	Side Pain	Rectal/ Vaginal Pain
Uterine Contractions > 5 min apart (Early Labor)	 • Annoying • Troublesome • Cramping • Pressure • Dull • Sharp • Pulsing **NWC= 7 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words** **TOTAL NWC: 7 (EARLY LABOR)**
Uterine Contractions ≤ 5 min apart	 • Unrelenting • Stabbing • Pulsating • Unbearable • Throbbing • Flashing • Apprehensive → **Flashing** • Tearing • Torturing • Splitting • Terrifying • Blinding • Sharp • Splitting • Pressure • Exhausting • Nauseating **NWC= 17 Words**	 • Unbearable • Quivering • Pounding • Exhausting • Sickening • Pinching • Aching • Heavy **NWC= 8 Words** Hip Pain Tailbone Pain	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • Sharp • Stabbing • Annoying • Intermittent **NWC= 4 Words** **TOTAL NWC: 29**
Epidural given at 6 cm				
Fully Dilated	 • Annoying • Troublesome **NWC= 2 Words**	 Upper Back Pain Back Pain Tailbone Pain • Constant • Annoying • Troublesome • Piercing **NWC=4 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • Intermittent **NWC= 1 Word** **TOTAL NWC: 7**
Epidural in situ				
Delivery	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words**	 • **No Words or Pictures Chosen** **NWC= 0 Words** **TOTAL NWC: 0**

Abstract #: T-22

Dexmedetomidine As An Adjunct For Analgesia In A Laboring Patient With Acute Myeloid Leukemia And Circulating Blasts

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Lawrence C. Tsen MD - Brigham and Women's Hospital - Boston, MA
Michaela K. Farber MD - Brigham and Women's Hospital - Boston, MA

Introduction: Newly diagnosed acute leukemia in pregnancy is a rare event that warrants multidisciplinary intervention. The incidence of acute leukemia in pregnancy is estimated to be 1 in 75,000-100,000 pregnancies. [1] Acute myelogenous leukemia (AML) is the most common hematologic malignancy in pregnancy, accounting for more than two thirds of cases. [2] Most frequently detected after the first trimester,[2] acute leukemia in pregnancy presents unique challenges; the timing and mode of delivery relative to initiation of chemotherapy with resulting pancytopenia as well as decisions regarding analgesic or anesthetic management require an analysis of maternal and fetal risks and benefits. We present our management of a patient with newly diagnosed AML for whom neuraxial analgesia was contraindicated due to presence of circulating leukemic blasts.

Case: A 32 year-old primigravida at 34 weeks' gestation presented with an 8-day history of night sweats, fatigue, gingival bleeding, and diffuse musculoskeletal pain. Previously, her prenatal course had been uneventful. Laboratory evaluation revealed leukocytosis (39,000/μL), thrombocytopenia (59,000/μL), and normochromic macrocytic anemia (Hgb 10.1 g/dL; MCV: 103.8μm^3). A peripheral smear demonstrated abundant monocytic forms in all stages of maturation with rare blasts. Bone marrow flow cytometry confirmed AML with monocytic features.

A meeting was held with the patient, her family, and the relevant health care teams (obstetrics, obstetric anesthesia, and hematology/oncology) to facilitate a plan for delivery to enable induction of chemotherapy. Although initial discussion focused on neuraxial techniques, this approach was ultimately abandoned for concern of potential seeding of the central nervous system (CNS) with malignant cells, which has been observed to worsen patient outcome and increase complexity of disease surveillance. [3]

The patient wished to avoid cesarean delivery and general anesthesia, thus labor was induced for anticipated vaginal delivery. Contingency planning included cesarean delivery under general anesthesia and intraoperative placement of a central venous catheter for postpartum chemotherapy. Labor analgesia was requested and achieved with intravenous (IV) fentanyl patient-controlled analgesia (PCA; 13 mcg bolus, 7 min lockout, no basal infusion). Breakthrough pain in the second stage of labor was controlled with IV dexmedetomidine 50 mcg (0.5mcg/kg) infused over 10 minutes. Successful analgesia was achieved without adverse effect. The patient had an uncomplicated vaginal delivery and chemotherapy was initiated.

Discussion: We present a management strategy for a parturient with new-onset AML and circulating blasts. In such patients, for whom neuraxial techniques are contraindicated, fentanyl PCA with dexmedetomidine infusion provide alternative analgesic options.

REFERENCES
1. Brenner B et al. Lancet 2012
2. Chelghoum Y et al. Cancer 2005
3. Gajjar A et. al. Blood 2000

Abstract #: T-23

Double Blinded Randomized Placebo Controlled Study in Evaluating the Effectiveness of IV Acetaminophen for Acute Post Operative Pain in C-Section patients.

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Betty Hua MS - Albert Einstein College of Medicine - Bronx, NY
Juan Davila MD - Albert Einstein College of Medicine - Bronx, NY
Singh Nair PhD/ MD - Albert Einstein College of Medicine - Bronx, NY
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Introduction: With nearly a third of deliveries in the United States being via cesarean section (CS), pain management and other related post operative care are becoming an ever increasingly important topic. Post operative pain management after C-section is managed in the same multimodal manner as any other surgery. Any medication given to the mother should be very effective and at the same time free from side effects, not only for the mother but also for the newborn. We hypothesize that IV acetaminophen will reduce post operative opioid requirements and opioid associated complications.

Objectives: The primary objective of the study was to evaluate the effectiveness of IV acetaminophen in reducing 24 hour opioid requirements in the CS patient population.
Secondary endpoints evaluated the effectiveness of IV acetaminophen in reducing the amount of rescue medications as well as reduce the Visual Analog Score (VAS pain score) in the two groups. Additionally, the sedation level in the two groups and the time till passing of first stool after the surgery were monitored. Lastly, the patient's overall anesthesia satisfaction were compared.

Methods: This is a randomized, placebo-controlled study that assigned patients either to receive IV acetaminophen or a placebo. Full term CS patients aged 18 or above, who are classified as ASA I-III were consented during their pre-natal visits. On the day of C-section, hospital pharmacy, which was not part of the data collection, randomized the patients to one of the two groups. As the routine standard of care, all the patients undergoing C-section received intrathecal 0.75% hyperbaric bupivicaine with morphine and fentanyl. Upon umbilical cord clamping in the OR or immediately after delivery; patients received the first dose of 1g IV acetaminophen (or placebo) followed by three more 1g doses every 6 hours. During the routine nursing evaluation, if the VAS pain score was greater than 5, rescue oxycodone per os was given every 2-4 hours until pain was controlled. If the pain was still uncontrolled, more opioid based pain medication was provided as per the discretion of the treating physician. Rescue pain medication was available for both groups. A research assistant who was blinded to the group assessed the pain score every 8 hours until 48 hours had passed since surgery. The amount of opioid required and patient level of sedation was recorded at the same interval. Additionally, patients were asked about other adverse events like nausea, vomiting, pruritus and breathing difficulties. On the day of discharge, the patients were asked for their overall pain management satisfaction level. All other adverse events recorded by the nurse were also collected.

Results: This study was completed this week. Interim analysis was limited by the blinded nature of the study. At this time, unblinding and analysis will begin. We look forward to sharing all the findings when presented.

Abstract #: T-24

Effects of regular intermittent bolus and continuous infusion on maternal fever during epidural labor analgesia

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Co-Author: Shi Q Xu M.D. - Nanjing Maternity and Child Health Care Hospital Affiliated to Nanjing Medical University - Nanjing, Jiangsu
Xian Wang M.D. - Nanjing Maternity and Child Health Care Hospital Affiliated to Nanjing Medical University - Nanjing, Jiangsu
Fu Z Wang M.D. - Nanjing Maternity and Child Health Care Hospital Affiliated to Nanjing Medical University - Nanjing, Jiangsu
Xiao F Shen M.D. - Nanjing Maternity and Child Health Care Hospital Affiliated to Nanjing Medical University - Nanjing, Jiangsu

Background: Epidural labor analgesia is associated with maternal fever. On- demand intermittent epidural injections showed a lower incidence of intrapartum fever than continuous infusion during early labor analgesia. The aim of this study was to determine the accidence of maternal fever of regular intermittent epidural bolus and continuous infusion during labor analgesia.

Methods: After establishing epidural analgesia with 10 ml of 0.125% ropivacaine + 0.4 μg•ml-1 sufentanil, all parturients received either regular intermittent bolus (RIB, n= 66) or continuous infusion (CI, n= 66) epidural labor analgesia. In the RIB group, bolus dose of 10 ml of 0.08% ropivacaine + 0.4 μg•ml-1 sufentanil was manually given hourly beginning 75 min post analgesia; In the CI group, the same solution was continuously infused at a constant rate of 10 ml•h -1 beginning 15 min post analgesia. All patients had breakthrough pain were administrated initially with 5 ml of 0.08% ropivacaine + 0.4 μg•ml-1 sufentanil followed by 5 ml of 0.15% ropivacaine. Maternal tympanic temperature was measured and peripheral venous blood was drawn before epidural analgesia and hourly thereafter until 1 h post partum. Cord blood was drawn post delivery and baby's temperature was recorded at 30 min post delivery. The incidences of fever (≥ 38 degrees Celsius) were calculated and blood samples interleukin- 6 (IL- 6) levels were measured. The effects on labor outcome in both groups were also compared.

Results: One hundred and twenty- five subjects completed the study protocol and were finally included in the analyses. The hourly (Table 1), total incidence of maternal fever (6/63 in RIB vs. 8/62 in CI, P= 0.549), and baby's temperature were similar between the two groups. Mean maternal temperatures gradually rose over time in both groups but the differences did not reach statistical significance at any time points between two groups, maternal serum IL- 6 presented similar changes.

Conclusion: Regular intermittent bolus demonstrates similar incidence of maternal fever compared to continuous infusion for epidural labor analgesia. IL-6 elevation could be involved in the increase in mean maternal temperature.

Table 1. Incidence of maternal fever.

Time	RIB group	CI group	*P* Value
1 h	0 (63)	0 (62)	-
2 h	1 (63)	2 (62)	0.989
3 h	0 (57)	2 (58)	0.496
4 h	2 (47)	4 (50)	0.731
5 h	4 (31)	5 (33)	1.000
Delivery	6 (63)	7 (62)	0.746
1 h post delivery	4 (63)	5 (62)	0.980
Total	6 (63)	8 (62)	0.549

Values are positive (total).

RIB: regular intermittent bolus; CI: continuous infusion.

References
1. Int J Obstet Anesth 2008; 17:123- 9.
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3. Am J Obstet Gynecol 2006; 195: 1031- 7.
4. Obstet Gynecol 1995; 86: 783- 9.
5. Anesthesiology 1999; 90: 1271- 5.
6. Anesthesiology 2002; 96: 546- 1.

Abstract #: T-25

Elective Caesarean Delivery in a Patient with Spondylometaphyseal Dysplasia

Presenting Author: Spencer H Menees M.D.
Presenting Author's Institution: Mayo Clinic - Rochester, MN
Co-Author: Spencer H Menees M.D. - Mayo Clinic - Rochester, MN
Adam K Jacob M.D. - Mayo Clinic - Rochester, MN

Case Report: 29 year-old G1PO at 28 2/7 with spondylometaphyseal dwarfism admitted for increasing shortness of breath from progressive pulmonary compromise related to body habitus and a phenotypically normal fetus. The patient noted progressive orthopnea and dyspnea on exertion. Her medical/surgical history was significant for asthma, GERD, gastroparesis, depression, and 2 lower extremity procedures with straightening pins. She was admitted for 40 days prior to the procedure for monitoring of pulmonary function. Unless there were earlier fetal or maternal indications, the plan was to proceed with elective Cesarean delivery at 34 weeks gestation via classic vertical incision and hysterotomy. On the morning of surgery, her airway exam showed intact dentition, Mallampati III, short thyromental distance, adequate mouth opening, short neck, and limited neck extension. Prior to induction, an L3-4 epidural was placed in the sitting position for postoperative analgesia in anticipation of pain from the classic incision and existing pulmonary compromise. Rapid sequence induction was performed with lidocaine, propofol, and rocuronium. A video laryngoscope was utilized with a 5.0 millimeter endotracheal tube. The vocal cords were seen with some difficulty, and the tube passed after 2 attempts. She delivered a healthy fetus (APGAR: 2 at 5 min, 8 at 5 min) through a low-transverse incision and had an uneventful intraoperative course. After delivery, the epidural was loaded with 2 mL bupivacaine 0.5% and morphine 2 mg. She was extubated after the procedure, and, per patient request, the epidural was removed that evening. She was dismissed home on postpartum day 4.

Discussion: These patients may present unique challenges to the anesthesia provider including: difficult intubation, difficult ventilation secondary to restrictive lung disease, cervical cord compression and instability, difficult regional placement, and potential need for prolonged respiratory support. Our patient had progressive pulmonary compromise from her short stature and phenotypically normal fetus; therefore, adequate postoperative analgesia was necessary to prevent pulmonary complications. The use of regional anesthesia has been described in patients with spondylometaphyseal dysplasia, but the risk of extensive or unreliable spread of neuraxial anesthetic is increased. Given the unpredictable spread of neuraxial anesthesia and baseline orthopnea, we elected to proceed with general anesthesia for the case and neuraxial analgesia for pain control. Fortunately, obstetricians were able to perform a low transverse incision and the patient was highly motivated to return to baseline activity. Pain control was adequate with single injection epidural morphine, oral opiates, and multimodal analgesia.

References: 1) Walters BA, et al. Am J Med Gen 2004;129A(3):265-76. 2) Benson KT, et al. Anesthesiology 1985;63:548-50. 3) Kumar MM, et al. Int J Obst Anesth 2002; 11(3): 225-7.

Abstract #: T-26

Entering paper-based medical records into a simple, low-cost database in a low resource country allows for more effective tracking of quality and outcomes measures.

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Petermann Cynthia -- - None - None, None
Haruna Rabiatu -- - Ridge Regional Hospital - Accra, Greater Accra
Adeyemi J Olufolabi MB BS - Duke University Hospital - Durham, NC

Background: Ridge Regional Hospital in Accra, Ghana, entered into collaboration with Kybele (Kybele, Inc., Winston-Salem, NC), in 2007 to advance the care of pregnant women and newborns. The hospital uses a paper-based medical record. In 2011, we designed and developed a low-cost database (MS Access, Microsoft Corporation, Redmond, WA) to store specific data points related to the pregnancy, delivery and neonatal outcome of each patient. This database was designed to work alongside the paper-based health records at Ridge Hospital, not as a replacement. After delivery, a patient's chart is forwarded to a medical records employee who transcribes approximately 50 data points into the database. The aim of this project was to validate the accuracy of data entry into the electronic database performed by a single individual.

Methods: We selected 6 data points that we considered important variables to follow, each of which are collected at the time of admission or immediately following delivery: Age, blood pressure, presence of proteinuria, fetal heart rate, delivery method (vaginal delivery vs. cesarean), and Apgar scores (1 and 5 minutes).

We determined the number of charts necessary to sample 5% of deliveries over a 3 month period, and then randomly selected the necessary number of charts. Each paper chart was reviewed by a medical records employee who was blinded to the database data. This employee read aloud each of the six data points of interest, while a researcher (WN) viewed the corresponding database data. Each data point was evaluated individually, and inconsistencies between the paper charts and the database records were noted.

Results: A total of 1511 deliveries occurred from October 1, 2013 through December 31, 2013. We reviewed 5% (76) of these charts and evaluated 6 data points per chart, for a total of 456 data points. There were 11 discrepancies noted during the comparison of paper charts and database records, yielding an error rate of 2.41%. (See attached table.)

Conclusion: This retrospective sampling suggests that paper-based medical information can be entered into a low-cost electronic database by a dedicated employee with a high degree of accuracy. Converting key obstetric patient data from a paper-based format to a simple database, although labor intensive, allows non-technical end-users to easily generate clinical outcome and quality measure reports on a more frequent basis than would otherwise be possible with only paper-based data.

Database Errors by Month and Data Point						
	Age	**BP**	**Proteinuria**	**FHR**	**Apgars**	**Delivery Method**
October 2013 (500 deliveries, 25 charts reviewed)	0	0	0	0	2	1
November 2013 (540 deliveries, 27 charts reviewed)	0	2	0	1	1	1
December 2013 (471 deliveries, 24 charts reviewed)	1	0	1	0	1	0
Total Errors	**1**	**2**	**1**	**1**	**4**	**2**

Abstract #: T-27

Equilibrium of acidifying and alkalinizing metabolic acid-base disorders in severe preeclampsia

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Co-Author: Bennie Combrink MD - University of Cape Town - Cape Town, Western Cape
Pascal Vuilleumier MD - University of Washington - Seattle, WA
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Robert Dyer PhD - University of Cape Town - Cape Town, Western Cape
Ruth Landau MD - University of Washington - Seattle, WA

Background: Acid-base (AB) disorders are associated with clinical outcome in critically ill patients. Conflicting results exist with regard to the metabolic AB status of severe preeclampsia, when the traditional concept of AB analysis is applied. The influence of common disturbances of water, electrolytes and albumin on AB status in preeclampsia has not been studied. The aim of this study was to clarify AB status in early and late onset severe preeclampsia by applying the physico-chemical approach (Stewart-Gilfix method) (1,2) in AB analysis, and therefore describing all independent parameters affecting womens' AB status.

Methods: 49 women with severe preeclampsia (24 at <34 weeks gestation [early onset] and 25 at >34 weeks gestation [late onset]) (PE gp) were enrolled in this prospective case-control study. 20 healthy non-pregnant women (NPW gp), and 45 healthy pregnant women, (HPW gp) equally distributed from 26-40 weeks gestation. AB analysis was performed at the time of diagnosis of the disease, before induction of labor, or with the decision to perform emergency cesarean delivery. AB status was analyzed applying the Stewart-Gilfix method. Power analysis was based on expected strong ion difference (α 0.05 and β 0.95); AB parameters were compared using one-way ANOVA.

Results: When compared with the NPW gp, we found respiratory alkalosis with metabolic compensation in the HPW gp ($PvCO_2$=36±5 mmHg), due to a decreased strong ion difference (SID) and increased strong ion gap (SIG), resulting in a net base excess (BE)=-3.5±1.9 mEq/L and vpH=7.39±0.03. There was no difference between the HPW and PE gps (BE=-3.9±2.6, vpH=7.41±0.03), however when analyzing factors determining BE, we find a hypoalbuminic alkalosis offset by hyperchloremic acidosis in preeclamptics, which explains a similar net BE. There was no difference in the accumulation of unmeasured anions (BE(UMA)), lactate (BE(Lac)) or free water (BE(Na)) between HPW and PE (Fig).

Conclusion: This is the 1st study demonstrating that while AB status in severe preeclampsia appears to be similar to that in healthy pregnant women, there is in fact a balance offsetting hypoalbuminic alkalosis and hyperchloremic acidosis. The clinical implications of these novel findings require further analysis to determine whether this measure can be used to monitor the severity of the disease.

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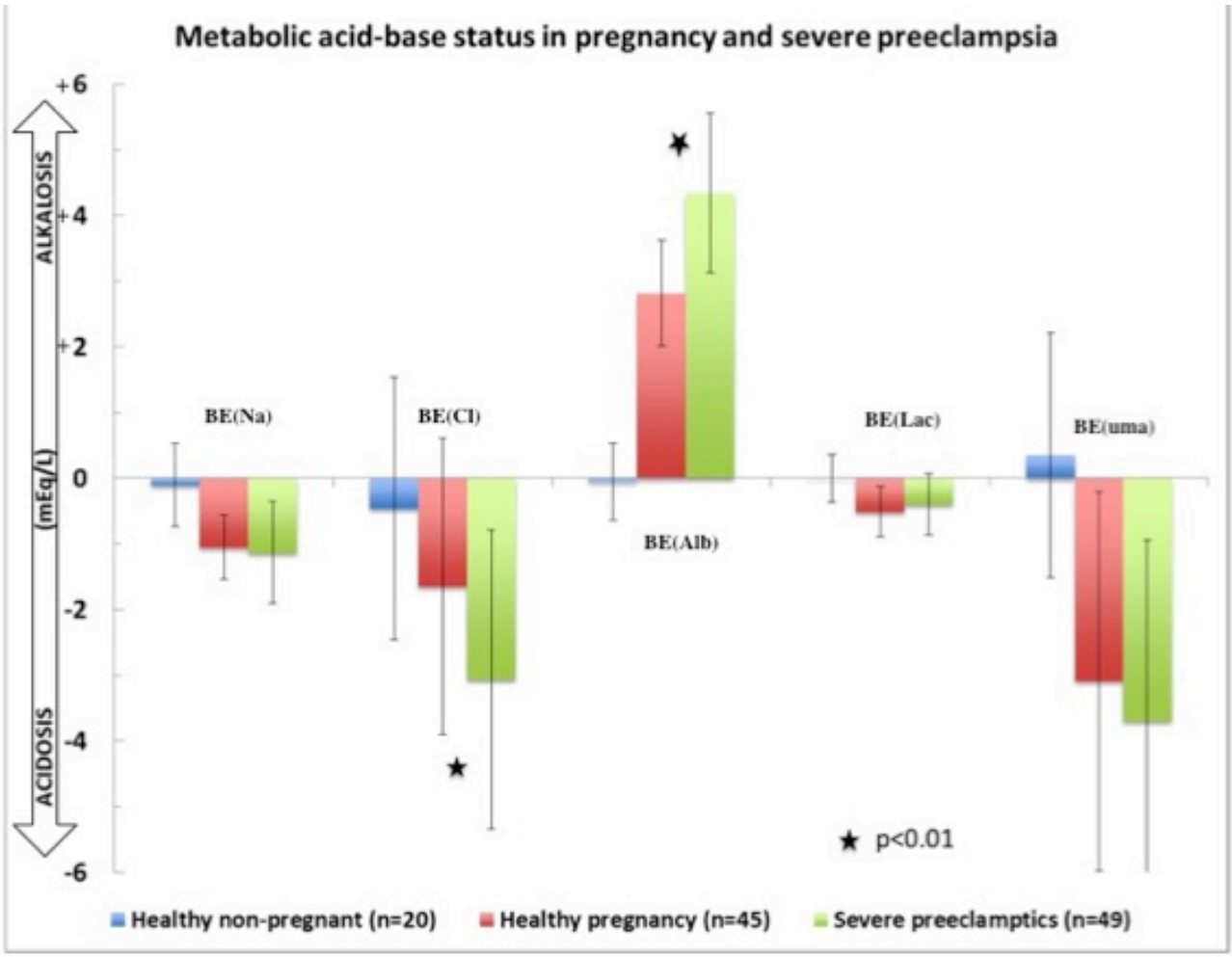

Figure: Metabolic acid-base (AB) status in non-pregnant women, healthy pregnancy and severe preeclamptics.
AB analysis was performed using the Stewart-Gilfix method, based on the concept that net base excess (BE) is determined by effect of free water excess BE(Na), changes in chloride BE(Cl), albumin BE(Alb), lactate BE(Lac) and the accumulation of unmeasured anions BE(uma), resulting in the equation: **BE =BE(Na)+BE(Cl)+BE(Alb)+BE(Lac)+BE(uma)**
Comparisons between healthy pregnant women and women with severe preeclampsia demonstrated an increased hypoalbuminic alkalosis that was offset by hyperchloremic acidosis.
There was no difference in BE(Na), BE(Lac) or BE(uma) between these 2 groups.

Abstract #: T-28

Experiences with Labor Epidural Analgesia: A Qualitative and Quantitative Analysis

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Objective: Most women who give birth in U.S. hospitals receive neuraxial analgesia to manage pain during labor. This analysis used both quantitative and qualitative methods to characterize women using epidural analgesia (EA) and to examine themes of the patient experience of EA among a national sample of U.S. mothers.

Methods: Data are from the Listening to Mothers II survey, conducted among a nationally representative sample of women who delivered a singleton baby in a U.S. hospital in 2005 (N=1,573). We examined the association of EA use with maternal characteristics and obstetrical/clinical factors using multivariate logistic regression. We also analyzed open-ended responses about the best and worst parts of women's birth experiences for themes related to EA.

Table 1. Sample quotations for identified themes.

Theme/subtheme	Sample quotation
Effective pain relief	Epidural. That was the most amazing thing I ever experienced while giving birth. I was able to enjoy the experience without the distraction of pain.
Timing	
Waiting in pain	Nurses did not get the original message that I wanted the epidural, and ended up having to wait about 1 hour for it
Late in labor	I requested [the] epidural when I was 5-6 centimeters dilated. It took a long time to arrive, over an hour… I think I was in transition... Had epidural too late and would have liked to been advised not to take epidural because I was in transition.
Wore off too soon	The epidural wearing off twice and the horrible pain of giving birth. (worst part)
Information and consent	When I was first given the epidural, as they were putting it in, my vitals crashed and I passed out...that was really scary because no one had discussed that as a risk or possibility and I was terrified when I started to get dizzy and cold and sweaty and I was scared because they had sent my husband out of the room and I didn't understand.
Adverse effects	After receiving the epideral, my left leg went completely numb during labor, making it difficult to push
Plans and expectations	I originally wanted to give birth without an epidural, but changed my mind about 14 hours after labor began. For a while I felt a little guilty about 'giving in', but came to realize that each labor is different and a 'woman's got to do what a woman's got to do'.

Results: Seventy-four percent of women in the sample used EA. Factors associated with higher odds of EA use were private insurance (vs. public, Adjusted Odds Ratio [AOR] 2.03; 95% Confidence Interval [CI] 1.29, 3.20), residence in the West census region (vs. Northeast, AOR 2.19; 95% CI 1.18, 4.05), previous cesarean delivery (AOR 3.59, 95% CI 1.19, 10.88), oxytocin use (AOR 2.55; 95% CI 1.70, 3.83), and labor induction (AOR 1.61; 95% CI 1.07, 2.43). Multiparous women and women who believed that birth was a process that should be minimally interfered with had lower odds of EA use.

In the qualitative analysis, we found that effective pain relief from EA was frequently reported as a positive aspect of their birth experience. Many women perceived timing-related challenges with EA, including waiting in pain for EA, receiving EA too late in labor, or feeling that the pain relief from EA wore off too soon. Other important themes in women's experiences with EA were information and consent, adverse effects of EA, and plans and expectations.

Conclusion: Findings from the qualitative analysis underscored the fact that women appreciate the effective pain relief that EA can provide during childbirth. The quality of women's birth experiences is affected by their level of pain control, but also by other factors over which clinicians have some degree of influence. Anesthesiologists can work with obstetric clinicians, nurses, childbirth educators, and with pregnant and laboring patients to help mitigate some of the challenges with timing, communication, EA administration, or expectations that may have contributed to negative aspects of women's birth experiences.

Abstract #: T-29

Extubation in the Third Trimester: Airway Edema, Leak Tests, and Tube Size Dilemmas

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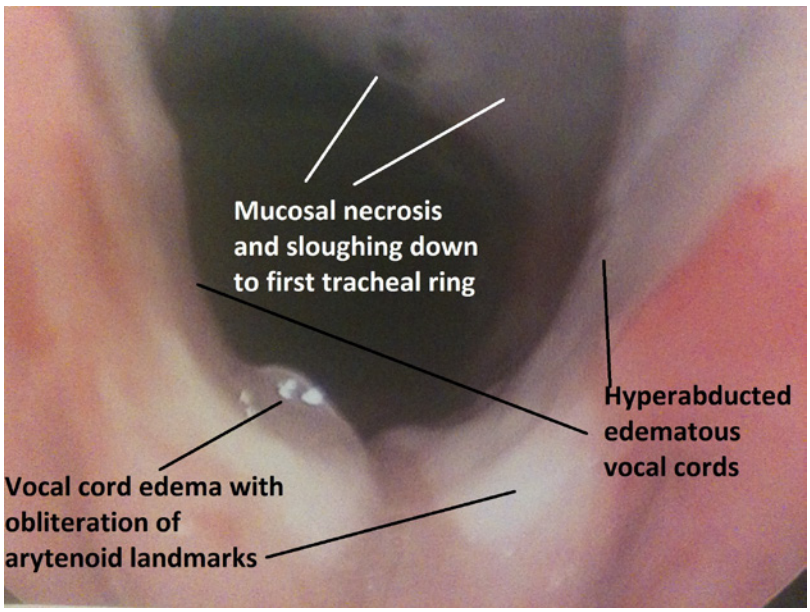
A 22 y/o G3P0 at 33 weeks was admitted in transfer from an outside hospital where she had presented with a rapid onset of obtundation requiring tracheal intubation for airway protection. The intubation was described as easy and atraumatic via direct laryngoscopy (DL) and a 7.5 mm ID endotracheal tube (ETT). MRI revealed bilateral thalamic infarcts due to emboli from sterile vegetations on the mitral valve in the setting of Antiphospholipid Syndrome (APS).

At 48 hours, extubation was considered but the cuff leak test (CLT) was negative. After IV methylpredisolone 20mg q4h x 4 doses and diuresis CLT remained negative. Following a further 48 hours of dexamethasone IV and more diuresis, the ICU, anesthesia, and ENT teams felt that the 7.5 ETT was the source of the negative CLT rather than airway edema due to pregnancy or any other laryngo-tracheal pathology. Extubation in the OR with ENT standby was planned. Prior to extubation, the onset of recurrent variable fetal heart rate decelerations prompted a semi-emergent cesarean delivery. After delivery of a premature neonate under GA, micro DL revealed the injuries outlined in the Figure. In light of the airway injuries and the high probability of developing sub-glottic stenosis during healing, the trachea was then reintubated without difficulty and a tracheostomy was performed with a 4.0 cuffed Shiley tube.

APS presents many challenges in the care of parturients, including a higher risk for pre-eclampsia and other causes of CNS dysfunction. The coordination of antithrombotic therapy and anesthesia care is a common concern, while maternal thrombosis and stroke during anticoagulation as occurred in this case is rare.

Obstetric anesthesiologists are very aware of the need for small ETTs in pregnancy, but in this case the large ETT used was chosen outside the obstetric anesthesia setting. The cautious approach toward extubation was based on the recurrently negative CLT and the effect that a difficult reintubation might have on maternal/fetal wellbeing. The CLT has been shown to have poor predictive value for decision making for reintubation. This report illustrates the injuries that can be caused by too large an ETT and suggests that a negative CLT with a large ETT in pregnancy may be an impetus, not a contraindication to extubation or ETT exchange.

Figure. Larynx immediately following the delivery of the baby, after 5 days of intubation



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Abstract #: T-30

Gastric ultrasonography in the fasted term pregnant women scheduled for elective Cesarean delivery: a prospective descriptive study

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Introduction: Pulmonary aspiration of gastric content is one of the most feared complications in obstetric anesthesia. Bedside gastric ultrasonography (US) can be reliably performed by anesthesiologists [1] to assess gastric content in the perioperative period,[2] and may be useful in risk assessment and clinical management. We aimed to describe the qualitative and quantitative US assessment of the gastric antrum in fasted pregnant women.

Methods: Prospective, descriptive study in non-laboring pregnant women at term scheduled for elective cesarean delivery. Subjects were examined after a minimum period of overnight fasting (solid food-8 hrs; clear fluids-2 hrs) and prior to the cesarean delivery. Two anesthesiologists performed a standardized scanning protocol of the gastric antrum: subjects on a 45-degree semi-recumbent position, first supine and then in the right lateral decubitus (RLD), using a 2-5 MHz curvilinear array transducer in a sagittal to right parasagittal plane on the epigastric area. Based on the qualitative assessment of the antrum, subjects were classified following a 3-point grading system [2]: grade 0, the antrum appears empty; grade 1, small fluid volume only seen in RLD suggesting residual gastric secretions; and grade 2: larger fluid volume seen both in supine and RLD. In addition, quantitative assessment was performed using 3 still images of the antrum at rest (between peristaltic contractions) in RLD to measure the cross-sectional area (CSA) with aid of the built-in caliper.

Results: We have recruited 40 of the 110 planed subjects. Age, height, weight, BMI, and gestational age: mean (SD) of 35.6(5) years, 163.1(8.2) cm, 79.1(15.3) kg, and 29.6(4.7) kg/m2, 38.6(0.9) weeks. Fasting period for solid food and clear fluids: median (IQR) of 13(3) and 3.75(6.5) hours. Qualitative assessment: grade 0 (18/40,45%), grade 1 (22/40, 55%), and grade 2 (0%). Quantitative assessment, mean (SD) [min-max] of CSA in RLD: 4.71 (2.1) [1.8-9.7] cm2. The qualitative grading system showed significant differences for the CSA in RLD: grade 0= 3.11 (0.8) cm2; and grade 1=6.09 (1.8) cm2; p-value<0.0001. There was no correlation between hours of fasting and CSA or qualitative grade.

Discussion: All women in our study presented with antral CSA compatible with residual gastric fluid.[3] Furthermore, applying the predictive model obtained in non-pregnant population,[4] our subjects presented with gastric volumes no greater than 110 ml. The qualitative 3-point grading system may be used to assess individual risk of perioperative gastric content aspiration. The quantitative measurement of antral CSA is a promising tool for predicting gastric fluid volume.

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Abstract #: T-31

Genetic analysis of >2000 cardiovascular candidate genes with pre-eclampsia in women of European, African-American and Hipanic Ancestry

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Introduction: Pre-eclampsia (PE), a common pregnancy disorder, can result in severe maternal and neonatal complications. It accounts for 10-15% of maternal deaths worldwide. PE also increases long-term maternal risk of cardiovascular diseases, including 4-fold increased risk of hypertension, and 2-fold increased risk of ischemic heart disease, stroke, and venous thromboembolism. The genetic basis of PE is unknown. Defining its causal genetic architecture should inform disease prediction, diagnosis, therapy and prevention of future cardiovascular risk.

Methods: To identify novel PE genes, we performed a multi-ethnic case-control study (n=640 cases/1,457 controls) using samples from 5 U.S academic medical centers. Genotypes were generated using a cardiovascular gene-centric SNP array comprising 2,000 genes selected based on prior genetic studies of cardiovascular diseases and on pathways expected to be important in cardiovascular disease. An additive genetic model with 10 principal components and clinical site of collection as covariates was used to test for genetic association in the European samples (516 cases/1,097 controls). For African-American (18 cases/67 controls) and Hispanic (106 cases/293 controls) samples, we assigned local ancestry at each genotyped position and employed a statistical framework combining SNP and admixture association, increasing power to detect genetic effects in these ethnic groups. Results across ethnicities were combined using a fixed-effects, inverse variance meta-analysis method. Pathway analysis was performed using a gene-set enrichment approach (MAGENTA).

Results: After quality control, 36,404 SNPs were available for association analysis in Europeans. No study-wide significant ($P<2x10-6$) associations were observed, but suggestive associations ($P<10-5$) were seen with SNPs in the genes Suppressor of Ty, domain containing 1 (S. cerevisiae) (SPTY2D1: OR (95%CI) 1.51 (1.27-1.80)) and pleckstrin homology domain containing, family G (with RhoGef domain) member 1 (PLEKHG1; 1.52 (1.26-1.82)). In multi-ethnic meta-analyses, the PLEKHG1 gene association retained strongest evidence of association, and additional suggestive signals at NRG3, PTGIS and GAB2 were observed. Pathway based analysis in Europeans highlighted 'retinol dehydrogenase activity' as the most significant gene ontology (GO term; $p=3.0x10-4$).

Conclusion: While replication studies are required to validate our findings, this study offers possible insights into the etiology of PE and demonstrates the added value of admixture analysis and multi-ethnic studies to the search for susceptibility genes for PE.

Abstract #: T-32

Improving STAT Cesarean Performance Through Industrial Engineering

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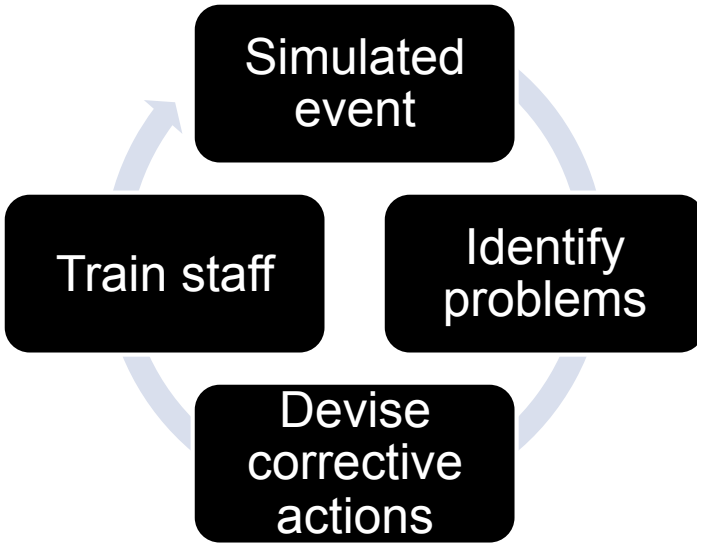
Background: The risk of emergency cesarean delivery is present during labor. Several critical steps are necessary in order to carry out emergent delivery without error, miscommunication, and delay. Not surprisingly, the complication rate in emergency cases is much higher than elective cases.1 It seems unlikely that the classic controlled trial would affect a significant improvement in a complex process. Plan-Do-Check-Act methodology (PDCA) is an industrial engineering tool that identifies and corrects complex processes in a systematic way.2 We hypothesized that PDCA methodology alongside STAT Cesarean simulation could be utilized to reduce error and create efficiencies in care.

Methods: Between 2/2011 and 1/2014, we conducted in situ STAT cesarean simulations every 4-6 weeks. We used the PDCA model to 1) define the process components, 2) identify errors and variations of practice, 3) develop and train standardized practices (Fig.). Simulations were audited by observers and intermittently filmed. Staff involved in the simulation debriefed to obtain process improvement input. Changes were planned after sessions in an iterative fashion, and staff education was performed prior to the next session.



Results: Several process categories were identified: Transport, Communication, Safety, OR Setup, Patient preparation. A total of 37 major process changes have been standardized to date, with significantly fewer in the later sessions ($P<0.05$). Initial process changes focused on transport, communication and staff roles, as it was found that providers generally focused on their individual role rather than on the coordination of the team. Later changes focused on introducing safety and team coordination. Several process changes required multiple iterations to perfect. Safety changes that were incorporated included timing of surgical item counts, skin prep, airway equipment, timeout scripting, and DVT prophylaxis. There was also a decrease in time to skin incision and instrument count on the videos, but the sample size is not yet adequate.

Conclusion: We were able to use PDCA methodology to standardize coordinated team practice for STAT cesarean delivery. By using iterative testing and evaluating changes we were able to develop standardized processes for stat cesarean, improve efficiencies and enhance patient safety features. It seems unlikely that a controlled experiment could accomplish these changes.

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Abstract #: T-33

Improving the Yield of an Antenatal Anesthesia High-Risk Consultation Service: Development and Assessment of a Screening Tool

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Introduction: Antenatal anesthesia high-risk consultation (HRC) of patients with medical comorbidities can optimize patient conditions, enable team-based decision-making, and allow advanced anesthetic planning (1). Patient factors that are associated with an antenatal change in management (CIM) are poorly understood. The purpose of this study was to define such factors and develop a screening tool to identify patients who may benefit from antenatal HRC.

Methods: Records from our high-volume obstetric anesthesia HRC service over a two and a half-year period were reviewed. CIM was defined as requesting consultation from another specialty, ordering radiologic studies, requesting existing images or records from an outside hospital, or reviewing the internal patient record for more information than is routinely obtained during the pre-anesthesia evaluation. The association between patient factors and antenatal anesthetic CIM was assessed by univariate analyses, followed by multivariate adjustment using logistic regression. The ability of an existing, clinically validated, screening tool from our hospital's preoperative clinic to identify patients requiring a CIM was evaluated.

Results: Data were collected from 612 consecutive HRCs. Significant multivariate predictors of a CIM included maternal cardiovascular ($p<0.001$) or neurologic ($p=0.008$) issues, absence of major obstetric issues ($p<0.001$), and lower gestational age at the time of HRC ($p<0.001$). The presence of at least one factor from the screening tool was also associated with a CIM: 45.6% of patients with a positive screen vs. 34.7% of patients with a negative screen; ($p=0.009$).

Discussion: Utilization of the HRC service has increased as patient comorbidities have become more prevalent (2). While inadequate recognition and mismanagement of high-risk parturients may contribute to maternal morbidity and mortality, overutilization of the HRC for low-risk patients has cost and manpower implications. We have identified patient factors that triggered a CIM following HRC and modified a screening tool to reflect these factors. Further sensitivity and specificity analysis will enable the development of a screening tool that will be externally valid. The ability of a HRC service to efficiently capture at-risk patients and prevent adverse outcomes is an important aspect of healthcare cost containment, particularly as maternal morbidity increases.

References
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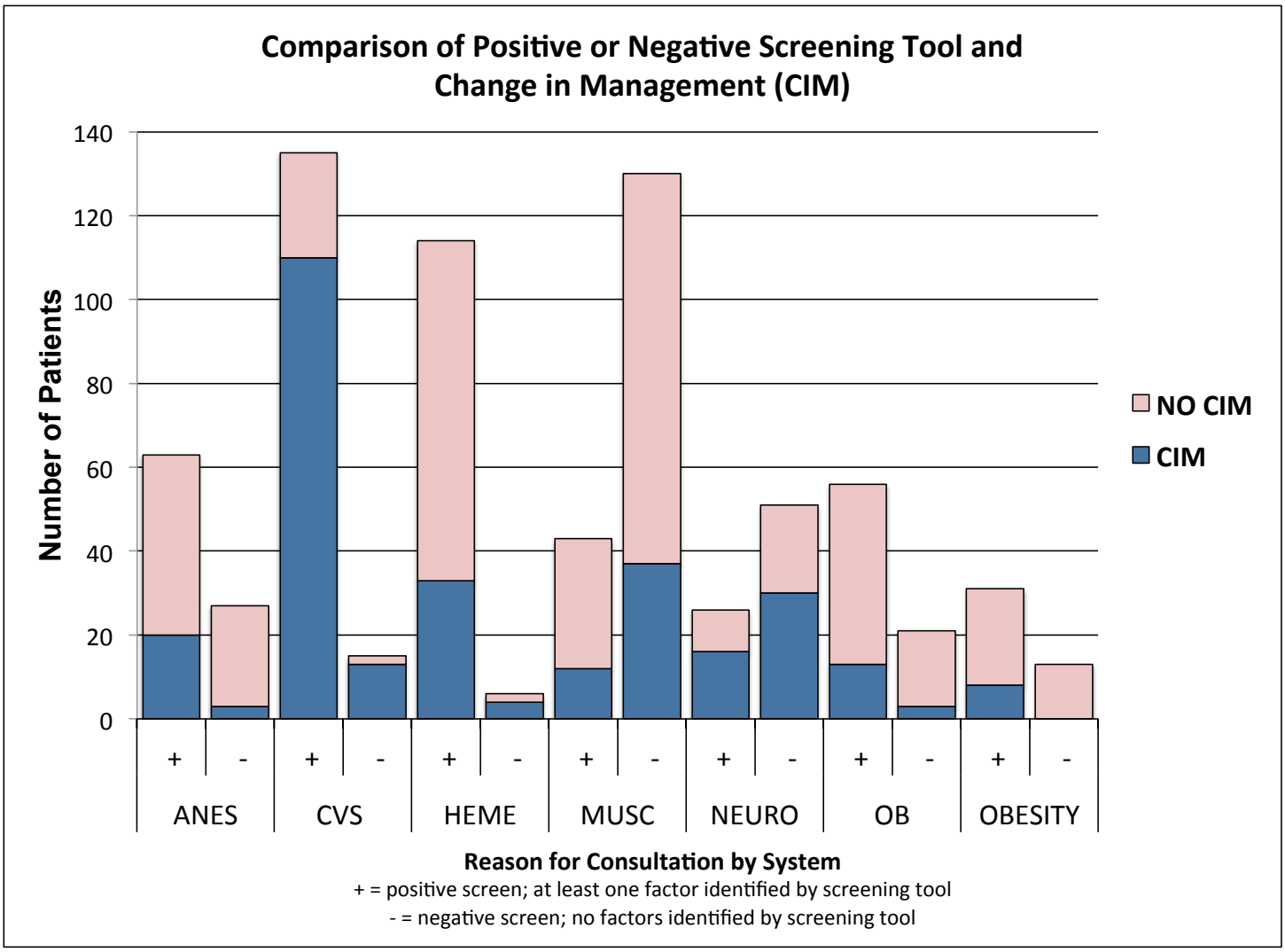
Comparison of Positive or Negative Screening Tool and Change in Management (CIM)
Number of Patients
140
120
100
80
60
40
20
0
NO CIM
CIM
+
-
ANES
CVS
HEME
MUSC
NEURO
OB
OBESITY
Reason for Consultation by System
+ = positive screen; at least one factor identified by screening tool
- = negative screen; no factors identified by screening tool

Abstract #: T-34

Intraoperative hydroxyethyl starch does not influence postoperative renal function in the parturients with severe preeclampsia undergoing cesarean section: A retrospective matched-pair analysis.

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Background: Anesthesia for severe preeclampsia has been debated and fluid management is one of the important issues of anesthetic management in theses patients. In our institute, limited amount of 6% hydroxyethyl starch (HES) 70/0.5 has been administered for intraoperative fluid infusion for anesthesia in parturients with severe preeclampsia. However, HES has harmful effect on renal function in septic patients. There is no evidence that HES is either safe or harmful in women with preeclampsia with impaired kidney function. Therefore, we conducted this study to determine whether HES worsens renal function in patients with severe preeclampsia undergoing cesarean section.

Methods: After IRB approval, all medical and anesthesia records of the severe preeclamptic patients who received anesthesia for cesarean section from Janurary 2011 to December 2013 at our university hospital were reviewed using electronic database (severe preeclampsia group: S-PE group). In addition, a matched-pair control group was selected from the same database. Patients in the control group were matched for age and gestational weeks of delivery. Preoperative complete blood count and chemistry were compaired to postoperative values. The t-tests and the chi-square tests were used to compare numerical and nominal variables, respectively.

Results: Among 3,705 patients, 87 parturients were included in the S-PE group and 86 parturients were selected as the control group. Amount of intraoperative HES in S-PE and control group were 859 ± 206 mL and 1063 ± 245 mL, respectively ($p<0.001$). Serum concentrations of creatinine, urea, and uric acid in S-PE group were significantly higher in all time points (Table. 1). The postoperative increase of creatinine from preoperative period to 48 hours postoperative period were not different in two groups.

Conclusion: There was no evidence that intraoperative 6% HES 70/0.5 less than 1,000 mL adversely affects kidney function during cesarean section in parturients with severe preeclampsia.

Parameter (unit)	Severe preeclampsia group (N = 87) N	Severe preeclampsia group (N = 87) Mean ± SD	Control group (N = 86) N	Control group (N = 86) Mean ± SD	P Value
Creatinine, mg/dL					
Preoperative	87	0.70 ± 0.29	86	0.48 ± 0.10	<0.001
Postoperative, within 48 hours	87	0.72 ± 0.34	86	0.49 ± 0.11	<0.001
% change compared with preop.	87	2.7 ± 15.8 %	86	3.3 ± 11.9 %	0.787
Postoperative, between 3 and 7 days	87	0.62 ± 0.17	85	0.50 ± 0.09	<0.001
% change compared with preop.	87	- 7.6 ± 13.9 %	85	6.9 ± 13.9 %	<0.001
Urea, mg/dL					
Preoperative	87	13.8 ± 8.1	86	6.8 ± 2.9	<0.001
Postoperative, within 48 hours	87	13.6 ± 9.1	86	6.2 ± 2.4	<0.001
Postoperative, between 3 and 7 days	87	9.6 ± 4.2	85	7.5 ± 3.4	<0.001
Uric acide, mg/dL					
Preoperative	84	6.83 ± 2.23	76	4.20 ± 1.28	<0.001
Postoperative, within 48 hours	69	6.54 ± 2.34	60	3.87 ± 1.21	<0.001
Postoperative, between 3 and 7 days	56	5.52 ± 1.34	46	4.15 ± 1.29	<0.001

Abstract #: T-35

IVF Pregnancy in a Patient With Fibrotic Eosinophilic Myocarditis and Precipitous Labor

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In hypereosinophilic syndrome (HES), the sustained overproduction of eosinophils leads to organ dysfunction. Cardiac involvement leads to morbidity and is a significant risk factor for mortality.

A 31 y.o. G3P0 at 26 weeks gestation from IVF presented with shortness of breath and a 10 lb weight gain, she was noted to be in acute on chronic heart failure. She was administered Lasix for 8 weeks. Her history was significant for right heart failure secondary to eosinophilic myocarditis with resulting endomyocardial fibrosis. Her previous transthoracic echo demonstrated an extremely small right ventricle, large tricuspid regurgitation, very dilated right atrium and dilated inferior caval vein (2.8cm without respiratory variation). A right heart cath two months prior showed no change in the pressure tracing morphology from the right atrium through to the pulmonary artery suggesting minimal right ventricle contractile performance. With exercise there was a fall in cardiac output from 3.56 to 2.78 l/min. She was anticoagulated with lovenox. A multidisciplinary plan was developed with input from obstetrics, cardiac surgery, cardiology, cardiac and obstetric anesthesiology. Patient was counseled regarding the high risk nature of her pregnancy and her options. The tentative plan was to place an arterial line, central line and early labor epidural with transfer to a cardiac operating room during 2nd stage. The appropriate teams would be on standby in the event that she required invasive cardiac support. In addition, a heart transplant workup was initiated.

She experienced PPROM and contractions at 31 weeks and was started on betamethasone with expectant management. The patient precipitously progressed from stage 1 to 2 within 20 mins and a lumbar epidural was placed without difficulty or hemodynamic consequences. Delivery was imminent in the obstetric operating room. The delivery was uneventful and the baby was transferred to the NICU. Following delivery she demonstrated signs of right heart failure with cyanosis of the lips but required no pressors, an arterial line and central line were placed. She was stable and transferred to the cardiac ICU. She received postpartum diuresis and was discharged to the regular postpartum floor 2 days later.

Cardiac manifestations contribute to most of the deaths associated with HES. The pathogenesis of cardiac involvement is characterized by an acute necrotic stage, an intermediate thrombotic stage, and a final fibrotic stage. The final stage involves scarring of the heart due to fibrous replacement of endocardial and myocardial tissue. The fibrosis can lead to impaired diastolic function and result in restrictive cardiomyopathy. This case demonstrates the complex physiology of right heart failure during pregnancy, which can be very challenging to manage. Our patient also presented ethical issues regarding assisted reproduction and the multidisciplinary planning required to ensure good outcomes in complex cases.

Abstract #: T-36

Labor Analgesia for a Parturient with Untreated Acromegaly

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Introduction: Acromegaly is a rare endocrine disorder with an incidence of 3 new cases per million people per year that is associated with infertility. With the development of medical therapies and infertility treatment, the anesthesiologist may provide intrapartum care for these patients. Medical and obstetrical comorbidities such as insulin resistance, hypertensive disorders and cardiovascular disease must be considered while developing a labor analgesic plan. Additionally during pregnancy, the pituitary gland undergoes global hyperplasia and increases by 45% due to escalation of lactotrophic cells. There is little data to describe concurrent pathologic growth of pituitary adenoma during pregnancy, but this has serious implications for neuraxial techniques. Before initiation of labor analgesia, intracranial imaging studies can elucidate tumor size and intracranial dynamics(1-2). However, that may not always be feasible or necessary. We report a case of successful lumbar epidural placement in a parturient with known acromegaly and insufficient imaging of a pituitary adenoma in preterm labor.

Case: Our patient is a 35 year old G2P1 parturient who presented in preterm labor at 34 weeks gestation. Her medical history included a pituitary adenoma and untreated acromegaly diagnosed 5 years prior during her previous pregnancy after vaginal delivery of an IUGR infant. Although the patient was compliant with antenatal visits, the patient failed to follow up for an MRI to evaluate her intracranial mass. On admission, she was normotensive and denied headache, nausea or visual disturbances. Physical exam revealed an obese woman with frontal bossing, coarse facial features, hirsutism and a Mallampati class 4 airway. In addition, the fetal heart tones were reassuring (category 1 tracing) and the uterine contraction pattern was adequate with oxytocin augmentation. After discussion of analgesic options with the patient, a lumbar epidural was placed uneventfully followed by successful vaginal delivery of a healthy infant.

Discussion: A known intracranial lesion associated with acromegaly, a rarity, may pose concerns for the anesthesiologist. In parturients with active acromegaly the incidence of clinically significant somatotrophic adenoma growth is 10%, even in the absence of treatment. Headache, a common surrogate marker of increased ICP, in this population can be attributed to withdrawal of somatostatin analogs, preeclampsia, or increased intracranial pressure from pathologic pituitary growth(1). History and physical exam may prompt additional work-up when necessary. As the patient was clinically asymptomatic, lumbar epidural was deemed safe and appropriate for this patient. This case supports the use of lumbar epidural for labor analgesia in parturients with untreated acromegaly.

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Abstract #: T-37

Lack of Corticotropin beneficial effects on postdural puncture headache

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Following accidental dural puncture (ADP) during labor more than 50% of parturient develop Postdural puncture headache (PDPH) (1). Various treatments including intrathecal catheter, epidural saline or morphine, and prophylactic blood patch have been studied. All have shown some efficacy but, to date, no clear recommendation can be made (1). Recently, Hakim has shown that corticotropin is beneficial in preventing PDPH when given soon after the baby is delivered (2): the study showed that women who received corticotropin had a 30% risk of developing PDPH when compared to 70% of women who received placebo(2). In our division, once ADP happens the risk of developing PDPH is 50 to 60%. As part of our quality assurance and improvement for patient safety, our obstetric anesthesiology division periodically reviews our complications and the way we can reduce them in our obstetric population. Our standard treatment of postdural puncture headache (PDPH) consists of conservative management first, then epidural blood patch in case conservative measures fail. Since corticotropin was found to be helpful in these patients (2) and some of our obstetric anesthesia division members changed their practice regarding prevention of PDPH by administetring 1 mg of intravenous corticotropin following delivery, we compared women who received corticotropin to women who did not regarding the incidence of PDPH and Epidural Blood Patch (EBP).

Among women who received corticotropin we found that: 12/22 (54%) women developed PDPH, 8/22 (36%) required a blood patch and 10/22 (46%) reported no PDPH.

Among women who did not received corticotropin we found that: 10/17 (58%) developed PDPH, 6/17 (35%) required a blood patch and 7/17 (41%) had no PDPH. The difference among groups did not reach statistical significance (Z-test P=0.89).

Our preliminary results are in contrast with the previous published study (2). Based on this analysis, we think that more data is needed to draw any conclusions regarding the use of corticotropin for preventing PDPH following ADP. A large prospective randomized trial will find out whether corticotropin will be beneficial in our patient population.

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Abstract #: T-38

Management of Symptomatic Subglottic Stenosis and Tracheal Dilatation Procedure in Pregnancy

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Symptomatic subglottic stenosis (SGS) is very rare in the child-bearing women. Few case reports exist in the literature.(1) This disorder presents dilemmas in obstetrical, surgical and anesthetic management of the pregnancy. Antepartum recognition of SGS is imperative, as management of unrecognized SGS can be life threatening for the mother and neonate during delivery.(2) Our patient was a 33 year old G3P2 female with 60% SGS originally discovered before this pregnancy because of cough, wheezing, shortness of breath and stridor on exertion. The symptoms worsened with pregnancy, as had the stenosis. A prior URI had markedly increased symptoms which decreased with a methylprednisolone taper. She had a history of reflux disease (treated with omeprazole), but otherwise was healthy. The cause of the stenosis was judged idiopathic. She had 2 prior cesarean sections (one emergent). Otolaryngology management included one prior tracheal balloon dilatation under general anesthesia with a normal laryngoscope view, but intubation with a 5.0 endotracheal tube. After multidisciplinary consultation, we met her at 37 weeks for an elective low transverse cesarean section and tubal ligation, to be followed by tracheal dilation under general anesthesia. Patient exam revealed a BMI of 38, distant basilar breath sounds, mild stridor and scattered wheezes on deep breathing. She had a MP class 2 airway score. RR 20 (unlabored at rest) with other vitals normal, and the ability to lie partially reclined. She was NPO and consented for a combined spinal epidural anesthetic for delivery, followed by general anesthesia for the dilatation. Consent was also obtained for tracheostomy if intubation was not possible. The ENT surgeon was present throughout the surgeries, and had reviewed the patient CT scan with the anesthesiologist which showed stenosis below the cricoid ring to the 2nd tracheal ring. Anesthesia and surgery for delivery were uneventful, with a healthy female delivered. After uterine repair and closure, the patient underwent induction of general anesthesia, with a modified rapid sequence induction ensuring adequate face mask ventilation, then an uncomplicated intubation, again with a 5.0 endotracheal tube. Tracheal balloon dilatation and emergence from general anesthesia were also uneventful, as was postoperative course.
Various conditions can cause SGS including trauma, GERD, Wegener's granulomatosis, autoimmune diseases, papillomatosis,TB,anatomical deformities, or neoplasm.(3) Idiopathic SGS occurs more often in women and can be exacerbated by hormonal and physiologic changes of pregnancy. Unrecognized SGS can lead to disasters in airway management, especially with repeated intubation attempts. The intrapartum management of SGS requires good multidisciplinary communication, consultation,and logistical coordinaton of patient care.

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Abstract #: T-39

Management of the Term Parturient Patient with Factor XI Deficiency

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Introduction: Factor XI deficiency is an inherited coagulopathy which is typically seen in the Ashkenazi Jewish population with an incidence of up to 9%. However, it has also been described in individuals with other ethnic backgrounds. There is limited definitive information currently available regarding the safety and standard practice of labor analgesic and anesthetic neuraxial techniques in the parturient patient who presents with this coagulopathy. We describe a case series of seven patients with factor XI deficiency who presented to our academic tertiary care hospital labor and delivery ward for delivery over the past 36 months.

Cases: All patients presented with documented factor XI deficiency and were under the care of a hematologist during pregnancy. Six of the 7 patients were otherwise healthy, whereas one patient was also heterozygous for a prothrombin gene mutation and factor V Leiden mutation. All patients had documented endogenous factor XI levels with a range between 4% and 48% at the time of delivery. Only two patients reported a history of bleeding, including heavy menses and hemorrhage after tooth extraction. Of the seven patients, three received a neuraxial anesthetic technique for labor and delivery, three had a vaginal delivery with a fentanyl PCA for analgesia, and one underwent a general anesthetic for scheduled cesarean section. Two patients received fresh frozen plasma prior to delivery, one patient received intraoperative tranexamic acid during cesarean delivery, and one patient received aminocaproic acid postpartum. No patients exhibited excessive postpartum hemorrhage or neurologic complications.

Discussion: Factor XI deficiency is an inherited coagulation disorder that presents challenges for the anesthesia provider, particularly when these patients present to the labor and delivery ward. Specific challenges include the rarity of the disease, lack of data on the safety of neuraxial anesthesia techniques, and the poor correlation between measured serum factor XI levels and severity of the clinical bleeding diathesis. At our institution, we have found considerable heterogeneity in the clinical management of these patients by obstetricians, hematologists, and anesthesiologists. More data is required to identify risk factors that better correlate with disease severity and predict the likelihood of adverse maternal outcomes such as spinal hematoma and postpartum hemorrhage, especially given the well-described benefits of spinal and epidural anesthesia in laboring women. Furthermore, a standard or protocol-driven approach regarding the use and timing of neuraxial anesthesia, factor replacement, and appropriate utilization of antifibrinolytic therapy would help provide consistent care to these patients who are frequently presented with conflicting information from multiple providers regarding labor and delivery management and anesthetic options.

Abstract #: T-40

Maternal temperature associated with continuous spinal labor analgesia

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Introduction: Several reports in recent years have described an increase in maternal temperature in association with labor epidural analgesia (LEA). [1] The relationship between maternal temperature and continuous spinal labor analgesia (CSLA) has never been reported.

Methods: In a retrospective cohort study, quality assurance data from December 2008 to December 2013 was reviewed, to identify patients who had CSLA. Each patient was matched with 2 patients who received LEA, based on parity, duration of labor (2-4 hours or >4 hours) and BMI. Maternal temperatures on admission and throughout labor were recorded. The standard protocol at our institution was to obtain maternal temperature every 2 hours in labor, but missing values were common.

Results: 33 patients had CSLA > 2 hours. No difference in maximal temperature or incidence of fever (T >38°C) was seen between CSLA and LEA groups. 5 patients in the LEA cohort (n=66) developed fever vs. 3 in the CSLA cohort (n=33), (p = 1). A clinical diagnosis of chorioamnionitis was made in 3 of 5 and 2 of 3 cases of fever in the LEA and CSLA groups, respectively. All cases with fever not attributed to chorioamnionitis, developed elevated temperature after >7 hours of catheterization.

Conclusion: The incidence of fever in both the spinal and epidural catheter cohorts (3%) is lower than in many other reports. [1] CSLA was associated with intrapartum temperature patterns similar to LEA. The stimulation of the epidural space may be more important than the type of neuraxial blockade. CSE labor analgesia has been reported to have similar rates of maternal fever to epidural analgesia. [2,3] Type of local anesthetic may affect fever rates.[4]

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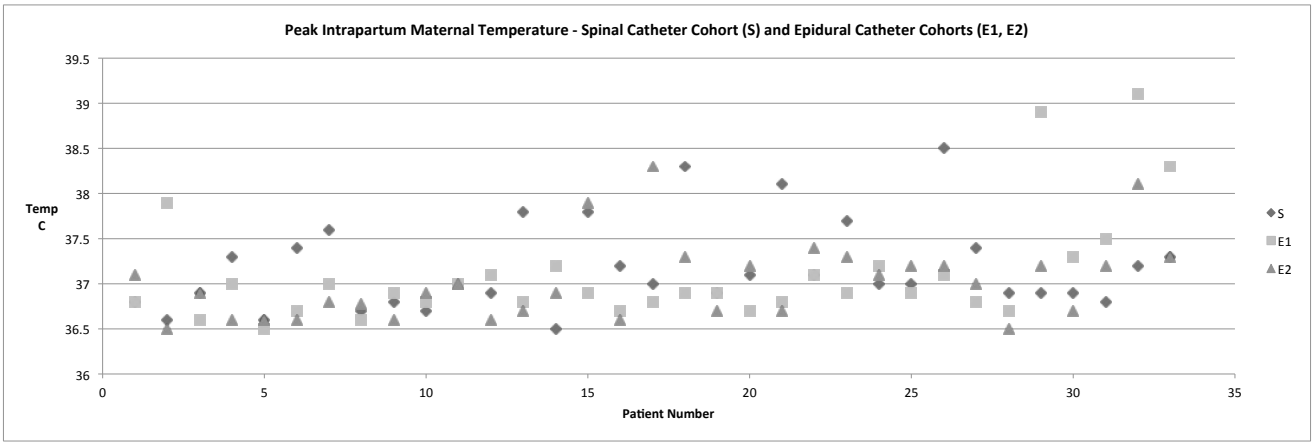

Abstract # :T-41

Metastatic Cancer in the Parturient

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Introduction: Management of the parturient with metastatic cancer requires a multidisciplinary approach with appraisal of the clinical and ethical risks and benefits unique to this patient population. This is a discussion of the physiologic, pharmacologic, and ethical management of a 31 year-old G5P1 diagnosed with stage IV gastric cancer.

Case: An otherwise-healthy female was diagnosed with stage IV gastric cancer at 19 weeks gestation after presenting with nausea, dysphagia and neck pain. Enoxaparin, for treatment of a RIJ thrombus and a course of palliative chemotherapy were initiated. At 34 weeks she presented with dyspnea and crushing chest pain. A chest CT revealed a large left-sided pleural effusion, which was treated with thoracentesis and pleural catheter placement. At 35 weeks, an external cephalic version was attempted for breech presentation, but was unsuccessful. She strongly desired to avoid a prolonged recovery from cesarean delivery given her uncertain lifespan, and so underwent induction of labor at 35 weeks for a vaginal breech delivery. Induction of labor also helped avoid further respiratory and physical decompensation and allowed appropriate cessation of anticoagulation for neuraxial anesthesia. She received an early placement of a combined spinal-epidural to avoid catecholamine surges that could lead to physical decompensation. She was moved to the operating room for vaginal breech delivery. Chloroprocaine 3% and IV nitroglycerin were available in anticipation of possible head entrapment. The patient had an uncomplicated vaginal delivery and postoperative course. Her baby girl was healthy with no ill effects from chemotherapy. One year postpartum, she is alive undergoing palliative chemotherapy.

Discussion: Approximately 1 in 1000 pregnancies are affected by a comorbid malignancy, the most common cancers being breast, cervical, lymphoma, and melanoma.1 Physiologic changes of pregnancy may diminish a woman's ability to cope with the complications and treatments of the malignancy. Restrictive lung physiology of pregnancy may be worsened by malignant ascites and pleural effusions, which may make a high sensory level from neuraxial anesthesia poorly tolerated. Labor or recovery in the postpartum period may be poorly tolerated due to underlying malnutrition and deconditioning. Both malignancy and pregnancy represent hypercoagulable states, so time off anticoagulation should be limited. Neuraxial anesthesia timing may be complicated by anticoagulation regimens or thrombocytopenia from myelosuppression.2 Lastly, the complex end of life discussions related to cancer and pregnancy may lead to uncommon obstetric scenarios such as vaginal breech delivery and necessitate a thoughtful appraisal of risks and benefits with regard to obstetric and anesthetic management.

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Abstract #: T-42

Mobility with programmed intermittent epidural bolus labour analgesia

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A new delivery method for labour analgesia combining programmed intermittent epidural boluses (PIEB) with patient controlled epidural analgesia (PCEA) has recently been introduced onto our labour ward. Recent trends have shown that the uptake of PCEA by maternity units is increasing in popularity [1]. Research into PIEB combined with PCEA has shown a reduced incidence of motor block and instrumental delivery [2]. We conducted a service evaluation to investigate maternal motor block and maternal satisfaction with analgesia.

Methods: After local audit department approval, prospective data was collected over a one month period from parturients who received PIEB analgesia for labour. The protocol was a PIEB of 7mL of 0.1% levo-bupivacaine with 2microgram/mL fentanyl every hour with a PCEA of 6mL of the same solution, available every 20 minutes.
Following initiation of analgesia, mobility was assessed hourly by the midwife and categorised as one of four options: "walking around", "sitting/standing", "mobilising in bed" or "dense motor block". Mothers were then reviewed on the postnatal ward prior to discharge home and questioned on their satisfaction with their analgesia.

Results: Mobility data was collected on 87 mothers. Of these, 63 were successfully reviewed prior to discharge home and maternal satisfaction for analgesia noted.

Of the 87 patients, 6 (6.9%) had a worst documented mobility of "walking around", 11 (12.6%) of "sitting/standing", 68 (78.2%) of "mobilising in bed" and only 2 (2.3%) had a "dense motor block".

Of the 63 maternal responses at postnatal review for pain relief during labour, 50 (79.4%) were "Very Satisfied", 13 (20.6%) "Satisfied" and none were "Dissatisfied". Of the 45 women who had either an instrumental or spontaneous vaginal delivery, 32 (71.1%) were "Very Satisfied" with their pain relief during delivery, 11 (24.4%) were "Satisfied" whilst 2 (4.4%) were "Dissatisfied".

Discussion: We have shown this PIEB protocol maintains mobility for the vast majority of our patients. Dense motor block was very uncommon and a large proportion of patients were able to mobilise in bed. Being able to mobilise in bed during labour allows mothers to move into comfortable positions, especially for the delivery of their baby. We also note that maternal satisfaction for analgesia remains excellent. We aim to repeat the audit once PIEB is more firmly established in our unit and mobility is encouraged to a greater extent.

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Abstract #: T-43

Neuraxial Labor Analgesia In A Parturient With VACTERL Association

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Introduction: The term VATER association, first coined in 1973 and later expanded to VACTERL association, is an acronym for a group of congenital malformations: involving Vertebral, Anal, Cardiac, Tracheo-Esophegeal, Radial and Limb anomalies. The incidence is less than 1-9/100,000 live births with male preponderance (69.8%). VACTERL association is genetically considered a polytopic change occurring during blastogenesis without any single, unifying etiology. The diversity of the VACTERL anomalies poses a formidable challenge to anesthesiologists. We describe the successful anesthetic management of a parturient in active labor with VACTERL association, who underwent a combined spinal epidural (CSE) technique for vaginal delivery.

Case report: A 23-year old primigravida at 39-weeks intra-uterine gestation presented in labor at 3cm cervical dilatation, with complete effacement, requesting labor analgesia. Past medical history included VACTERL association with an imperforate anus and an atrial septal defect, which were both repaired in early childhood. She also had significant dorso-lumbar scoliosis with an extra vertebra. An MRI performed at 14 years age revealed dorso-lumbar scoliosis, an extra thoracic vertebra, and no spinal cord abnormalities. Echocardiography done at age of 21-years revealed mild aortic and mitral regurgitation with a LVEF of 60%. The patient had a BMI of 27 kg/m2, and Mallampati class I airway. With a normal neurologic exam and with her describing a 9 out of 10 pain (0-10 numeric pain rating scale) it was planned to attempt CSE in sitting position despite not having recent neuraxial image to assess the degree of scoliosis. Although, there was significant scoliosis, the epidural space was identified at L3-L4 interspace at depth of 6 cm via a loss-of-resistance to saline technique. Spinal Fentanyl 25mcg was administered followed by patient-controlled epidural analgesia with epidural infusion of 0.1% Bupivacaine and 2mcg/ml of Fentanyl at 6ml/hour with 5ml bolus dose every 20 minutes. The patient had complete pain relief within 3 minutes of the spinal fentanyl. She had an uneventful vaginal delivery 5 hours later requiring only 2 epidural bolus doses.

Conclusion: The rarity of VACTERL association in the obstetric population (only 2 previous case reports in cesarean section patients) coupled with the myriad of systemic malformations mandates a vigilant multidisciplinary approach in the perinatal period. This is the first reported case of a successful and safe neuraxial technique in a laboring patient with the VACTERL association. Despite not having anesthesia involvement in the prenatal period, the importance of a thorough and timely work-up of these patients in the prenatal period cannot be over-stressed to mitigate potential complications especially in more severe cases of the VACTERL association.

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Abstract #: T-44

Obstetric Anesthetic Considerations for a Patient with a Fontan Repair of Tricuspid Atresia

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Case Presentation: We present a 19yo nulliparous patient with a history of congenital tricuspid atresia/pulmonary atresia and hypoplastic right heart syndrome s/p Glenn procedure at 8 months of age followed by a lateral tunnel fenestrated Fontan baffle at 19 months of age who was referred to the Obstetric Anesthesiology service for consult early in her pregnancy. The patient was asymptomatic and was maintained on labetalol for prevention of hypertension. This patient's care was discussed at several multidisciplinary meetings including Obstetricians, Pediatricians/Neonatologists, Cardiologists, and Anesthesiologists all of whom had been involved in her prenatal care. At 18 weeks, an echo showed an unobstructed Fontan baffle into the pulmonary arteries, mild mitral regurgitation and normal left ventricular systolic function. An echo repeated at 32 weeks showed a mildly depressed LV systolic function.

Hospital Course: The patient presented to the Labor and Delivery Unit in active labor with spontaneous rupture of membranes. A Fetal Scalp Electrode was placed and the patient requested an epidural for labor analgesia. Labor analgesia was induced with subarachnoid fentanyl via combined spinal/epidural technique. An arterial line was placed and then the epidural catheter was bolused with 6ml of bupivacaine 0.25%. Shortly after obtaining an analgesic level the patient was fully dilated and after a very short second stage of labor delivered an infant with Apgars of 9 and 9. The patient remained on the Labor and Delivery Unit for 24 hours after delivery for continuous vital sign monitoring.

Discussion: Important considerations for a patient with a Fontan repair of a congenital heart defect include the high risk of congestive heart failure and atrial arrhythmias, the existing right to left shunt and the maintenance of CVP for passive lung perfusion. Our plan included avoiding abrupt changes in SVR/PVR, placing air traps on all IV lines, using a pediatric central venous catheter to avoid disruption of the existing repair and having furosemide and milrinone available for fluid overload and cardiac output support as needed. These patients are candidates for a vaginal delivery with early epidurals to avoid increasing catecholamines and pain mediated increases in SVR or PVR. The obstetricians planned for a predominantly passive second stage of labor with cesarean section reserved for obstetric indications. Management of postpartum hemorrhage can be difficult because methylergonovine and prostaglandin F2alpha should be avoided due to the increase in SVR and PVR respectively. During the postpartum period, these patients are at risk for congestive heart failure as the intravascular volume remains elevated while the parallel circuit of the placenta has been removed, potentially overwhelming the central circulation. Extensive multidisciplinary planning is required to ensure their care is carefully coordinated during the peripartum period.

Abstract #: T-45

Paraplegia of Unknown Etiology Following Spinal Anesthesia for Cesarean Section

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Introduction: Neurologic injury after neuraxial blockade is a rare event with potentially devastating consequences. We present a case of paraplegia following spinal anesthesia for Cesarean section.

Case: A 45 yo G7P1051 with no significant past medical history presented at 26 1/7 with severe preeclampsia. In addition, this pregnancy was complicated by advanced maternal age and multiple known fetal anomalies. She was delivered by cesarean section for nonreassuring fetal status. Spinal anesthesia with 15mg bupivacaine, 10mcg fentanyl, and 200 mcg hydromorphone was performed without incident. The following day, the patient complained of bilateral mild upper and lower extremity weakness, which was initially thought to be due to magnesium toxicity. However, the weakness progressed after discontinuation of magnesium.

Multiple consultations were obtained including physical medicine, neurology, and psychiatry. Her neurologic exam was inconsistent and progressively worsening. She was found to have significant lower extremity weakness and absent deep tendon reflexes. The differential diagnosis included Guillian-Barre syndrome, spinal cord ischemia or hematoma, multiple sclerosis, cauda equina syndrome, and conversion disorder.

Electrolytes, PTH, vitamin D, and a sensory-motor neuropathy antibody panel were normal. MRIs of the lumbar plexus, cervical, lumbar, thoracic spines, and a head venograph were significant only for mild degenerative changes in the spine. A brain MRI revealed scattered hyperintense white matter foci that were felt to be nonspecific. On postoperative day #6, the patient was transferred to inpatient rehabilitation. An EMG performed six weeks after symptom onset was equivocal. There were findings suggestive of a possible upper motor neuron lesion but the exam was inconclusive for a definitive diagnosis. Deemed medically stable, she was discharged home wheelchair-bound with physical and occupational therapy. She was referred for outpatient follow-up, but remains with an unclear diagnosis and uncertain prognosis.

Discussion: Evaluation of suspected neurologic injury begins with a thorough history and exam to localize the lesion. The deficit may either be transient, require immediate intervention, or require a multidisciplinary approach with appropriately timed neuroconduction studies and imaging(1,2). Patients with pre-existing deficits or predisposing conditions are at increased risk, but unpredictable complications may occur in healthy patients(3). Thorough preoperative assessment, meticulous neuraxial anesthetic technique, and prompt evaluation of any neurologic injury are essential to minimize complications(1). In our patient, the diagnosis was elusive in light of her lack of risk factors, negative or inconclusive imaging, and inconsistent neurologic exam.

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Abstract #: T-46

Parturient with Cerebral Cavernoma

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This case report describes a 29 year old G1P0 who presented to the labor and delivery suite for a primary cesarean section due to a cerebral cavernoma located at the right temporal lobe. The patient was first diagnosed with the cavernoma 4 years prior during a workup for severe headache which revealed a cavernous hemangioma with subarachnoid hemorrhage. Cavernous malformations, also known as cerebral CMs, cavernous angiomas, cavernous hemangiomas, or cavernomas are vascular malformations found commonly in the central nervous system. Cavernomas are one of the most common vascular malformations with an incidence of 1 in 200 people. The danger of these lesions is the risk of rupture that may consequently lead to a stroke or death. There are no clear guidelines for the anesthetic management during pregnancy for a patient with a cavernoma. Case reports of patients presenting with urgent cesarean section in which general anesthetics have been used have been noted with successful results. Regional anesthesia may be ideal as this minimizes the potential hemodynamic stresses associated with a rapid-sequence general anesthetic technique. For our management, a spinal anesthetic was performed with a 24 g sprotte spinal needle. A total of 1.6cc of hyperbaric bupivacaine 0.75%, fentanyl 10µg and duramorph 0.2mg were injected into the subarachnoid space. A healthy infant was delivered, and the patient's intraoperative and postoperative courses were uneventful.

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Abstract #: T-47

Patient with Cerebral Venous Sinus Thrombosis and Postdural Puncture Headache treated successfully with Epidural Blood Patch and Anticoagulation

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Introduction: Postdural puncture headache (PDPH) is considered the most probable cause of headaches occurring after delivery under regional anesthesia, especially when a postural component is reported. We report a case of a parturient whose workup and follow-up of PDPH revealed underlying concurrence of cerebral venous sinus thrombosis (CVST).

Case Presentation: A 35-year-old G6P2 at 40 weeks gestation, with history of chronic headaches (negative head CT)and previous C-section presented with anhydramnios at term. After induction of labor, epidural analgesia was requested and the placement of an epidural catheter was uncomplicated. She achieved excellent analgesia for 10 subsequent hours of labor utilizing a continuous infusion of Hydromorphone 3 mcg/ml and Bupivacaine 0.05% in NS. She then went on to have an uneventful vaginal delivery of a male infant with apgars 8/10. Headache wwas first reported 2-3 minutes following removal of epidural catheter. It was bifrontal and periorbital in location with a strong postural component. An unrecognized dural puncture was suspected and conservative treatment for PDPH was initiated. She only achieved partial relief of her symptoms and was offered an Epidural Blood Patch (EBP) prior to discharge but she chose to continue conservative management at home. Patient returned on post partum day (PPD) 8 with intractable headaches that had progressed in severity. She again described bifrontal and periorbital headaches with radiation to occiput that was 5/10 in severity when recumbent and 10/10 when upright. Nausea and photosensitivity were also present. Neurology was consulted and urgent imaging was done. CT/MRI/MRV of brain showed bilateral subdural collections measuring 2 mm and nonocclusive right transverse sinus thrombosis extending into sagittal sinus with radiologic signs of intracranial hypotension. An EBP was requested by neurology to prevent exacerbation of a low CSF state before starting anticoagulation for the CVST. An EBP was performed on PPD 10 and anticoagulation with heparin was started 5 hours following EBP. The patient reported progressive improvement of symptoms with complete resolution of her headaches in 4 days. Repeat imaging showed resolution of right SDH and she was discharged on Coumadin to be continued for 6-12 months.

Discussion: The concurrence of CVST and PDPH is rare. In this case, CVST concurring with PDPH was diagnosed early and treated successful with EBP and anticoagulation.

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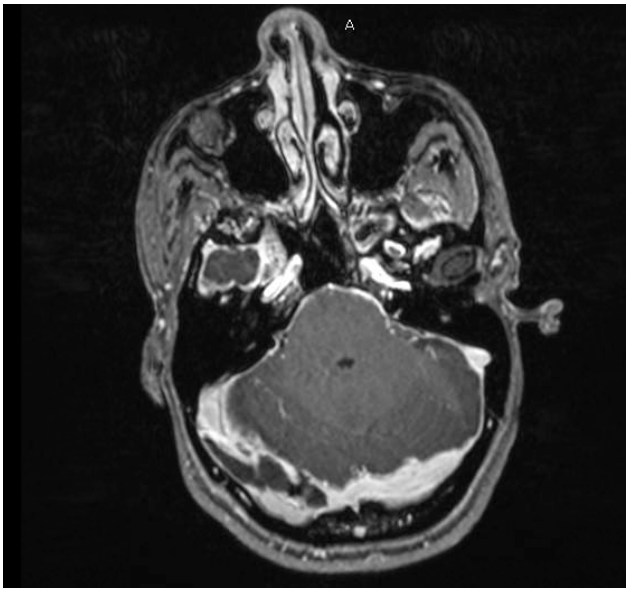

Abstract #: T-48

Peripartum Spontaneous Coronary Artery Dissection: A diagnostic Dilemma

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Introduction: Spontaneous coronary artery dissection (SCAD) in pregnancy is an exceptionally rare event, previously reported in 1 in 20, 000 to 30, 000 deliveries.1 Diagnostic challenges, often due to a paucity of data on the diagnosis, may result in a catastrophic cardiac event in an otherwise young, healthy patient. Mortality from peripartum myocardial infarction (MI) is high and therefore prompt diagnosis is essential for effective management. Absence of risk factors in conjunction with decreased provider awareness of the condition often leads to delays in diagnosis. Although the etiology is undetermined, hormonal changes related to progesterone are thought to play a role in the arterial wall disruption that leads to SCAD.

Case Report: A 29 year old multiparous African American female with history of anemia and otherwise uncomplicated pregnancy was admitted in labor to our unit, and underwent spontaneous vaginal delivery of a 3025g infant. Her immediate postpartum course was complicated by postdural puncture headache, treated with epidural blood patch on postpartum day (PPD) five. On PPD 13, she presented to the emergency room (ER) with complaints of intermittent chest pain, nausea, and vomiting. Work up (metabolic panel, blood count, D dimer, chest radiography, electrocardiogram (EKG), and CT scan), was negative and she was discharged home. On PPD 16, she returned to the ER with recurrent severe chest pain. She presented with elevated cardiac enzymes, ST segment elevations, and a transthoracic echocardiogram, which showed left main coronary artery dissection and marked left ventricular hypokinesis with an ejection fraction of 25%. She was taken emergently to the coronary catheterization laboratory, where an intra aortic balloon pump was placed. Subsequently she underwent emergency two-vessel coronary artery bypass surgery. Postoperatively her ejection fraction improved to 45%. Her hospital course was uncomplicated and she was successfully discharged from the hospital on postoperative day 7.

Discussion: Despite prior reports of SCAD as a potential cause of peripartum morbidity and mortality, this diagnosis is often missed. In our case, the patient visited the ER twice over a course of 3 days before the diagnosis was made and treatment initiated. Increased reporting of these cases will hopefully lead to a larger database of patients so that common risk factors may be identified and thus increase awareness for early detection and treatment. Additionally, this will aid in further analysis of management options and treatment outcomes. High suspicion for MI related symptomatology in an otherwise healthy-young patient is key to diagnosis. Development of diagnostic as well as therapeutic algorithms is likely an appropriate next step to assist physicians in the diagnosis and management of these patients.

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Abstract #: T-49

Persistent opioid use following cesarean delivery: patterns and predictors among opioid naïve women

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Background: The incidence of opioid-related death in women has increased 5-fold over the past decade (1). For many women, their initial opioid exposure will occur in the setting of routine medical care. Approximately 1 in 3 deliveries in the U.S. is by cesarean and opioids are commonly prescribed for post-surgical pain management. The objective of this study was to determine the risk that opioid naïve women prescribed opioids after cesarean delivery will subsequently become consistent prescription opioid users in the year following delivery, and to identify predictors for this behavior.

Methods: We identified women in a database of commercial insurance beneficiaries who underwent cesarean delivery and who were opioid naïve in the year prior to delivery. To identify persistent users of opioids, we used trajectory models, which identify groups of patients with similar patterns of medication filling during follow-up (2), based on patterns of opioid dispensing in the year following cesarean delivery. We then constructed a multivariable logistic regression model to identify independent risk factors for membership in the persistent user group.

Results: 285 of 80,127 (0.4%), or approximately 1 in 300, opioid naïve women became persistent opioid users following cesarean delivery. Persistent users could be accurately predicted using demographics, baseline comorbidity and characteristics of the index prescription (c statistic=0.74). Compared to patients whose initial prescription was for ≤3 days supply, those with a days supply of either 4-5 days or ≥6 days had a higher risk of persistent use (adjusted odds ratio (aOR), 95% confidence interval (CI) of 1.43 (95% CI, 1.07 - 1.93) and 1.92 (95% CI, 1.33 - 2.77), respectively). Compared to patients receiving an initial prescription for total daily dose of <81 mg of morphine equivalent, those with a daily dose of >112.5 mg of morphine equivalent were also significantly more likely to become persistent users (aOR 1.42 (95% CI, 1.03 - 1.96)). Other significant predictors included a history of substance abuse, tobacco use, back pain, migraines, and antidepressant or benzodiazepine use in the year prior to cesarean delivery.

Conclusions: A small but important and identifiable proportion of opioid naïve women become persistent prescription opioid users following cesarean delivery. Characteristics of the initial opioid prescription, including days supply and dose, were strong and potentially modifiable risk factors for persistent use.

(1) CDC, Morbidity and mortality weekly report 2013;62:537-42.
(2) Franklin et al, Med Care. 2013 Sep;51(9):789-96.

Abstract #: T-50

Postpartum Pre-Eclampsia Complicated by Atypical Positional Headache

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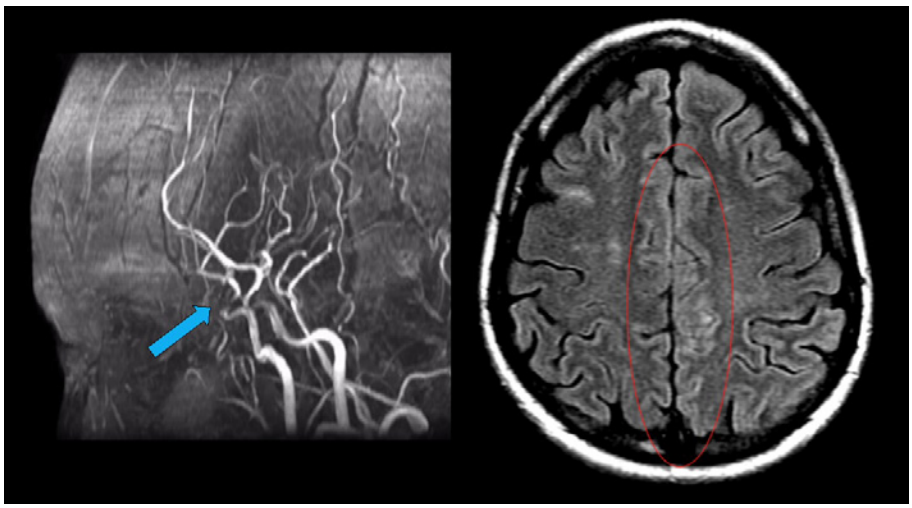
A 39-year old female patient, Gravida 2, Para 0, with a twin pregnancy at 36 weeks gestation, presented for cesarean section. An uneventful cesarean section was performed under spinal anesthesia. A few hours post-partum, the patient developed hypertension with blood pressures (BP) in the 170-180/80-90 mmHg. A diagnosis of severe pre-eclampsia was made and magnesium sulfate therapy was started.

On postpartum day (POD) 3, the patient complained of a severe, atypical, positional headache, described as pulsating at the front and the back of the head, worse when lying down and improved when sitting in the upright position. Magnetic resonance imaging (MRI) demonstrated multifocal areas of cortical and subcortical T2 hyperintensity involving the bilateral parasagittal frontoparietal lobes, compatible with Posterior Reversible Encephalopathy Syndrome (PRES). Magnetic resonance angiography (MRA) demonstrated multifocal areas of stenosis involving the anterior and posterior cerebral circulation, compatible with Reversible Cerebral Vasoconstriction Syndrome (RCVS).

The patient was admitted to the neurosurgical intensive care unit (ICU), managed with labetalol, nicardipine, verapamil and magnesium sulfate. On POD 7, MRI showed resolving PRES and improvement of the headache but MRA showed little improvement in the cerebral vasoconstriction. On POD 11, the headache and the BP were under control and the patient was discharged home. The patient was followed in the neurology outpatient clinic with transcranial doppler and resolution of the cerebral vasoconstriction by the POD 52.

PRES is a clinicoradiological diagnosis characterized by reversible brain edema secondary to cerebrovascular auto-regulatory dysfunction. Clinically, the patient may present with seizures, headache, altered consciousness and visual disturbances. PRES is associated with pre-eclampsia, eclampsia and hypertensive disorders.



RCVS is characterized by severe headache with reversible cerebral vasoconstriction usually within 12 weeks after diagnosis. Ten percent of RCVS cases are complicated by PRES.

PRES and RCVS are reversible with early recognition and treatment of hypertension in ICU setting. Delayed diagnosis may result in cerebral ischemia and infarction.

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1. SK Feske. Posterior Reversible Encephalopathy Syndrome: A Review. Semin. Neurol 2011; 31:202-215.
2. A Ducros, M GBousser. Reversible Vasoconstriction Syndrome. Pract. Neurol. 2009; 9:256-269.

Abstract #: T-51

Prolonged Postpartum Foot Drop in a Patient with Congenital Perineural Cysts

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Background: A healthy 25 y/o parturient presented for elective cesarean delivery. We performed combined spinal-epidural anesthesia as a two-step procedure. We inserted the epidural catheter uneventfully at L3-4. The first attempt at placement of a 27 gauge spinal needle at L4-5 produced a severe right leg paresthesia. No drug was injected. The spinal needle was removed and reintroduced at L4-5. We obtained clear cerebrospinal fluid (CSF), there was no paresthesia, and we injected 11mg 0.5% hyperbaric bupivacaine intrathecally to achieve a T4 level. Neurologic examination on postoperative day 1 was normal except for weak right ankle dorsiflexion, numbness over the lateral right calf, significant right foot drop, and a limping gait requiring a walker. One month later, a significant right foot drop with a limping gait persisted. A plain film of the lumbar spine was negative. A nerve conduction velocity study showed reduced amplitude of compound muscle action potential in the right peroneal nerve and reduced amplitude of sensory action potential in the right superficial peroneal nerves. The F-wave study showed absence of F response and/or presence of A waves in the right peroneal and tibial nerves and prolongation of minimal F-wave latency in the left peroneal and tibial nerves. These findings suggested bilateral lumbosacral radiculopathy, more severe on the right side, or right superficial peroneal neuropathy. Two months after delivery, magnetic resonance imaging found perineural cysts bilaterally along the S1 and S2 nerve roots.(Figure) All symptoms resolved spontaneously 3 months after delivery.

Discussion: Perineural (Tarlov) cysts form at the junction of sacral dorsal root ganglions and posterior nerve roots. They contain CSF but do not communicate with the subarachnoid space. Tarlov cysts enlarge with age and can cause pain and severe sensory and motor dysfunction. A case of new-onset cauda equina syndrome after uneventful combined spinal-epidural anesthesia has been reported in a patient with Tarlov cysts.(1) We do not know if the paresthesia during spinal placement contributed to our patient's neuropathy.

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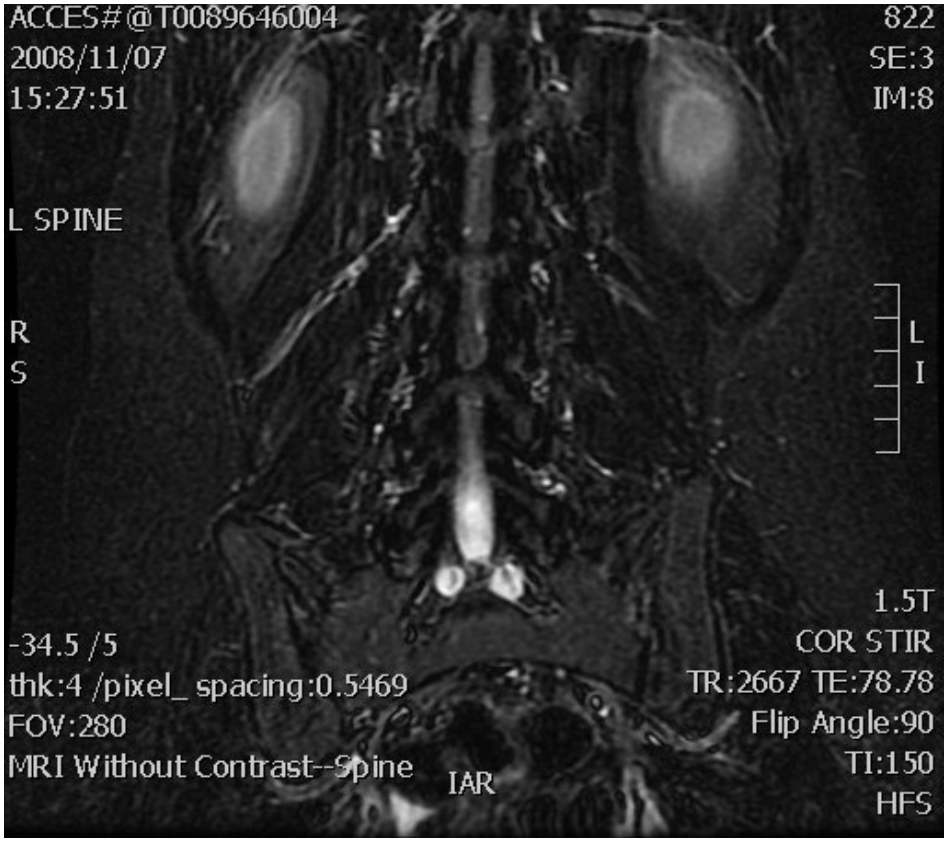

Abstract #: T-52

Prophylactic bolus administration of phenylephrine can prevent spinal hypotension during caesarean delivery: a randomized double blind study

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Background: One of treatments for spinal hypotension in the caesarean delivery is continuous infusion of phenylephrine (PEPH). However, continuous infusion method required large amount of phenylephrine. Though PEPH is relatively safe in the pregnancy, high dose of PEPH might be associated with reduction of maternal heart rate, which could consequently reduce maternal cardiac output. Prophylactic bolus injection of PEPH, instead of continuous infusion, may effectively prevent spinal hypotension with lower amount of PEPH. This double-blind, randomized, controlled study was designed to investigate of the effect of prophylactic PEPH treatment on preventing spinal hypotension during caesarean delivery. The appropriate dose of bolus injection was also investigated.

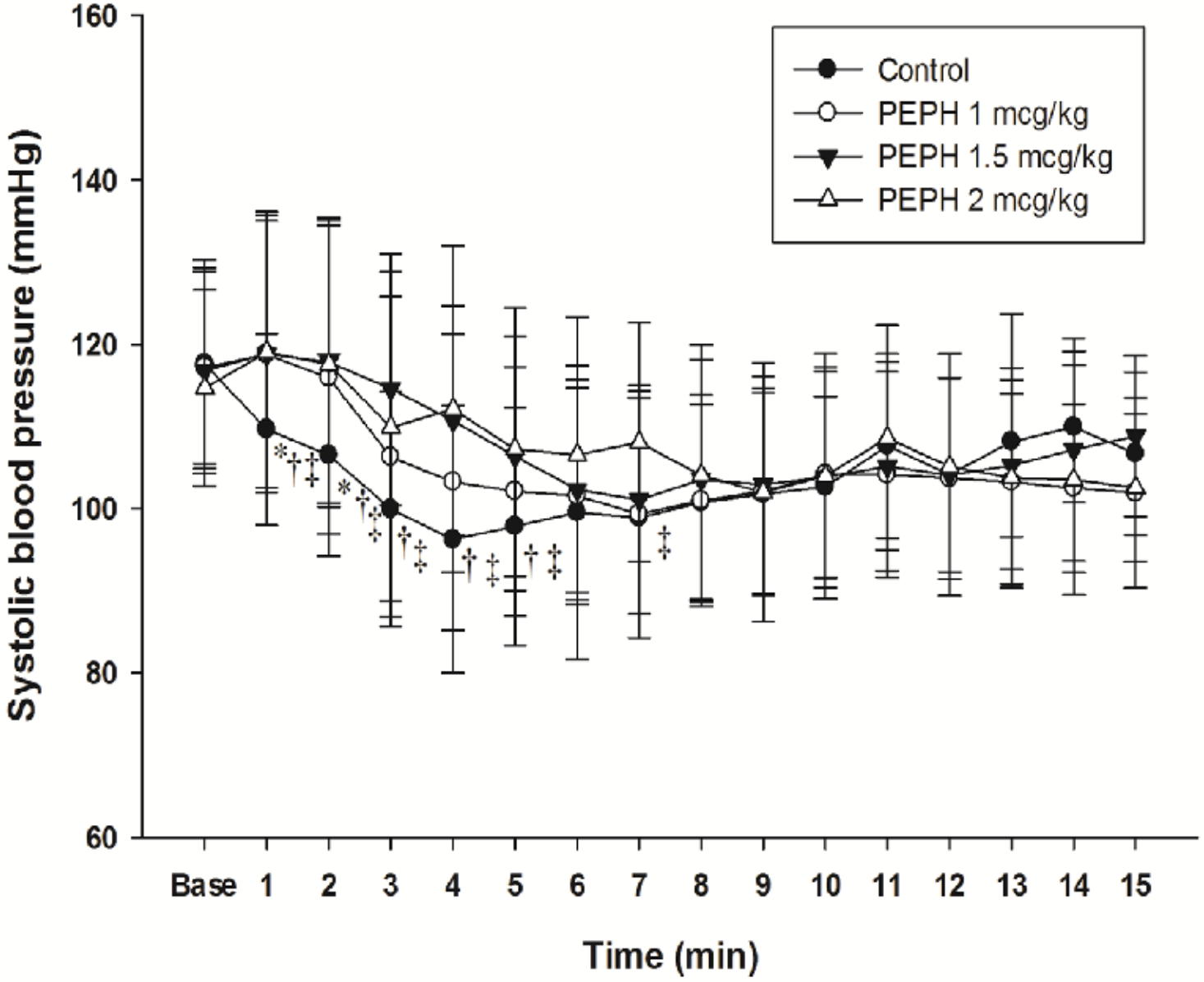
Methods: we recruited 184 ASA physical status I and II women with term singleton pregnancies scheduled for elective caesarian delivery under combined spinal-epidural anaesthesia. Patients in control group were received 2ml of normal saline. Patients in PEPH 1, PEPH 1.5 and PEPH 2 groups were received 2ml solutions of 1 μg/kg, 1.5 μg/kg, and 2 μg/kg of phenylephrine mixed in normal saline, respectively. Spinal anaesthesia was conducted in the left lateral position at the L3-4 interspace with 0.5% hyperbaric bupivacaine 7 mg and fentanyl 15 μg. an anaesthesiologist blinded to group allocation injected 2ml of normal saline mixed phenylephrine or normal saline intravenously. Blood pressure and heart rate were recorded at 1 minute intervals until the time of delivery. If the systolic blood pressure (SBP) decreased by 20% from the baseline value, 50 μg of phenylephine was given. When bradycardia (HR < 50 beats/min) occurred with hypotension, 0.5 mg of atropine was administered. We investigated obstetric data including time from the intrathecal injection to skin incision, uterine incision, and delivery, neonatal Apgar scores at 1 and 5 minutes and umbilical artery and venous pH and Pco2.

Results:The incidence of spinal hypotension were significantly higher in control group (71%, n=33) and PEPH 1 (69%, n=31) compared with PEPH 1.5 (37%, n=17) and PEPH 2 (46%, n=21) (p=0.001). Control group and PEPH 1 group required significantly larger amount of additive phenylephrine than PEPH 1.5 and PEPH 2 group (p<0.001). PEPH 2 group showed significantly higher incidence of reactive hypertension compared with other groups (37%, n=17, p<0.001). The incidences of nausea or bradycardia were not significantly different among groups (p=0.054, p=0.870, respectively).

Conclusion: Prophylactic bolus injection of 1.5 μg/kg PEPH reduces the risk of spinal hypotension and avoid adverse effects of high-dose PEPH.

References

Ngan Kee WD, Khaw KS, Ng FF, Lee BB. Prophylactic phenylephrine infusion for preventing hypotension during spinal anesthesia for cesarean delivery. Anesthesia and analgesia 2004; 98: 815-21.


Systolic blood pressure (mmHg)
160
140
120
100
80
60
Base
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Time (min)
Control
PEPH 1 mcg/kg
PEPH 1.5 mcg/kg
PEPH 2 mcg/kg

Abstract #: T-53

Readability Assessment of Web-based Patient Education Materials Related to Neuraxial Labor Anesthesia and Analgesia

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Paloma Toledo MD, MPH - Northwestern University Feinberg School of Medicine - Chicago, IL

Introduction: The Internet is increasingly utilized as a source of health care information. Web-based patient education materials (PEMs) should be written at a reading level appropriate for the average patient. The US Department of Health and Human Services recommends that PEMs be written at or below the 6th grade reading level. This study aimed to assess the content and readability of neuraxial labor anesthesia and analgesia-related web-based PEMs written by US academic obstetric anesthesia divisions.

Methods: A list of US academic medical centers with obstetric anesthesia divisions was compiled (n=122). A search for web-based PEMs was conducted using the names of these institutions along with search terms such as: obstetric anesthesia, labor analgesia, labor epidural, spinal anesthesia, and health information. Links to PEMs from external websites were excluded. The readability of PEMs was assessed with three commonly used indices: Flesch-Kincaid Grade Level (FKGL), Simple Measure of Gobbledygook (SMOG), and Gunning Frequency of Gobbledygook (Gunning FOG). The scores reflect the grade level required to comprehend the material. Readability scores were compared to national recommendations using a one-sided t-test. $P < 0.05$ was considered significant. A scoring matrix was developed to assign one point to PEMs that addressed specific content domains, including descriptions of the procedures, risks, benefits, adverse effects, contraindications, and alternative analgesic modalities.

Results: PEMs were identified on the websites of 78 US academic medical centers. The average FKGL, SMOG, and Gunning FOG scores were all higher than the recommended 6th grade reading level (Table 1). The most commonly addressed complications were unintentional dural puncture, postdural puncture headache, and hypotension (85%). The least addressed complication was epidural failure (8%). Contraindications were discussed by 13% of PEMs, and alternative modalities were discussed by 64%.

Conclusions: The majority of web-based PEMs that we identified were written above the recommended 6th grade reading level. Furthermore, while most PEMs explained the benefits of neuraxial analgesia, information about adverse effects, contraindications, and alternatives was not consistently presented. Previous work has shown that patients have significant misunderstandings regarding labor analgesia, therefore the content and readability of PEMs should be improved to enhance patient understanding.

Table 1

Readability Scores of Web-based PEMs

Readability Indices	Mean Score ± Standard Deviation	Comparison to 6th Grade Reading Level (*P*-value)
FKGL	9.3 ± 2.0	< 0.001
Gunning FOG	11.9 ± 2.2	< 0.001
SMOG	8.8 ± 1.5	< 0.001

Abstract #: T-54

Rectus Muscles Closure at Cesarean Delivery Increases Post-operative Pain

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Introduction: Different surgical closure techniques for cesarean delivery, such as closure of the peritoneum, may impact post-operative pain and analgesic requirements.(1) The aim of this prospective study was to investigate whether closure of the rectus muscles at cesarean delivery increases post-operative pain and analgesic use.

Methods: Healthy women > 35 weeks undergoing primary cesarean delivery prior to labor were the study population for this IRB-approved, randomized, double-blind study. Patients were randomized either to closure of the rectus muscles (with three interrupted sutures), or non-closure. Intra-operative (spinal anesthesia with intrathecal bupivacaine, fentanyl and morphine) and post-operative pain management (multimodal analgesia with acetaminophen, NSAIDs and opioids) was standardized within the study protocol. The primary outcome was the combined opioid use and movement pain score using the Silverman Integrated Assessment (SIA) score.(2) Total opioid use was determined using standardized relative-potency conversion scales. Verbal numerical pain scores (0-10) were assessed at rest and with movement at 24, 48, 72 hours and 6 weeks post-operatively, and area-under-the-curve (AUC) 0-72 h was calculated. Maternal satisfaction with pain management was also assessed. Appropriate parametric and non-parametric statistics were applied with $P<0.05$ considered statistically significant.

Results: 63 women were enrolled and randomized into the study. Thirty five women underwent closure of the rectus muscles, and 28 underwent non-closure. Demographic and obstetric variables were similar between groups. The SIA combined opioid use and movement pain scores were higher in the rectus closure group (-31±78% vs. +15±100%; $p = 0.043$). Opioid use was 30 mg (18-45) and 20 mg (12-35) in the closure and non-closure groups respectively ($p = 0.152$). There were no significant differences in rest and movement pain scores at 24, 48 and 72 hours and 6 weeks between the groups. There was a trend toward lower AUC 0-72 h movement pain scores in the rectus closure group ($p = 0.083$). Maternal satisfaction was high in both groups; 85% (73-90) and 90% (75-100) in the closure and non-closure groups, respectively ($p = 0.155$).

Conclusion: Closure of the rectus muscles at cesarean delivery appears to increase combined post-operative movement pain and opioid use. Findings suggest that the cesarean technique should be considered when planning analgesic protocols and anticipating postoperative pain and analgesic requirements.

Reference:
1. J Obstet Gynaecol. 2011; 31(4):307-10.
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Abstract #: T-55

Risk factors for postcesarean pain immediately postoperative period and 1 month postpartum.

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Introduction: Neuraxial morphine is commonly used for postcesarean analgesia, but we sometimes encounter patients who require frequent supplemental analgesic. Also, we do not know who may suffer persistent pain after cesarean section. The purpose of this study is to identify risk factors that are associated with increased pain immediately postoperatively and at 1 month postpartum, so that we can better tailor the analgesic method for each patient.

Method: After IRB approval, all patients undergoing elective or emergency cesarean section between August and November, 2013 were recruited to this prospective observational study. Patients were asked to fill anxiety inventory (STAI) at the time of preanesthetic visit. Possible risk factors for postcesrean pain were recorded including psychiatric and surgical history, uterine diseases, current medication, number of previous cesarean sections. Intraoperatively, patients' anxiety, response to local infiltration before spinal anesthesia, type of uterine incision, and supplemental analgesic were recorded. Postoperative assessments include time until first ambulation, analgesic use, pruritus, PONV. Visual Analogue Scale scores (VAS) were recorded at 12, 24, 48, 72 hours postoperatively. At 1 month postpartum, VAS and SFMPQ (short form McGill Pain Questionnaire) were recorded at routine postpartum visit.

Result: All 91 patients who were recruited consented to this study.
Immediate postoperative pain were not associated with any of the above factors. The incidence of persistent pain (VAS≥31mm) at 1 month postpartum was 8.8% (8/91). The factors associated with pain at 1 month include surgical history (P=0.05), as well as preoperative state anxiety (lower in persistent pain group). Other factors were not significantly different between those with and without persistent pain at 1 month postpartum.

Discussion: The incidence of persistent pain after cesarean section in our patient population was almost the same with previous studies. Persistent pain was associated with a surgical history other than CS. However, we were unable to confirm other factors such as type of skin incision and association between immediate postoperative pain and persistent pain. Interestingly, women with higher preoperative state anxiety complained less pain at 1 month postpartum. Future study should include factors such as breastfeeding and postpartum depression while extending follow up period.

Abstract #: T-56

Risk factors for prolonged length of stay after cesarean delivery

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Introduction: Rising rates of cesarean delivery (CD) have been linked to increases in severe obstetric morbidity.(1) However, the impact of pre- or perioperative morbidities on hospital length of stay (LOS) after CD is unclear. Using a CD registry, our aim was to identify risk factors for prolonged LOS among women undergoing CD.

Methods: Women undergoing CD were sourced from a US (NICHD MFMU Network) registry of 19 academic centers between 1999-2002.(2) Prolonged LOS was defined as a postpartum hospitalization duration ≥90th centile.(1) We compared maternal, obstetric and neonatal variables between women with vs. without prolonged LOS. Unadjusted and adjusted multiple logistic regression analyses were performed. Candidate variables that were associated with prolonged LOS on univariate analysis ($P \leq 0.1$) were included as covariates in a multivariate logistic regression analysis using a traditional backward model selection.

Results: In our cohort, 57067 women underwent CD and 6122 (10.7%) women had prolonged LOS. In our study, a LOS >6 days after CD was defined as a prolonged LOS. Candidate variables independently associated with prolonged LOS are presented in Table. The following perioperative complications had the highest independent risk for prolonged LOS: Endometritis (aOR=9.81; 95% CI=8.84-10.89), maternal ileus (aOR=9.28; 95% CI=7.03-12.2), and wound complications (aOR=5.0; 95% CI=4.02-6.21). Several antepartum, obstetric and neonatal variables were associated with prolonged LOS including placenta previa (aOR=3.32; 95% CI=2.74-3.28), pre-eclampsia (aOR=2.99; 95% CI=2.73-3.28), preterm delivery <37 weeks (aOR=4.18; 95% CI= 3.77-4.63) and neonatal birthweight < 2500 g (aOR=3.57; 95% CI=3.01-4.23). One or ≥2 prior CDs were independently associated with lower risk for prolonged LOS compared to no history of prior CD (aOR=0.62; 95% CI=0.55-0.69).

Conclusion: Based on our results, we identified specific maternal, perinatal and perioperative morbidities associated with prolonged LOS. In order to reduce the health-care burden of prolonged LOS after CD, modified approaches are needed for optimizing the perioperative care of high-risk women undergoing CD and to reduce the incidence of perioperative complications.

References: (1) Obstet Gynecol 2009; 113: 293-9 (2) N Engl J Med 2004; 351: 2581-9.

Table: Risk factors for prolonged postpartum length of hospital stay (>6 days following cesarean delivery:

	Adjusted OR (95% CI)
Placenta previa	3.32 (2.74-3.28)
Pre-eclampsia[a]	2.99 (2.73-3.28)
Endometritis	9.81 (8.84-10.89)
Maternal Ileus	9.28 (7.03-12.2)
Wound complications	5.0 (4.02-6.21)
Preterm delivery (<37 weeks)[b]	4.18 (3.77-4.63)
Birthweight < 2500 gms[c]	3.57 (3.01-4.23)
1 prior Cesarean delivery[d]	0.67 (0.62-0.73)
2 or more prior Cesarean deliveries[d]	0.62 (0.55-0.69)

[a] No pregnancy associated hypertension = referent group
[b] Gestational Age at delivery: 37-41 weeks = referent group
[c] Birthweight: 2500g-3499g = referent group
[d] No prior Cesarean deliveries = referent group

Abstract # :T-57

Role of genetic factors for BMI in susceptibility to preeclampsia

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Introduction: In the United States about 28% of women aged 20-39 are obese. Obesity and increased pre-pregnancy body mass index (BMI) increase adverse pregnancy outcomes. Preeclampsia (PE) affects 6-8% of pregnancies and is a leading cause of maternal and fetal morbidity and mortality. Compared to a BMI of 21, risk of PE doubles at a BMI of 26, triples at a BMI of 30 and increases further with severe obesity. Several large genome-wide association studies (GWAS) have identified single nucleotide polymorphisms (SNPs) that are associated with BMI. In contrast, despite its strong heritable component, there are no genetic variants that have been robustly associated with PE. In an effort to shed light on the genetic basis for PE and to better understand if obesity plays a causal role in PE, we sought to define the association between PE and SNPs implicated in obesity in pregnant patients of European ancestry.

Methods: The case-control study population comprised 516 PE patients and 1,097 controls, drawn from sample collections of European ancestry from 5 U.S. academic medical centers and a population-based study. Subjects were genotyped on a cardiovascular gene-centric SNP array containing ~2,000 loci selected based on prior genetic studies and on pathways expected to be important in cardiovascular disease. SNPs from 32 independent genome-wide significant BMI loci ($P<5x10-8$) were identified from a recent BMI GWAS comprising ~250,000 subjects; there were 15 independent SNPs with direct genotypes or proxies with $r2>0.5$ in HapMap CEU contained on our SNP array. These were analyzed for association with PE. Single-SNP genetic association testing was completed using logistic regression, assuming additive effects for each risk allele present, and included 10 principal components in the model to account for population structure. To assess the combined effect of BMI genetic factors in PE, a weighted genetic risk score (GRS) was constructed and evaluated for association with PE. Statistical significance for single variants was judged as a Bonferroni-corrected $P<0.003$ to account for multiple testing, while significance for the BMI GRS was judged as $P<0.05$ based on the single hypothesis.

Results: No BMI-associated SNPs were individually associated with increased risk of PE. In total 12/15 SNPs tested demonstrated a concordant direction of effect between PE and BMI, with the BMI-raising allele contributing to increased risk of PE (binomial P=0.014). The multi-SNP weighted GRS trended towards association with increased risk for PE (OR 1.29 (0.99-1.67) p = 0.057), while an unweighted GRS showed significant association (OR 1.06 (1.01-1.11) p = 0.021).

Conclusion: In sum, our results suggest that a GRS for BMI may predispose to risk of PE, but at present it is unknown if the risk is entirely mediated through BMI. These results require validation in larger studies with pre-pregnancy BMI on cases and controls.

Abstract #: T-58

Spinal anaesthesia for Elective Caesarean Delivery in a parturient with Yellow Nail Syndrome

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Background: Yellow Nail Syndrome (YNS) is a rare syndrome of unknown aetiology presenting with 2 or more of the classic triad of lymphoedema, chronic respiratory disease and yellow nails. To our knowledge, there have been no reports describing the obstetric anaesthetic management of patients with YNS.

CASE REPORT: A 20 year old primigravida presented to our obstetric services at 20 weeks gestation with an unplanned singleton pregnancy. The patient had a history of Yellow Nail Syndrome (YNS) and displayed the classic triad of yellow nails, lymphoedema and respiratory manifestations including recurrent chylous effusions.

The patient was followed up regularly by a respiratory physician and at the time of presentation her only regular medications were anti-asthma inhalers and iron tablets.

She was reviewed in our high risk pregnancy clinic with ongoing review by the obstetric team. Blood tests revealed a mild microcytic anaemia and lymphopenia (Hb 106, Plt 256, WCC 9.5). Lung function tests demonstrated an FEV1 of 1.5L and FVC 1.7L (FEV1:FVC 88%). CT Chest showed basal atelectasis. She had an uncomplicated pregnancy and was admitted at 39 weeks for an elective caesarean section. Spinal anaesthesia was conducted with the patient seated, at the level of L3/4 with 2.4ml 0.5% heavy bupivacaine and 400 micrograms diamorphine. A healthy male infant was delivered with Apgar scores of 9 and 10 at 1 and 5 minutes. Post-operative blood loss was estimated at 700ml and duration of surgery was 95 minutes. Postoperative recovery was complicated by anaemia (Hb 84 g/dL) for which she received a 2 unit blood transfusion. Further recovery was uneventful and she was discharged at 48 hours.

Discussion: Information on Yellow Nail Syndrome is limited. There are approximately 150 case reports or series in the literature but none describing the obstetric management of parturients.

Regional anaesthesia is the technique most familiar to anaesthetists (1). However, ventilatory compromise associated with YNS may necessitate a GA. This highlights the importance of adequate preassessment, investigation and optimisation for such patients within a multidisciplinary setting. No further preoptimisation was necessary but we suggest seeking advice from a respiratory physician as further investigations and procedures, such as thoracocentesis, may be appropriate in other cases. We found that gross lymphoedema of the lower limbs and back caused minor difficulties in positioning the patient and palpation of the relevant anatomy. Lymphoedema and chronic lung conditions may also predispose to local and systemic infections (2), which may contraindicate regional anaesthesia. These risks should be balanced against the benefits of GA and postponement of the procedure if indicated.

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2. Maldonado F, Ryu JH. Curr Opin Pulm Med. 2009 Jul;15(4):371-5

Abstract #: T-59

Starvation Ketoacidosis Presenting as Hypocapnia during Emergency Cesarean Section

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Introduction: Starvation ketoacidosis is a rare metabolic derangement that has been primarily reported in the third trimester of pregnancy. Patients often present with poor calorific intake due to nausea and vomiting. Maternal acidosis can be severe, requiring critical care admission and possible emergency cesarean section for fetal distress.

Case Report: We describe a case of a 29 year-old, G6P0503 female at 25 weeks gestational age and no prenatal care who underwent emergency cesarean section under general anesthesia for fetal distress. She reported a one-month history of daily nausea and vomiting with no food intake during the preceding two days. Upon initiation of positive pressure ventilation, patient was noted to have marked hypocapnia measured by capnography (EtCO2: 8), despite satisfactory endotracheal tube placement and hemodynamic status. ABG revealed pH: 7.039, bicarbonate 6 mmol/L, PCO2 25.1 mmHg, base excess -22.7 mmol/L, and an anion gap of 23. The patient was also noted to have acute renal failure. She was treated with sodium bicarbonate and fluid resuscitation intraoperatively pending further evaluation of her acid-base disturbance. B-hydroxybuterate serum concentration was elevated beyond 9 mmol/L while urinalysis revealed ketonuria (80 mg/dL) in the absence of glucosuria. Serum hemoglobin A1C and glucose concentrations were within normal limits. Evaluation for other causes of anion gap metabolic acidosis was unremarkable. A male newborn weighing 836 grams with APGAR scores 2 and 7 was delivered and transferred to the neonatal ICU. With improved oral intake, the patient's serum bicarbonate and renal function normalized on postoperative day 2.

Discussion: Poor calorific intake and insulin resistance due to placental hormones, particularly in the third trimester, result in compensatory upregulation of catabolic pathways promoting protein and fatty acid degradation. Anion gap metabolic acidosis results from increased hepatic ketogenesis to provide substrate for central nervous system metabolism during starvation. Providing adequate calorific intake is fundamental to limiting and reversing this process.

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Abstract #: T-60

TAP'ing into alternative resources for post-Cesarean analgesia

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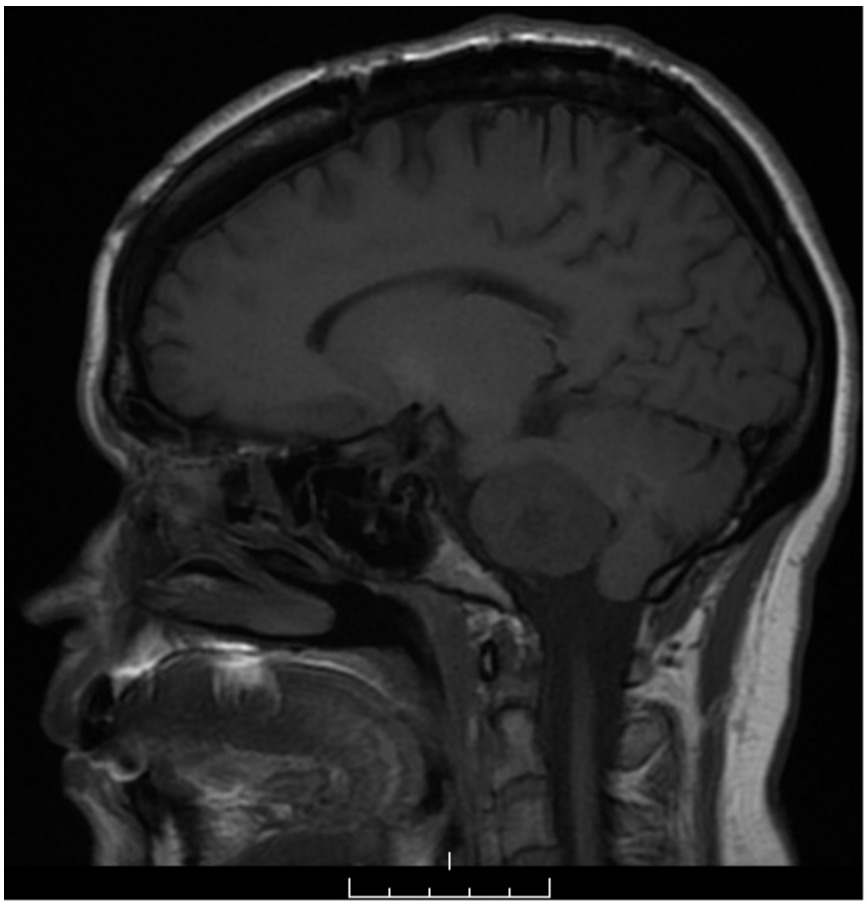
Background: Post-partum (PP) pain management is critical to maternal-infant bonding and maternal recovery. Parturients with intracranial lesions present a unique challenge for pain management after cesarean section (CS) as neuraxial anesthesia(NA) is often contraindicated in this population. In addition, intravenous narcotic use may be limited, due the potential to cloud sensorium and confound subsequent neurological exams, and to cause nausea/vomiting and hypoventilation, which can increase intracranial pressure(ICP). We report a case of a parturient with a large intracranial mass, where multimodal analgesia(MMA), including a transversus abdominis plane (TAP) block and early maternal bonding, was used to achieve excellent PP pain control and patient satisfaction.

Case Report: A 33 year-old G1P0 with Neurofibromatosis type 2 (NF2) presented for multidisciplinary discussion on options for delivery. In the setting of pregnancy and a pause in active suppressive Avastin chemotherapy, a left vestibular schwannoma had progressively enlarged, leading to significant compressive mass effect on the left anterior brainstem and cerebral aqueduct(-Fig. 1). The result was depletion of the intracranial cerebrospinal fluid, with subsequent downward movement of the brainstem, increase in ICP and new onset deafness. NA was contraindicated because of the risk of further herniation in the setting of an intentional or inadvertent dural puncture. Patient underwent a scheduled CS under general anesthesia (GA) with provisions to avoid increases in ICP and minimize risk of aspiration. Options for PP analgesia were further limited by an allergy to NSAIDs. TAP block was considered a good alternative, and was performed after full recovery from GA , so as to avoid confounding findings of neurological changes that could have resulted from either worsening brainstem compression during the surgery or from local anesthetic toxicity from the TAP block. The MMA achieved excellent pain relief in the PP period.

Discussion: Early maternal bonding and skin-to-skin contact may improve patient perception of pain and overall satisfaction . In cases where NA is contraindicated and opioid use is limited, MMA including TAP block is a valuable tool for PP pain relief after CS. TAP blocks have been shown to provide adequate analgesia for up to 48 hours and to reduce narcotic use. Considerations such as patient selection, timing of the TAP procedure and priorities of care are reviewed in this repor.



Abstract #: T-61

The Content of Informed Consent for Neuraxial Analgesia

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Objective: Informed decision-making is a challenging task. Work in the outpatient setting has shown that <1% of complex decisions (e.g. procedural decisions) met criteria for completely informed decision making. The decision to use or not use neuraxial labor analgesia is a complex decision, as there are extensive effects to the patient, there is no consensus on the medical necessity of the procedure, and there are multiple possible outcomes for the patient. The purpose of this observational study was to evaluate the content of analgesic counseling for neuraxial labor analgesia.

Methods: Anesthesiology resident physicians and English-speaking nulliparous women, recruited after admission to the Labor and Delivery unit, participated in a study on patient-provider communication. The analgesic counseling session was audio-recorded and transcribed verbatim. A scoring matrix was developed, and each analgesic risk, benefit, and discussion of any alternatives was given one point. Count data were presented as percentages, and discussion content was compared among residents using a chi-square statistic. $P < 0.05$ was significant.

Results: Ten residents participated in this study. A total of 82 patient interviews were recorded, and each resident counseled between one and sixteen patients. During the counseling, 98% of residents mentioned risks, 95% mentioned benefits, and 21% mentioned alternatives to neuraxial analgesia. There was significant variability amongst residents in what specific risks and benefits were discussed with patients (Table 1).

Conclusion: While there are no formal guidelines as to what information needs to be discussed while obtaining informed consent for neuraxial analgesia, risks with an incidence of ≥1% should be disclosed, as well as risks with serious morbidity or mortality. In addition, benefits and alternatives should be discussed. Our results demonstrate that inconsistent information is being discussed with patients during analgesic counseling, and this may result in poor quality decision-making, as patients may not be truly informed. A more formal, standardized process for teaching informed consent should be developed and evaluated to improve the quality of analgesic counseling discussions.

Funding: Robert Wood Johnson Foundation grant 69779

Table 1. Risks of neuraxial analgesia discussed by resident physicians during analgesic counseling

Complication	Median (Interquartile Range)*
Infection	100 (92-100)
Bleeding	100 (92-100)
Neurologic injury†	83 (31-92)
Post dural puncture headache	100 (92-100)
Epidural failure†	90 (42-100)
Back pain†	28 (8-100)
Hypotension†	82 (50-100)
High spinal†	0 (0-0)
Pruritus†	83 (0-94)

* Percent of residents who discussed risk with patient; †Different among the residents.

Abstract #: T-62

The impact of noninvasive cardiac output monitoring on maternal hemodynamics during cesarean delivery under spinal anesthesia: a randomized controlled trial

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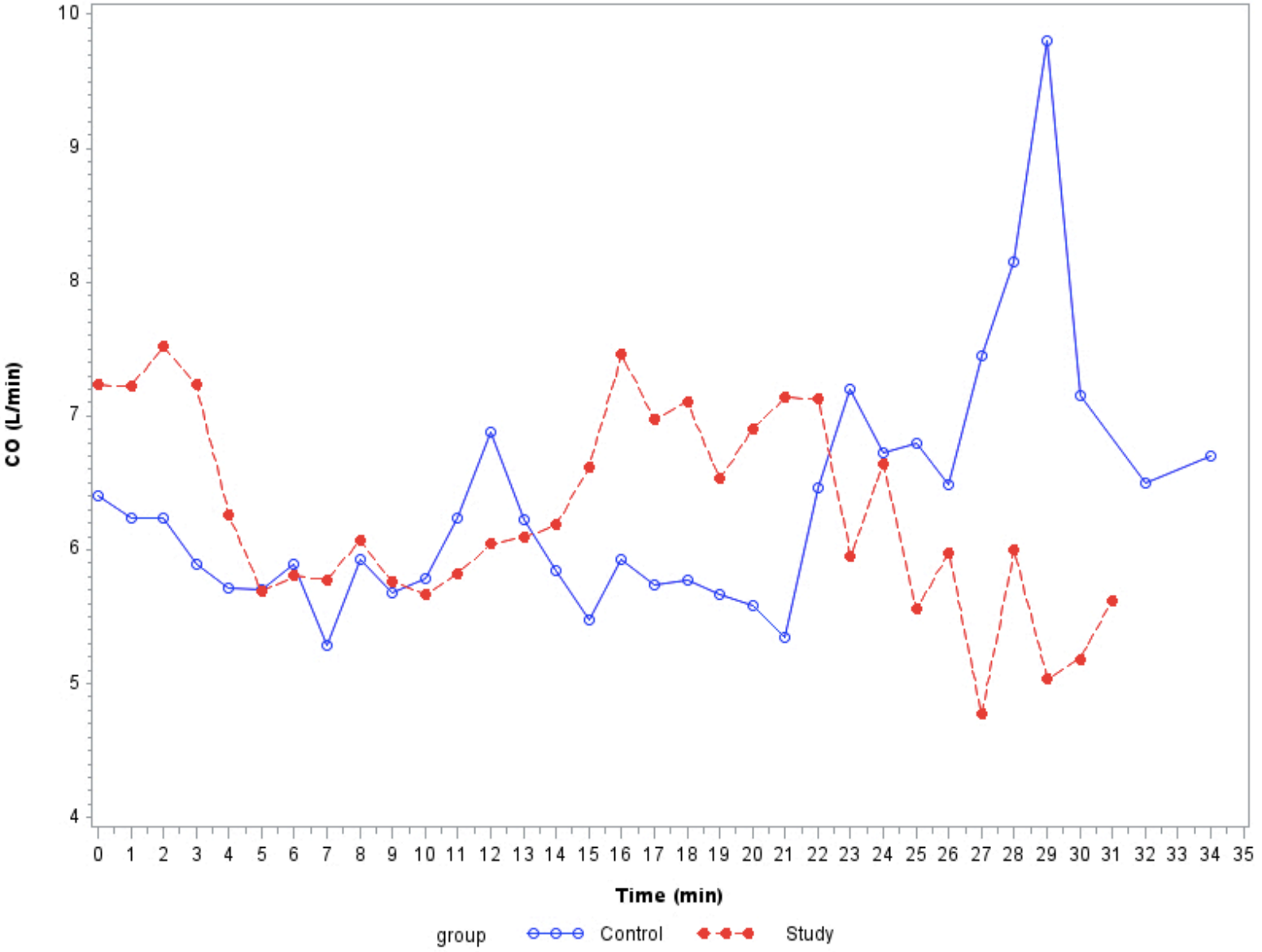
Introduction: Recent studies have demonstrated that uteroplacental blood flow correlates better with maternal cardiac output (CO) than with maternal systolic blood pressure (SBP) during cesarean delivery (CD) (1,2). However, the impact of hemodynamic management using CO compared to SBP on maternal and fetal outcomes remains unknown. The purpose of this study was to evaluate CO changes during elective CD using CO-based management versus conventional SBP-based management of maternal hemodynamics with the use of a noninvasive CO monitor.

Methods: Healthy parturients scheduled for elective CD under spinal anesthesia (SA) were randomized to control or study groups. A non-invasive CO monitor (ICON®, Osypka Medical, California, USA) was applied to measure CO based on electrical velocimetry. The control group received standard care with CO data blinded to the providers, and vasopressor selection (phenylephrine, ephedrine) was based on physician preference. The study group received vasopressor treatment based on an algorithm integrating CO data with SBP values. All subjects received 1L of Lactated Ringer's co-load during placement of SA. Hemodynamic data was collected every minute from initiation of SA until delivery of the fetus. Primary outcome was change in mean CO over time. Secondary outcomes were incidence of CO, SBP, and heart rate (HR) maintained within 20% of baseline, total vasopressor use, incidence of nausea and vomiting and neonatal well-being assessed via APGAR scores and umbilical cord gases.

Results: To date, 28 of 50 patients have been recruited with 14 patients in each group. Using mixed model analysis, there was no difference in mean CO between the two groups ($p=0.605$). However, a significant fluctuation in mean CO over time was observed in the control group ($p<0.0001$). There were no significant differences in secondary outcomes.

Discussion: For healthy parturients undergoing elective CD under SA, our preliminary results suggest that CO-based hemodynamic management offers no advantage over SBP-based management. Therefore, routine use may not offer additional benefit. Significant fluctuations in mean CO over time in the conventional management group may suggest a role for CO-based management in a subgroup of patients with hemodynamic instability or cardiac dysfunction (e.g. preeclampsia). Further investigation in this population is warranted.

References:
1. McDonald S et al, Anesth Analg 2011
2. Dyer RA et al, Anesthesiology 2008


CO (L/min)
10
9
8
7
6
5
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
Time (min)
group
Control
Study

Abstract #: T-63

The use of Tranexamic Acid in a patient with heretofore undescribed genetic mutation causing pancytopenia in a parturient with placenta previa undergoing a cesarean section.

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Erythroid Krüppel-like Factor(EKLF) is a transcription factor that is necessary for the proper maturation of erythroid cells. An E325 mutation in KLF1 has been reported to cause a severe Congenital Dyserythropoietic Anemia phenotype. Our patient is homozygous for a novel amino acid change in the KLF1 transcription factor. This change has not been reported in the literature, as the homozygous mutation was thought to be non-viable. EKLF deficient (knockout) mouse embryos exhibit a lethal anemic phenotype; fail to promote the transcription of adult β globin and die by embryonic day 14.

Case:A 42-year-old G2P0 with GDM and placenta previa, was noted to have severe anemia and thrombocytopenia on routine CBC at 13 weeks. Further history revealed a previous first trimester loss, but no other significant bleeding history. During the pregnancy, the patient reached a nadir of 4 thousand platelets and Hemoglobin of 16. The patient was transfused 2 units of blood biweekly, beginning at 13 weeks and received a pool of platelets whenever her platelets fell below 15 thousand. She was scheduled for elective C-section at 36 weeks and 6 days. The patient was transfused 4 units PRBC and 2 pools of platelets over a period of 2 days prior to surgery to a HCT of 28 and platelet of 100k. The morning of the procedure the HCT had remained stable, but the platelet had dropped to 60k. The patient was put under general anesthesia uneventfully and additional peripheral lines and an arterial line were placed. Platelets were hung shortly after initial incision and with increased bleeding and atony after delivery of the baby and placenta, 4 units of PRBC's were administered along with Pitocin, methergine, hemabate and misoprostol. With continued bleeding and oozing from incisions, FFP and one gram of Tranexamic Acid was given. Hemostasis was obtained shortly thereafter and the procedure concluded without further intervention.

Antifibrinolytic therapy has been widely used in surgery and especially trauma in order to reduce surgical blood loss. Critically to our pro-thrombotic population, there was no evidence of an increased risk of thrombotic events. Pending the results of the WOMAN Trial, there is no good prospective evidence that recommends TXA for Post Partum Hemorrhage (PPH). Retrospective analysis has detailed the efficacy of TXA in treatment of PPH without an increase in risk of thrombotic event.In our case, given what is known about KLF mutations and its association with the phenotypic presentation of a CDA-like pancytopenia, in conjunction with intractable hemorrhage, we relied on case reports successfully detailing use of TXA in patients with CDA and the multiple positive reports found in PPH literature to justify the use of TXA in this scenario

Hodge D, Coghill E, Keys J, Maguire T, Hartmann B, McDowall A, Weiss M, Grimmond S, Perkins A. A global role for EKLF in definitive and primitive erythropoesis. Blood. 2006 15 April2006;107(8):3359-70.

Abstract #: T-64

To Section or Not? - the Management of a Parturient with Dilated Cardiomyopathy

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Introduction: Cardiac disease during pregnancy poses incredible challenges for the anesthesiologist and great risk to the mother and fetus. Maternal outcome is highly correlated with the New York Heart Association functional classification, with a 5% to 15% mortality rate in patients with Class III or IV disease. We present a patient with a dilated cardiomyopathy who was initially presumed to be optimized for the induction of labor, but instead was found to be in Class IV heart failure by the anesthesia team in the labor suite resulting in a change of delivery plan to urgent cesarean section (CS).

Case Report: A 36 year-old, morbidly obese G5P3011 with a history of dilated cardiomyopathy (EF 15%) and an AICD was admitted for an acute exacerbation of CHF at 27 wk EGA. Other co-morbidities included asthma and hypothyroidism. After a 5-wk course of in-house medical optimization, she underwent induction of labor for vaginal delivery (VD) per recommendation of her cardiologist at 32 wk EGA. Upon anesthesia consultation for epidural placement, she was noted to be dyspneic, tachycardic, hypotensive and edematous. An ABG was ordered emergently which revealed a metabolic acidosis with respiratory compensation indicative of a poor perfusion state. A BNP obtained at the same time showed 802 pg/ml, which was consistent with her symptoms of a marked CHF exacerbation. The patient was taken to the OR urgently, an A-line was placed, and she received a dural-puncture epidural for CS with no pre-anesthetic fluid administration. Additionally, she was started on dobutamine and norepinephrine infusions for hemodynamic support. Post-delivery, n-methyl ergonovine maleate IV was titrated to increase uterine tone and avoid the fluid-retaining effects of pitocin; while permissive bleeding was used for acute intravascular volume reduction. The patient clinically improved in the OR with a marked reduction in work of breathing and subjective dyspnea. She was subsequently transported to the CCU for post-operative management.

Discussion: There are several topics of discussion concerning the management of delivery for this parturient. While VD may be the preferred route of delivery, it poses unique hemodynamic challenges to the parturient with cardiomyopathy, and consideration for VD vs CS requires a multi-disciplinary approach and a careful assessment of the patient's functional cardiac status. Currently no official recommendations on delivery approach exist, and thus, the appropriateness of VD vs CS must be individualized to the clinical scenario. Finally, the perioperative management of a patient in CHF involves a complex interplay between adequate anesthesia, appropriate fluid balance, and preservation of the already severely reduced cardiac function all of which were approached very deliberately during delivery of the anesthetic.

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Abstract #: T-65

Tumefactive Multiple Sclerosis Presenting as Neurologic Deficits in Pregnancy

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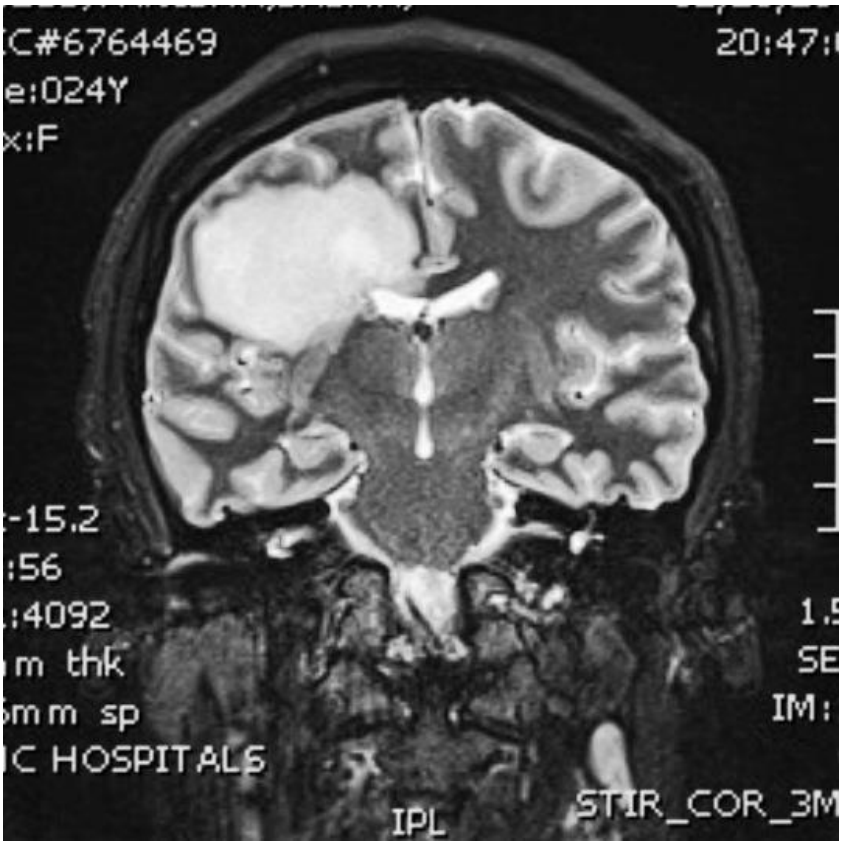
A 24 year-old female with a 23-week intrauterine pregnancy and a history of depression, morbid obesity, and tobacco abuse presented to the ED with new onset headache, dysarthria, and facial asymmetry. Head CT was negative for mass or hemorrhage. However, MRI revealed several intracranial lesions with increased T2 signal in the periventricular and sub-cortical white matter; the largest lesion in the right frontal lobe measuring 3.8x2.4x2.7cm. The presentation was consistent with an acute demyelinating process, most likely tumefactive multiple sclerosis (TMS). Oligoclonal bands in her CSF further supported the diagnosis. Despite aggressive steroid therapy, the patient continued to decline, developing profound left sided weakness. Repeat MRI showed an interval increase of the largest lesion, now measuring 5.3x4.3x4.9cm, with a new midline shift. At 32 weeks gestation, fetal testing revealed a non-reactive NST and reversed end-diastolic flow on US. She was delivered via cesarean delivery (CD) for breech presentation. Given imaging consistent with elevated intracranial pressure (ICP), general anesthesia using RSI technique was chosen. Anesthesia was maintained with a remifentanyl infusion and volatile agent. The surgery was uneventful and she was discharged on POD 4. We present a very rare form of multiple sclerosis (MS) in a pregnant patient with elevated ICP and the substantial anesthetic challenges associated with CD.

MS is a chronic, often relapsing–remitting disease thought to be of immunologic etiology characterized by a variety of neurological symptoms. TMS is a variant of MS distinguished by large demyelinating lesions which frequently cause mass effect, elevated ICP, and cerebral edema (1). Pregnancy has been found to be protective against the development of an MS flare, but the effects of pregnancy on TMS are unknown. While neuraxial anesthesia is safe in patients with MS, it is relatively contraindicated in the setting of elevated ICP given the risk of herniation and the resultant morbidity and mortality. In pregnancy, GA carries the increased risk of difficult intubation. In addition, hypertension and the associated increase in ICP during laryngoscopy and emergence are imperative to avoid in a patient with known elevated ICP. For these reasons, CD in a patient with TMS presents significant anesthetic challenges.

1) Kaeser DC et al. Tumefactive multiple sclerosis: an uncommon diagnostic challenge. J Chiropractic Med 2011;10: 29-35.



Abstract #: T-66

Use of a Time Out Checklist Identifies Deficiencies in Obstetric Preanesthetic Preparation

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Co-Author: Curtis Baysinger MD - Vanderbilt University School of Medicine - Nashville, TN
Mary DiMiceli MD - Vanderbilt University School of Medicine - Nashville, TN
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Background: In 2008, the World Health Organization (WHO) published the Surgical Safety Checklist (CL) for operating room (OR) use1 and recent studies attest to its effectiveness in improving patient safety2. Adaptation of the "Sign In" portion of the WHO list to improve preanesthetic (PA) induction safety detects a significant rate of missed checks3. The ACOG has described a patient safety CL specific for cesarean section (CS)4; only one other author describes an obstetric (OB) PA CL5. No study reports on its effectiveness. We recently adopted use of an OB PA CL and recorded data on its ability to identify deficiencies in PA preparation.

Methods: IRB approval was obtained. The CL was developed in mid-2013 using a Delphi method among 6 obstetrical anesthesiologists who attend in the obstetrical suite 84% of the time. The CL was identified with the acronym ACED with the following elements: A: Anesthesia (type), Allergies, Antibiotics, Airway; C: Consent, Co-morbidities; E: Eat (NPO status), Equipment (pulse ox, suction, O2 delivery); D: Drips (IV access adequate), Drugs (MgSO4, pitocin, insulin, vasopressor). Two authors (CB & JB) recorded instances of deficiencies detected by CL use for all obstetric anesthesia procedures. Fisher's exact test was used to compare rates of deficiencies between neuraxial labor analgesia (EPI) and OR procedures (CS, cerclage, D&E, tubal ligation).

Results: Data on 225 procedures were collected in this ongoing observational study (Table 1). 32 deficiencies were detected overall (14.7%) with higher rates noted for (EPI) compared to CS/other (18.4% vs. 9.0%, P = 0.04). Incorrect or unavailable antibiotics were detected in 3.3% of patients for CS/other, while lack of suction, pulse ox, and oxygen delivery system were detected in EPI (5.1%, 2.9%, 0.7% respectively), but not in CS/other.

Table 1: Results

Deficiencies detected	n (%)
Total EPI	**25 / 136 (18.4%)***
No pulse ox	4
No suction	7
IV insufficient	3
No wrist band	1
No vasopressor	2
No oxygen	4
Oral piercings	2
Consent issues	1
No BP equipment	1
Total CS/Other	**8/89 (9.0%)**
No/wrong antibiotics	3
Consent issues	3
IV insufficient	2
Overall Total	**33/225 (14.7%)**

Ox = oximeter; CS = cesarean section; BP = blood pressure
* P = 0.04 compared to CS/Other Total by Fisher's exact test

Discussion: We observed an overall rate of in OR deficiencies (9.0%) similar to that reported by others (11.2%) (3). The rate of deficiencies was higher for EPI compared to CS/other, with differences in the types of deficiencies. Our data suggests that widespread implementation would identify a significant number of PA preparation errors. However, others have noted significant CL infidelity occurs when CLs are widely adopted into clinical use (6).

Ref: 1)Lancet2008;86:1; 2)N Engl J Med2009;360:491; 3) Anesth Anlag2011;113:84; 4)Obstet GYN2011;118:1471; 5) IJOA2010;19:235; 6)Surgery2012;152:331

Abstract #: T-67

Use of Transthoracic Echocardiography to Assess Hemodynamic Changes Associated with CSE Labor Analgesia

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Background: Point-of-care (POC), focused cardiac ultrasound is being integrated into a variety of acute care settings, including obstetric anesthesia, to guide clinical decision making.1 However, it is unclear whether image acquisition is feasible and measurements are valid in the dynamic environment of labor. The aim of this pilot study was to determine the feasibility of using POC, focused cardiac ultrasound in laboring patients to evaluate left ventricular and IVC volume status before and after CSE labor analgesia.

Methods: After IRB approval and written informed consent, 10 healthy parturients admitted for elective labor induction were recruited. Ultrasound was used [Sonosite M Turbo, P-21x/5-1 mHz transducer] to measure left ventricular end-diastolic diameter (LVEDD) and inferior vena cava diameter (ICVD) during three different time periods: prior to oxytocin induction (Baseline), at request for analgesia (Pre-CSE), and 10 minutes after IT administration (Post-CSE). Neuraxial analgesia was initiated using a CSE technique (IT bupivacaine 2.5 mg, fentanyl 15 mcg, followed by epidural test dose [lidocaine 45 mg, epinephrine 15 mcg]). A crystalloid bolus (LR 500 mL) was co-administered with CSE. Images were acquired from parasternal short axis (PSSA), parasternal long axis (PSLA), and subcostal (SC) views, by a single investigator (ED), with patients in the left lateral decubitus position. Three measurements were made for PSSA and PSLA views at each time period; two measurements were made for ICVD at end-expiration (EXP) and end-inspiration (INSP). Data were compared over time and between modalities using a repeated measures generalized linear model.

Results: [Table] Image acquisition was obtained in 100% of PSSA and PSLA attempts, and 90% of SC exams. The coefficient of variance for mean LVEDD measurements was 6% for PSSA and 5% for PSLA views. No patient required vasopressor post-CSE.

Conclusions: It is feasible to obtain PSSA, PSLA and IVC images with reproducible measurements in laboring patients. No significant changes were observed in LVEDD or IVCD over time despite decreases in BP post-CSE. This methodology may be used to assist clinical decision-making in laboring parturients.

Table (Duncan)

Approach	Measurement	Baseline	Pre-CSE	Post-CSE	Postpartum	*P*
PSSA	LVEDD [cm]	4.0±0.4	3.8±0.3	4.1±0.4	3.7±0.7	0.82
PSLA	LVEDD [cm]	4.0±0.8	4.0±0.9	4.2±0.4	4.2±0.4	0.29
SC	IVCD [cm]					
	EXP	1.2±0.4	1.3±0.4	1.2±0.3	1.3±0.3	0.74
	INSP	0.9±0.2	1.0±0.4	0.9±0.3	0.9±0.3	0.48
NIBP	mmHg					
	Systolic	115±13	124±12†	111±12‡	116±11	0.01
	Diastolic	66±11	67±11	60±8¶	68±8	0.004

1. Dennis, A. Use of Transthoracic Echocardiography in Postpartum Hypotension. Anesth Analg 2012;115:1033-7

Abstract #: O2-01 & T-68

Dexmedetomidine For Management Of Awake Craniotomy In A Pregnant Patient

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Awake craniotomy is often indicated for neurosurgical procedures requiring intraoperative monitoring of speech or motor function. We describe the management of a pregnant patient referred for awake craniotomy for glioma resection. Although the use of dexmedetomidine for awake neurosurgical procedures has been described, this is the first report of the use of dexmedetomidine for an awake neurosurgical procedure during pregnancy.

A 27 year old G2P1001 female who developed a new-onset seizure was found to have a large intra-axial left superior temporal neoplasm consistent with glioma. As the tumor was located near eloquent cortex responsible for control of speech and motor function, she was to undergo awake left craniotomy, motor and speech mapping, and resection at 20 weeks gestation.

Surgery was performed in the supine position with left uterine displacement. Fetal heart tones and uterine contractility were assessed both before and following surgery, and intermittently during the procedure. Sedation was maintained with a dexmedetomidine infusion. Dexmedetomidine was infused at 0.4-0.5 ug/kg/hour initially with intermittent doses of propofol (10-30mg). The infusion was decreased to 0.2 ug/kg/hr during motor and speech mapping. After successful mapping was complete, dexmedetomidine was increased to 0.3-0.7 ug/kg/hr for increased sedation during tumor resection and closure. There was no evidence of changes in fetal heart tones or uterine contractions during the perioperative period. Postoperative MRI confirmed gross total resection of tumor and patient did not have any new neurologic deficits. She uneventfully delivered a healthy baby at term.

Dexmedetomidine is an α2 adrenergic receptor agonist with sedative, anxiolytic, and analgesic effects that does not cause respiratory depression (1). These characteristics make it very useful for sedation during awake craniotomy as there is limited access to the airway. However, the effects of dexmedetomidine on the preterm fetus are not well described. Dexmedetomidine has minimal effects on fetal cardiovascular status and cerebral oxygenation in preterm fetal sheep (2). Also, dexmedetomidine was found to enhance the frequency and amplitude of contractions in human myometrium in vitro (3). We did not observe any adverse effects due to dexmedetomidine in the fetus. This may be attributable to high placental retention of dexmedetomidine thus minimizing fetal exposure to the drug (4). Further research is required to better understand the effects and safety of dexmedetomidine in the pregnant patient.

References:

1. Bekker AY. Anesth Analg 2001;92:1251-3
2. Uemura K. Int J Obstet Anesth. 2012;21:339-47
3. Sia AT. Int J Obstet Anesth. 2005;14:104-7
4. Karaman S. Adv Ther. 2006;23:238-43

ABSTRACTS- FRIDAY

Abstract #: F-01

A lesson from the occult

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Lessons from the occult

Introduction: The lumbosacral cerebrospinal fluid (CSF) volume, as assessed by magnetic resonance imaging, is a major determinant of the intrathecal spread of local anaesthetics(1). Asymptomatic spina bifida occulta is relatively common in the general population (10-50%) and may be associated with enlarged lumbosacral dural sac dimensions. We report a case of low block following spinal anaesthetic in a parturient with spina bifida occulta and enlarged sacral dural sac dimensions.

Case Report: A healthy 34-year-old lady presented for elective Cesarean Section for transverse lie.
She reported a small lower back anomaly present since birth that had remained completely asymptomatic. Physical examination revealed a subtle fat pad stretching from L2-L4. There were no other anomalies noted.
Lumbar spine X-ray revealed incomplete fusion of the posterior elements of the L3 and L4 vertebrae, consistent with underlying spina bifida occulta. MRI showed a tethered, low lying spinal cord extending to L4 and capacious lumbosacral dural sac dimensions.
Using spinal ultrasound the L5-S1 interspace was identified and marked. A spinal anaesthetic containing 13mg of bupivacaine, 15 mcg of fentanyl and 0.1mg of morphine was successfully inserted with aspiration of clear CSF prior to, and following injection. The patient was placed in the supine position and a wedge inserted under the right hip. After 15 minutes, including 10 minutes in 15 degree Trendelenberg position, the patient had Bromage 3 motor block bilaterally, while the sensory block level extended to T12, determined by pinprick. An epidural catheter was subsequently inserted at T12/L1 level and 12ml of 5mg/ml bupivacaine administered to achieve a sensory block level of T4 bilaterally. Surgery proceeded uneventfully and a healthy baby was delivered. The mother recovered well, and was discharged home on the fourth postoperative day, with neurosurgical follow up arranged.

Discussion: We propose that the low block level following spinal anaesthesia was most likely related to enlarged lumbosacral dural sac dimensions. While this relationship has been reported in the general population, with a good correlation between lumbosacral dural sac dimensions on MRI and block height, the same data has not been available to date for the obstetric population. This report supports the theory that spinal canal dimensions are the primary determinant of block height following spinal anaesthetic administration in the pregnant population.

(1) Carpenter RL, Hogan QH, Liu SS, Crane B, Moore J. Lumbosacral cerebrospinal fluid volume is the primary determinant of sensory block extent and duration during spinal anesthesia. Anesthesiology 1998; 89: 24–9.

Abstract #: F-02

A Multidisciplinary Approach to Designing a Protocol for Safe Labor and Delivery Management of a Patient with Idiopathic Anaphylaxis (IA) and Plasminogen Activator Inhibitor Type 1 (PAI-1) Deficiency

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Summary: An interdisciplinary team created and implemented a labor and delivery plan for the successful management of a patient with IA and PAI-1 deficiency.

Background: This is a case of a 31-y.o. G1P0 patient with a past medical history of IA, PAI-1 deficiency, and heterozygosity for hemophilia A. IA is anaphylaxis not explained by a proved or presumptive cause or stimulus. The patient's symptoms typically included urticaria and upper airway swelling that resolved with prompt administration of antihistamines and steroids. All of her medications were manufactured by a single pharmacy in another state.

PAI-1 is an important component of the coagulation system that down-regulates fibrinolysis. A reduction in the levels of PAI-1 may result in increased fibrinolysis and an associated bleeding diathesis. The patient had a history of menorrhagia and had received aminocaproic acid in the past as prophylaxis for dental procedures.

Clinical Course: The patient was admitted at 26 weeks with preterm contractions. She provided a list, created by her allergist, of medications and suppliers that were known to be safe as well as those known to induce allergic reactions. She received two doses of betamethasone, constituted by the pharmacy that usually makes all of her medications, prior to cessation of her contractions. She developed urticaria during her admission, thought to be due to the intravenous (IV) tubing. She was discharged and an interdisciplinary task force was formed to create a plan for her pending delivery.

The team included Obstetric Anesthesiology, Obstetrics, Hematology, Nursing, Pharmacy and Perioperative Services. The patient and her allergist were active participants in the protocol development.

The task force collaborated to identify and assemble medications and supplies safe for administration. Delivery scenarios were discussed among the team members and, in conjunction with the patient, a plan was created to manage each situation. A storage container dedicated to the patient was stocked with materials such as medications, sutures, DEHP-free IV tubing, and surgical instruments.

The patient returned at 29 weeks with premature preterm rupture of membranes and in labor. All involved team members implemented the previously generated plan. The patient had a spontaneous vaginal delivery of a baby boy with hemophilia A.

Discussion: Patients with IA present unique challenges for any surgical procedure. In addition, the presence of PAI-1 deficiency can complicate the anesthetic management of patients in labor. The interdisciplinary collaboration among multiple services resulted in a coordinated patient care plan to safely manage the labor and delivery of a patient with IA and PAI-1 deficiency.

References:
1. Greenberger, P. Idiopathic Anaphylaxis. Immunol Allergy Clin N Am 2007; 27: 273-293
2. Mehta R, Shapiro A. Plasminogen activator inhibitor type 1 deficiency. Haemophilia 2008; 14: 1255-1260

Abstract #: F-03

A Randomised Double Blind Clinical Trial To Evaluate The Effects Of Intrathecal Bupivacaine Or Bupivacaine-Fentanyl Combination On Internal Uterine Tone And Fetal Heart Rate During Labour Analgesia

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Background: Literature suggests association between subarachnoid opioids and transient fetal bradycardia. We evaluated the effects of a lower dose of spinal fentanyl -bupivacaine or bupivacaine alone during CSE technique on the uterine basal tone and its association with the occurrence of FHR abnormalities.

Methods: This randomized double blind trial was conducted in 30 parturients who requested labor analgesia. After written informed consent, Group B received spinal analgesia with 2.5mg (0.5%) hyperbaric bupivacaine ; Group BF received 2 mg (0.5%) hyperbaric bupivacaine with 15 µg fentanyl. A disposable intrauterine pressure catheter system, attached to the cardiotocograph machine, was inserted by a blinded obstetrician after rupture of membranes beyond 3 cm cervical dilatation of active labour, but < 5 cm. Intra uterine pressure recordings and FHR patterns were noted for 15 minutes prior and 30 minutes following spinal analgesia. The primary outcome was an increase in 10mmHg of uterine basal tone. As secondary outcomes, incidence of FHR change, maternal hemodynamics, VAS scores, spinal block characteristics, nausea, vomiting, pruritis and immediate neonatal outcome was observed.

Results: In group B, a significant decrease in basal tone was observed (p=0.022; t-test).Within group BF the tone was higher than baseline but did not reach a value of statistical significance .Three parturients in Group BF showed a hypertonus pattern [>10mmHg elevation (p=0.102; t-test)].Statistical analysis revealed significant difference (p=0.046; χ2test) of non reassuring fetal heart rate (NRFHR) abnormalities in group BF (n=7) when compared to group B (n=2). Further, uterine hypertonus with NRFHR pattern occurred in 2 of 7 (28.5%), parturients in group BF only. NRFHR with associated maternal hypotension was seen in two women each in groups BF & group B (p=1.00; χ2test).Similar VAS scores were recorded following intrathecal drugs during the first 5 minutes in both the groups showing NRFHR pattern(p=0.00; t test). Neonatal outcome was similar in the two groups.

Conclusions: There was no evidence of significant hypertonus uterus in either group. A higher incidence of FHR abnormalities and pruritis was seen in BF group as compared to bupivacaine alone. None of the women required emergency caesarean delivery due to these FHR changes. Labour outcomes as well as neonatal outcomes were comparable between the groups.

UTERINE BASAL TONE

	Group B(n=15)	Group BF(n=15)	p
Baseline uterine basal tone(mmhg)	11.60±6.52	10.2±8.52	0.621
Uterine basal tone after analgesia	7.733±2.57	13.3±7.04	0.010*
p	0.022*	0.102	

Reference

1. Abrao et al: Obstet Gynecol 2009; 113: 41–47.

Abstract #: F-04

A Single-Blinded Prospective Study Comparing Pain Relief in Laboring Term Parturients Receiving Sedara Versus Butorphanol

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Introduction: Nitrous oxide (N2O) has been used to treat labor pains for over 150 years. Sedara™ is a self-administered, portable gas delivery system which delivers a 50% N2O / 50% oxygen mixture (N2O/O2) by a negative pressure triggering mechanism. We present a single-blinded prospective study comparing the analgesic effect of Sedara versus Butorphanol in laboring term parturients.

Materials and Methods: Healthy term parturients in active labor who requested labor analgesia were approached for study participation. Exclusion criteria included age < 18, cervical dilation ≥ 5 cm, gestational age less than 37 or greater than 41 weeks, analgesic use within the prior 12 hours, multiple gestation pregnancies, and presence of significant maternal co-morbidities. Each participant was blinded to study drug and received either Sedara and placebo injection of 1 mL saline or 1 mg Butorphanol and 100% oxygen placebo over a 60 minute period. Primary outcome measures were collected at 5, 15, 30, and 60 minutes after study initiation and included: pain reduction, nausea, dizziness, and overall satisfaction on a 0-10 visual analog scale (VAS) score.

Results: Nineteen subjects were recruited, 11 receiving Sedara and 8 receiving Butorphanol. There was no difference in demographic data between the two groups, including cervical dilation or pregnancy length. Mean changes in VAS scores were compared to baseline at the pre-determined data collection points during the 60 minute trial and were as follows: (format: N2O/O2, Butorphanol; p-value); pain score reduction (4.21, 2.16; p=0.01), nausea (0.88, 1.03; p=0.74), dizziness (1.98, 2.62; p=0.44), and overall satisfaction (7.32, 4.59; p=0.01).

Conclusions: Sedara showed superior pain reduction and overall satisfaction compared to Butorphanol in early laboring parturients. Coupled with the enhanced safety of this system's negative pressure triggering, Sedara is an attractive analgesic tool in this patient population. Further patient recruitment to adequately power the study will continue at our institution.

Mean Change in 0-10 VAS Scores from Baseline During 60 Minutes Trial Period

	N2O/Oxygen (Sedara™)	Butorphanol	P-value
Pain Score Reduction	4.21	2.16	0.01
Nausea	.88	1.03	0.74
Dizziness	1.98	2.62	0.44
Overall Satisfaction	7.32	4.59	0.01

References:
1. Collins MR, Starr SA, Bishop JT, Baysinger CL. Nitrous oxide for labor analgesia: expanding analgesic options for women in the United States. Rev Obstet Gynecol. 2012; 5(3-4): e126-31.
2. Rooks JP. Nitrous oxide for pain in labor-why not in the United States? Birth. 2007; 34: 3-5.
3. Rosen MA. Nitrous oxide for relief of labor pain: A systematic review. Am J Obstet gynecol. 2002; 186: S110-126.

Abstract #: F-05

An atypical presentation of placental abruption as neck and shoulder pain

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Introduction: Placental abruption (PA) complicates about 1% of pregnancies and is an important cause of perinatal mortality and morbidity. (1) Patients with PA classically present with painful vaginal bleeding. However 20% of women may present with concealed bleeding (2), and labor epidural analgesia may attenuate abdominal pain associated with PA. We present the anesthetic management of a woman who received epidural labor analgesia and developed an atypical presentation of neck pain associated with PA.

Case Presentation: A 38 year-old, G1P0 woman with mild preeclampsia at 37+3 weeks gestational age presented to our institution for induction of labor (IOL). Two hours after IOL, the patient requested a labor epidural. A combined spinal-epidural (CSE) was placed at L3-L4 interspace without difficulty. Four hours later, she reported no pain and had approximately T8 level to cold without motor block. Six hours post-CSE placement, she complained of sudden onset, 10/10 mid-neck and bilateral shoulder pain. Her heart rate increased to 130 bpm and blood pressure was 150/70. The fetal tracing demonstrated two late decelerations, and cervical exam indicated she was remote from delivery. As a result, her OB requested urgent cesarean delivery for presumed worsening preeclamptic disease. The epidural was incrementally dosed with a total of 12 ml of 2% lidocaine with bicarbonate and epinephrine to achieve T4 level for cesarean delivery. Concurrently, midazolam 0.5mg was dosed incrementally to a total of 2mg to treat presumed muscle spasm and to alleviate distress due to continued neck pain. Decision-to-delivery time was 11 minutes and the baby's APGARs were 7 and 9 at 1 and 5 minutes, respectively. A large placental abruption with leakage of blood into the peritoneal cavity via both Fallopian tubes was observed intraoperatively. The patient's shoulder and neck discomfort resolved completely upon delivery. Both infant and mother were discharged home without complication on postoperative day 4.

Discussion: Referred pain from diaphragmatic irritation, experienced in the shoulders and neck, is a well-described entity with a wide range of etiologies including gastric, splenic, cardiac, and pulmonary pathology. Severe shoulder pain has been described in a pregnant patient with uterine rupture and dense epidural block. (3) In our case, pain was initially presumed to be secondary to muscle spasm. Instead, the patient likely experienced referred pain caused by diaphragmatic irritation from tracked blood in the peritoneum. Our case highlights the importance of considering PA as a cause of atypical pain in patients with a functioning epidural for labor analgesia.

References:
1) Obstet Gynecol 2006;108:1005-16.
2) Obstet Gynecol Surv 2002;57:299-305.
3) Int J Obstet Anesth 2012;21:200-1.

Abstract #: F-06

Anesthetic Management for Cesarean section in a patient with Von Hippel-Lindau Disease and Growth Hormone deficiency

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Introduction: Von Hippel-Lindau Disease (vHL) is an autosomal dominant multisystem disorder often associated with craniospinal axial hamangiomas (60-80%) and pheochromocytomas (10-20%). Both of these manifestations have significant impact on pregnancy and management of labor and delivery. The anesthetic management of this condition is still controversial. Growth hormone deficiency is associated with short stature with difficult vaginal delivery, and need for adjustment of drugs and equipment used for anesthesia.

Case report: A 36 years old G2P0 presented to the Obstetric anesthesia clinic at 28 weeks gestation. She was diagnosed with growth hormone deficiency at 2 years of age and was treated with hormone replacement therapy. Despite this, she had a short stature (weight 33 kg, height 111 cm) but proportional body habitus. She had a strong family history of vHL disease. Her first pregnancy at the age of 24 years was terminated due to a new diagnosis of pheochromocytoma. A bilateral adrenalectomy was done with a small portion of adrenal gland left behind. Investigations also revealed asymptomatic haemangiomas in lower thoracic and upper lumbar spinal cord. A repeat brain MRI during her current pregnancy was normal, while the spine MRI, without gadolinium, showed lesions suggestive of hemangiomas, however, the study was suboptimal. She developed hypertension, tachycardia with increasing urinary catecholamine levels, but had normal ACTH level and hence was started on calcium channel blockers for adequate control of blood pressure. A multi-disciplinary patient care conference was held at 33 weeks of gestation and an elective cesarean section (CS) was planned at 37 weeks for cephalo-pelvic disproportion. However, at 36 weeks, the patient went in to premature labor and an urgent CS was required. A general anesthetic technique was carried out with close hemodynamic monitoring after the placement of arterial line and non invasive cardiac output monitor. A 5.5 mm endotracheal tube was easily inserted after induction. She received medications appropriate for her weight and had good intraoperative hemodynamic stability. The post-operative course was also uneventful.

Discussion: Both regional as well as general anesthetic techniques can be successfully used in patients with vHL disease (1, 2). The anesthetic management has to be tailored to the individual patient depending on the extent of their disease. We chose to provide general anesthesia mainly because of the concerns of possible high block and disruption of spinal hemangiomas due to her short stature from regional anesthesia. Our patient presented a unique challenge, however, multi-disciplinary management and close hemodynamic control led to a successful outcome.

References: Demiraran Y et al. Euro J Anesthesiol 2001,18;330-2; Razvi SAH et al. Int J Obstet Anesth 2009,18;294-5.

Abstract #: F-07

Anesthetic Management of a Parturient with Hyperekplexia

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Introduction: Hyperekplexia (HK) is a hereditary disorder caused by a mutation encoding the postsynaptic inhibitory glycine receptors (GLRA1, GLRB) and presynaptic glycine transporter (SLC6A5) resulting in abnormal glycinergic neurotransmission. (1) Patients with HK experience exaggerated startle reflex in response to unexpected acoustic, tactile or other stimuli such as emotional stress. (2) Neonates may present with hypertonia, developmental delays, apnea and sudden death.(3) Clonazepam, an allosteric potentiator of GABA(A) receptor, is the mainstay of treatment.(1)

Case: A 38 yo G6P1 presented for antenatal anesthesia consultation regarding her diagnosis of HK with symptoms including excessive generalized startle, hypertonia, and hyperreflexia to stimuli since birth. The patient was diagnosed after a workup of autonomic instability, postural hypotension, syncope and sinus tachycardia. The maternal grandmother and mother have history consistent with HK. Her first pregnancy was an uncomplicated vaginal delivery with epidural analgesia. The first baby boy developed feeding discoordination, increased startling and hypertonia at 2 weeks of age. Her current pregnancy was accompanied by worsening autonomic dysfunction and orthostatic presyncope. Her HK is well controlled on clonazepam and paroxetine. The patient returned at term with spontaneous labor and epidural analgesia was inserted uneventfully. In addition to establishing a rapport with the patient and her husband, every step during the epidural placement including skin sterilization, local anesthetic infiltration, and epidural needle insertion were preempted by meticulous verbal forewarning. Four hours later, patient delivered a baby girl (APGAR 9 and 9) with neonatology on standby. The baby was observed in NICU for 24 hours without problems and both patient and her baby were discharged on postpartum day 2.

Discussion: The inheritance pattern for HK can be autosomal dominant or recessive.(3) Our patient has a strong family and clinical history consistent with the autosomal dominant form of HK, and thus early consultation by anesthesiology and neonatology were crucial. Early epidural was recommended to minimize painful contraction stimuli and allow a more gentle, methodical approach to epidural placement, including copious preemptive warnings. Despite her autonomic dysfunction, the patient's hemodynamics remained stable throughout the labor. Babies born to mothers with HK should be monitored for signs of respiratory distress, chest wall rigidity and apnea. Equipment for Intubation, mechanical ventilation and rescue intravenous midazolam were prepared in advance in anticipation for acute crisis.

References:
1. Thomas RH, et al. Brain. 2013;136(10):3085–95
2. Harvey RJ, et al. Trends in Genetics. 2008;24(9):439–47
3. Mineyko A, et al. Can J Neurol Sci. 2011;38(3):411–6

Abstract #: F-08

Anticipated Pain, Perceived Analgesic Needs and Psychological Traits Predict Pain and Analgesic Usage Following Cesarean Delivery

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Introduction: Fear and anxiety are associated with postoperative pain.(1) This study aimed to determine if preoperative tests for anxiety, fear of pain, pain catastrophizing and/or simplified anticipated pain and analgesic rating scores could reliably predict pain intensity and analgesic usage following cesarean delivery (CD).

Methods: 50 healthy women undergoing scheduled CD comprised the study population for this prospective, IRB-approved study. Patients received spinal anesthesia with intrathecal morphine and multimodal analgesia. Preoperative predictors included 3 validated psychological questionnaires [Anxiety Sensitivity Index (ASI), Fear of Pain (FPQ), Pain Catastrophizing Scale (PCS)]; and 3 simple ratings: 1. Anticipated postoperative pain (How much pain 0-10 do you expect to experience after your surgery?), 2. Analgesic threshold (At what point on a pain scale of 0 - 10 would you likely request post-operative pain relief?), and 3. Perceived analgesic needs (What do you expect your analgesic requirements will be after surgery? 0=no analgesia, 10=highest possible amount). Postoperative response outcome measures included post-CD pain (combined rest and movement scores) and opioid use for the 48-h study period. Bivariate (Spearman) correlations of predictors and outcomes followed by forward-backward multiple regression modeling were utilized.

Results: Bivariate correlations between preoperative predictive tests and post-CD outcomes are outlined in Table 1. Significant correlations were found with anticipated pain and opioid use (r=0.35), analgesic threshold and post-CD pain (r=-0.35), analgesic needs and post-CD pain (r=0.31). Multiple linear regression analysis found that anticipated postoperative pain and analgesic needs contributed to post-CD pain prediction modeling (R2=0.44, p<0.0001); and anticipated postoperative pain, ASI and FPQ were associated with opioid use (R2=0.42, p<0.0001).

Conclusion: Simple questions rating women's anticipated pain, analgesic threshold and analgesic needs correlated with post-CD pain and analgesic usage. Results suggest that asking patients their anticipated pain and analgesic needs is useful in predicting and planning pain management post-CD (2). Although ASI and FPQ contributed to opioid use predictive modeling, these time-consuming questionnaires appear less useful than simple rating questions in post-CD pain prediction.

References:
1. Anesthesiology 2009; 111: 657-677
2. Anesthesiology 2013; 118:1170-9

Table 1: Bivariate correlations between preoperative predictive tests and postoperative response outcome measures following cesarean delivery

Preoperative Tests	Postoperative Outcomes	
	Opioid use	Pain scores*
ASI	-0.019	0.148
FPQ	-0.132	0.165
PCS	-0.137	0.067
Anticipated postoperative pain	0.349 †	0.263
Anticipated analgesic threshold	0.032	-0.349 †
Anticipated analgesic need	0.169	0.313 †

* Combined (rest + movement) numerical verbal pain scores (0-10) area under the pain scores x time curve over the 48-hour study period. Opioid use measured as mg-morphine equivalents.
ASI = Anxiety Sensitivity Index; FPQ = Fear of Pain Score; PCS= Pain Catastrophizing Scale
†=unadjusted p < 0.05

Abstract #: F-09

Bench-top testing of a model for assessment of distribution characteristics of epidural boluses.

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Introduction: Compared to continuous infusion, the use of intermittent techniques, such as patient-controlled epidural analgesia, are associated with less anesthetic interventions and motor block [1]. Studies of in vitro epidural bolus flow have shown that intermittent boluses result in greater bolus distribution, compared to continuous infusions, suggesting a greater pressure is generated within catheters [2]. In multi-orifice epidural catheters, lower pressures have been shown to result in preferential flow through more proximal orifices [3]. We aimed to produce a bench top model in order to assess flow distribution characteristics of epidural boluses generated at various flow rates and catheter sizes by epidural pumps.

Method: A clear perspex container of know dimensions, was superimposed with a standardised grid. An epidural catheter was introduced into the container, with the distal portion of the catheter submerged in a standardised gelatin-saline solution. A bolus of 5 mLs of ink-stained saline was delivered at a know flow rate by a standard epidural pump. This was repeated using 19g and 20g epidural catheters, and at 250 mL/hr and 500 mL/hr via 3 identical epidural pumps. The flow patterns of boluses were recorded, and the area of spread was calculated using image analyser software [4].

Results: The mean transverse bolus distribution areas are shown for various catheter sizes (a) and flow rates (b) in the figure.

Conclusions: Our novel bench top model to assess epidural bolus epidural flow distribution has allowed us to quantify the affect of bolus flow rate and epidural catheter gauge on bolus distribution. Surprisingly, variation in the flow rate of bolus delivery did not make a difference in the area of distribution, while the size of the epidural had a significant effect. Further work will validate the model in the use of manually delivered boluses, so that the optimal conditions for epidural bolus delivery can be found.

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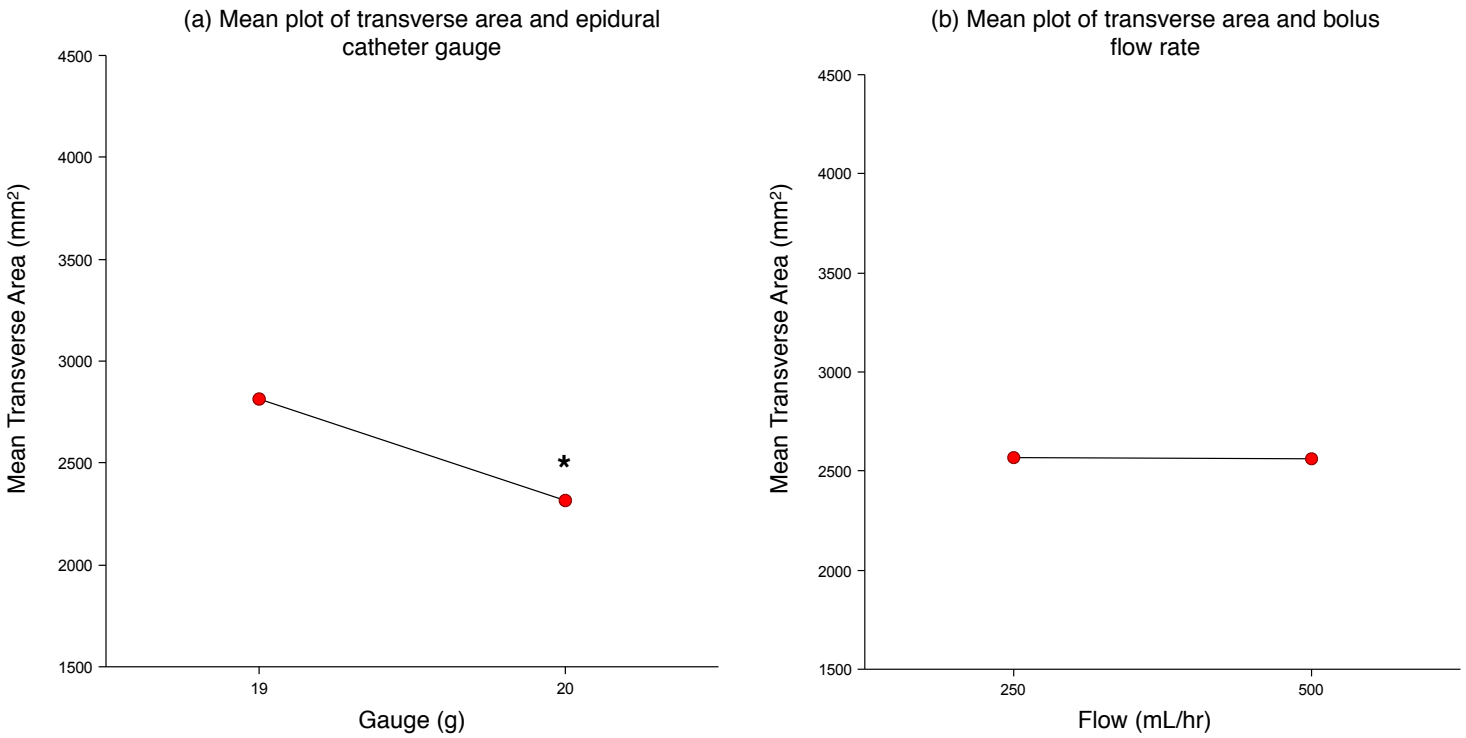

Figure - Mean plot of transverse area and (a) catheter gauge, and (b) bolus flow rate. *P value < 0.005

Abstract #: F-10

Cesarean delivery in a patient on extracorporeal membrane oxygenation for acute respiratory distress syndrome

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Introduction: We present a case of cesarean delivery in a patient on extracorporeal membrane oxygenation (ECMO). This is the second cesarean delivery performed during ECMO therapy at our institution.

Case: A previously healthy 33 year-old G2P1 at 26 weeks was transferred with acute respiratory distress syndrome (ARDS) for ECMO. Five days prior to presentation, she was admitted to an outside hospital for management of community-acquired pneumonia and started on antibiotics. Her symptoms worsened, necessitating intubation. She continued to decompensate, requiring increasing respiratory support and vasopressor therapy. Our ECMO team was consulted, and venovenous ECMO was initiated at the outside hospital, immediately prior to transfer. At our institution, a nasal swab was positive for influenza H1N1 virus. During her ECMO course, the patient developed renal failure requiring continuous venovenous hemofiltration, as well as intermittent episodes of severe hypertension (SBP 200s), despite sedation with propofol (50 mcg/kg/min), midazolam (70 mg/hr), and hydromorphone (70 mg/hr). After consultation with several obstetric experts, and debate among the local care team, the patient was given a diagnosis of preeclampsia, and a decision was made for cesarean delivery at 28 weeks. Heparin infusion (required for ECMO) was discontinued one hour prior to surgery, and 10U of cross-matched blood, 10U of fresh frozen plasma, and platelets were immediately available. Anesthesia was maintained with propofol 150 mcg/kg/min and 3% desflurane, in addition to the midazolam and hydromorphone infusions. Brain function monitoring and transesophageal echocardiography were performed intraoperatively. The neonate was delivered 9 minutes after skin incision with Apgar scores of 7 and 8 at 1 and 5 minutes. EBL was approximately 1.4 L. The patient received 3 units of packed red blood cells. She remained stable throughout and was transferred back to the intensive care unit.

Discussion: H1N1 can cause ARDS in otherwise healthy patients. For reasons that are not completely understood, pregnant women are at higher risk of morbidity and mortality from H1N1 infection (1). The physiologic changes of pregnancy may interfere with the ability to clear the virus. When conventional therapy fails to reverse ARDS, ECMO may save patients who would have otherwise succumbed to the disease (2). Although the evidence for preeclampsia was not overwhelming in this case, there was a general consensus that delivery of the neonate might increase the patient's chance for recovery. The fact that she appeared to require such high dose sedation, commonly seen in patients on ECMO, made it difficult to determine what would constitute an effective anesthetic. Since the neonate cried at delivery, we were convinced that the maternal and fetal blood levels of midazolam and hydromorphone were not excessively high.

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Abstract #: F-11

Cesarean Sections, Buprenorphine, Intrathecal Opioids, & Pain Control – What to do?

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Buprenorphine is becoming a popular alternative to methadone maintenance in opioid abstinence. This population will expand in the future presenting a challenge for perioperative analgesia. Conventional pharmacology suggests that buprenorphine has a high binding affinity for the mu-opioid receptor (MOR), displacing any other opioid; only overcome by extremely high opioid doses. Hence recommendations are usually that buprenorphine should be discontinued before surgery so the MOR is available perioperatively. Buprenorphine is considered to have a "ceiling" analgesic effect rather than a classic opioid dose-response curve and it should not be effective for postoperative analgesia. This case supports an emerging concept that buprenorphine may provide acceptable analgesia and that discontinuation may not be the best practice. Further, dose adjustment of buprenorphine for postoperative analgesia may be possible.

A 25 y/o G3P2 parturient with a history of opioid addiction in recovery, presented in labor at 39 weeks. Her addiction was managed with buprenorphine 8mg/naloxone 2mg (Suboxone®) twice daily, which she took that morning. An urgent cesarean section (C/S) was indicated for breech presentation. Spinal anesthesia was established (bupivacaine 15mg, hydromorphone 200mcg, fentanyl 10mcg) and surgery was performed with delivery of a male infant (APGARS 8 & 9). Buprenorphine treatment was continued and a hydromorphone IV-PCA was provided for postoperative analgesia. Pain was well controlled, using a total of 5.4 mg of IV hydromorphone in the first 12 hours. No other analgesics were given.

The recent increase in patients on buprenorphine has created treatment a dilemma for anesthesiologists. Do we (a) stop the medication pre-op; (b) continue it as prescribed; or, (c) increase the dose to use as an analgesic? Buprenorphine is a long acting mu-opioid partial agonist shown to be effective for treating opioid dependence (1). Our traditional understanding is that buprenorphine has an extremely high binding affinity for the opioid receptors thereby blocking the action of additional opioids hence requiring discontinuation prior to surgery. However, buprenorphine may provide adequate analgesia. In this case, the relatively small dose of IT and IV hydromorphone given would likely have been completely blocked by the high buprenorphine dose. Surprisingly, she had excellent pain control.

Due to the urgent necessity of the surgery, we were unable to stop her buprenorphine preoperatively. We continued it at her home dosage, added IT opioids to the spinal anesthetic and a hydromorphone IV-PCA postoperatively. It is possible that buprenorphine provided the majority of the analgesic effect in this patient. This is a novel concept in acute pain management and may be on the horizon of effectively treating our acute on chronic pain patients in the hospital.

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Abstract #: F-12

Characterising long term pain after caesarean section: a prospective, longitudinal study

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Aim: It is thought that up to 18% of cesarean section patients may experience chronic post-surgical pain (CPSP) lasting >3 months[1]. The Oxford Persisting Post-Operative Pain Study (OxPPOPS) is an on-going prospective, longitudinal study (the largest in the UK to date) assessing the incidence and predictive factors of pain up to 1 year after planned cesarean section. Predictive factors such as patient psychology, pain perception, surgical and anesthetic techniques, and acute post-operative pain management are under investigation.

Methods: Following ethics board approval, 670 women aged 18-45 undergoing planned cesarean section at a gestation >34 weeks have been recruited into the study. Exclusion criteria include pre-pregnancy painful conditions and depression. Follow-up data are presented here from 119 women at 4 and 12 months after surgery, collected using postal questionnaires. Women were asked to report whether or not they were suffering from pain related to their cesarean section. The intensity of the pain experienced at rest and on movement was rated on a numerical rating scale (NRS) of 0-10. The women also answered questions about pain frequency and analgesia use. NRS rating comparisons were performed using Wilcoxon signed-rank tests.

Results: Four months after surgery, 25% of women (n=30) reported suffering from pain related to their cesarean section. This was most commonly experienced on a weekly basis (50%, n=15). By 12 months pain had resolved in approximately half of the women with only 13% (n=16) reporting suffering from pain, most commonly on a monthly basis (44%, n=7). Two women reported pain at 12 months although they had no pain at 4 months. In women who were experiencing pain at 4 months, median (IQR) NRS of pain at rest was 0(0) and on movement was 1(1). At 12 months, median NRS was 0(1) and median NRS on movement was 2(3). At both time points, NRS on movement was significantly higher than at rest (Wilcoxon,$p<0.001$ at 4 months and $p<0.002$ at 12 months). Approximately 3% of women (n=3 at 4 months, n=4 at 12 months) reported taking mild analgesics as required in the preceding week. One woman reported regular codeine use at 4 months only.

Discussion: One year after planned cesarean section, women report suffering from pain at an incidence of 14%, which is within the range of previous studies[1]. Frequency of pain occurrence and pain intensity ratings decreased between 4 and 12 months. These pain outcomes will be further analyzed along with predictive factors, with the goal of identifying patients at increased risk of developing CPSP.

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Abstract #: F-13

Cognitive Error: The Implications of Anchoring Bias and the Framing Effect in the Diagnosis of Intrauterine Fetal Demise (IUFD) in the Setting of Undiagnosed Concealed Placental Abruption

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A 37yo G3P1011 at 32 weeks, presented with moderate abdominal pain and no noted fetal movement for >2 days. Fetal heart tones were absent and IUFD was confirmed by ultrasound. IOL and delivery of the fetus was planned. Anesthesiology was consulted, finding a pale and ill-appearing patient, but attributed the patient's condition to the stress and grief of a newly diagnosed IUFD. Options for labor analgesia were discussed. Later, while obtaining IV access, the patient was noted to be diaphoretic and lethargic. Repeat ultrasound exam suggested retroplacental clot and abruption. Laboratory values confirmed DIC, and significant vaginal bleeding began during her exam. An arterial line was placed, large bore PIV access established, and a massive transfusion protocol was activated in preparation for an emergent cesarean section.

General anesthesia was induced without complication, followed by a repeat cesarean section. Approximately 2L of blood clot, placenta, and fetus were removed from the uterus. Significant hemorrhage necessitated uterotonics, B-Lynch sutures and bilateral uterine artery ligation. Total blood loss was approximately 5.5 L and 20 units of blood products were required for resuscitation. The patient was transferred to the surgical ICU, extubated the next day and discharged home on POD #4.

Discussion: Multiple types of cognitive error contributed to a delay in diagnosis of placental abruption, DIC, and the urgency of cesarean delivery. More specifically, anchoring, or fixation, bias played an important role. Attention is focused on one feature of a diagnosis exclusively, at the expense of a more comprehensive understanding.(1) Cognitive errors in decision making may cause more than two thirds of missed or delayed diagnoses according to some estimates.(2) Reports from the ASA closed claims registry suggest that >50% of diagnosis-related adverse events in obstetric anesthesia were related to a delay in diagnosis or treatment.(3) Heuristic decision making and an initial focus on the diagnosis of IUFD delayed the recognition of worsening physical signs and eventual diagnosis of abruption.

This patient was discussed by three different care teams: OB, Anesthesia, and Nursing. The framing effect clouded each team's impression of the clinical situation. The patient was described to be experiencing significant grief, erroneously providing an explanation for her organic clinical picture. Placental abruption was the likely etiology for this IUFD, and should be immediately considered as a possible diagnosis in the setting of IUFD, hypertension, and abdominal pain.(4) In addition to those discussed, other types of cognitive errors played significant roles in this case. Hindsight analysis can enable practitioners to better evaluate their clinical decision making abilities and biases in the future.

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Abstract #: F-14

Complications of spinal anesthesia for cesarean delivery following inadequate labor epidural

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Background: High spinal block has been reported in patients who undergo spinal placement for cesearean delivery (CD) following inadequate existing labor epidural or failed top up. There is limited data, however, describing the incidence of failed spinal anesthetics in this situation. The purpose of this study was to investigate the incidence of high blocks and failed blocks in patients who received a spinal for CD after an inadequte labor epidural, and whether these outcomes were impacted by the administration of an epidural top up topped prior to spinal dosing.

Methods: After IRB approval, we searched the perioperative database from 2003-2012 for laboring women with an existing epidural who needed CD and received either spinal or combined spinal epidural because the epidural was deemed inadequate. Inadequate surgical anesthesia (failure) and high spinal following the spinal anesthetic were the primary outcomes. Failure was defined as need to repeat the neuraxial technique to obtain adequate block height; convert to general anesthesia secondary to pain or inadequate block height after spinal; or supplement with nitrous oxide or intravenous agents. High spinal was defined as need to convert to general anesthesia within the first 20 minutes after initial block due to weakness, altered mentation or respiratory distress or recorded block height ≥ T1. Patients were divided into two groups based on whether they had received a top up dose (≥ 100mg epidural lidocaine) prior to spinal administration. Kruskal-wallis test and Chi-square test were used for analysis. We also performed a multivariable analysis with failure as the outcome, and age, bupivacaine dose and receipt of an epidural top up as predictors.

Results: The results are summarized in the table. Overall, there were 29 (11%) failed spinals and 9 (3%) high spinals. The incidence of failed spinals was significantly higher in those patients who received an epidural top up than those who did not (24% versus 4%, $p<0.001$). The incidence of high spinals was not different between the groups. In the multivariable model, receipt of a top up dose was a significant predictor of failure ($p=0.0005$), whereas the other predictors were not.

Conclusions: Administration of a spinal anesthetic following a topped up epidural is associated with a high risk of failure. This may be due in part to the presence of a large volume of local anesthetic in the epidural space, which may be mistaken for cerebrospinal fluid.

	Epidural topped up (n=87)	Epidural not topped up (n=180)	P-value
Age, yrs	26±7	28±7	0.001
Height, cm	162±8	162±8	0.5
Weight, kg	86±26	87±20	0.2
Gestational age, weeks	39±3	38±3	0.9
Hyperbaric bupivacaine dose, mg	10±2	11±1	<0.0001
Failures	21 (24%)	8 (4%)	<0.0001
High blocks	2 (2%)	7 (4%)	0.5

Data are mean±SD or number (%)

Abstract #: F-15

Considerations for the Parturient of Short Stature a Retrospective Review

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Introduction: Reported complications associated with maternal short stature (height less than 148cm) include: increased risk of respiratory compromise, increased risk of cesarean delivery and unpredictable degree of analgesia and anesthesia with neuraxial techniques. Dwarfism and short stature are frequently used interchangeably, however dwarfism is a subset of short stature with multiple etiologies. The literature of the anesthetic management of parturients of short stature is sparse and limited to isolated case reports of parturients with a diagnosis of dwarfism. Therefore, we conducted this retrospective review to evaluate outcomes in short stature parturients.

Methods: Short stature women who underwent a cesarean delivery between May 1, 2008 and May 1, 2013, were identified through a query of billing data and then the electronic medical record was hand searched for qualifying patients with heights of <148cm. Data extracted included: patient demographics, obstetric and anesthetic information. Patients were stratified into parturients with a diagnosis of dwarfism and parturients of short stature not otherwise specified (NOS). Categorical data were compared using a chi-squared test, and continuous data were compared using a t-test or Wilcoxon rank sum test. Bupivacaine doses used for spinal anesthesia were compared to 11.25 mg (standard dose for parturients at our institution), using a one-sided t-test. $P<0.05$ was considered significant.

Results: Patients with a diagnosis of dwarfism were more likely to be obese and more likely to be scheduled for an elective cesarean delivery than short-stature women (NOS) (Table 1). Additionally, more attempts at neuraxial anesthesia were necessary in women with dwarfism, but there were no differences in anesthetic complications including difficult airway between the groups. The mean dose of bupivacaine used for spinal anesthesia (9.5 +/- 0.3 mg) was less than that used in non-short-stature women $P<0.001$.

Conclusions: These data suggest that women with a diagnosis of dwarfism are at increased risk for difficult neuraxial placement. However, we were limited by our small sample size. No patient had a high spinal and adequate surgical levels were obtained with lower doses of bupivacaine in short stature women compared to standard dose used for normal stature patients. Outcomes between short stature women should be compared to non-short stature women in order to better define risks for this patient population.

	Parturients with diagnosis of dwarfism (n=11)	Parturients of short stature not otherwise specified (n=65)	*P*
Demographics			
Age (years)	26 ± 7	28 ± 7	0.54
Gravidity	2 (1-3)	3 (2-4)	0.09
Parity	1 (0-2)	1 (1-2)	0.19
Body Mass Index (kg/m^2)	42 ± 8	34 ± 8	<0.001
Delivery Data			
Planned mode of delivery			0.04
Vaginal Delivery	18%	51%	
Cesarean Delivery	82%	49%	
Urgency of Cesarean Delivery			0.03
Elective	9 (82%)	27 (41%)	
Urgent	0	18 (28%)	
Emergency	2 (18%)	20 (31%)	
Anesthetic Data			
Number of attempts at neuraxial analgesia/anesthesia*			0.008
1	5 (63%)	32 (94%)	
2	1 (12%)	2 (6%)	
3	2 (25%)	0 (0%)	
Unintentional dural puncture	0 (0%)	2 (3%)	NS
High spinal	0 (0%)	0 (0%)	NS
Intraoperative conversion to general anesthesia	2 (18%)	6 (9%)	0.37
>1 attempt at intubation	0	0	NS

Data presented as mean ± standard deviation, median (interquartile range), or n(%)

*Number of attempts only recorded for 42 parturients

Abstract #: F-16

Decompensated supraventricular tachycardia in late pregnancy resistant to conventional treatment: A case report

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Introduction: Sustained tachy-arrhythmias have an incidence of 2-3 per 1000 in pregnancy for those who develop supraventricular tachycardia (SVT)1.

Case Report: A 38-year-old pregnant woman (G2P1) at 35 weeks of gestation attended the emergency department (ED) with a 2-hour history of feeling unwell and palpitations. Her past obstetric and medical history were largely unremarkable apart from a previous caesarean delivery for breech presentation. Initial examination in the ED showed she had a heart rate of 170 beats per minute and blood pressure 100/64 mmgHg with no other significant findings. She was sat up on a chair and could talk in full sentences. 12 lead electrocardiogram showed a supraventricular tachycardia and routine blood tests were within normal range. Vasavagal manoeuvres followed by medical treatment of SVT with repeated doses of adenosine and metoprolol failed to resolve the arrhythmia. It was decided that electrocardioversion as the next line of treatment should be carried out in the operating theatre with obstetric and paediatric teams on standby. On arrival to theatre, the patient rapidly decompensated, SpO2 falling to 75% on 15L oxygen and became haemodynamically unstable. The patient had clinical signs of pulmonary oedema at this stage. A rapid sequence induction was done and IPPV commenced. PEEP of 12 cmH2O and FiO2 of 70% were required to maintain SpO2 above 90%. Immediately after this the patient received 3 synchronized direct current shocks of 50J, 100J and 150J. With each shock the heart rhythm transiently returned to sinus rhythm for approximately 30 seconds but then returned to SVT. At this stage the cardiotochograph showed fetal compromise and the decision was taken to perform an emergency caesarean section. Baby APGAR scores were 0 and 1 at 1 and 5 minutes. On delivery of the placenta the maternal heart rate returned to normal sinus rhythm accompanied by rapid improvement in haemodynamic parameters. Lower segment caesarean section was completed in 30 minutes. Fi02 and PEEP requirements remained high to maintain satisfactory oxygenation due to the pulmonary oedema. The patient was transferred to the intensive care unit where she rapidly improved with supportive and diuretic therapy and was discharged successfully within 8 hours.

Discussion: Conventional medical treatment as per recommended guidelines1 for the treatment of SVT were unsuccessful in this pregnant patient. Change from a sitting posture in ED to a recumbent posture during transfer might have contributed to the rapid hemodynamic instability and development of pulmonary oedema in this patient. Interestingly it was only after delivery of the placenta did the arrhythmia revert spontaneously to normal sinus rhythm.

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Abstract #: F-17

Desaturation after Cesarean Delivery in a Parturient with a Single Ventricle

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Case: A 23 year old G2P0010 presented for anesthesia preoperative evaluation due to a history of hypoplastic right ventricle, tricuspid valve atresia, and pulmonary valve atresia. After several congenital heart surgeries, she had a bidirectional Glenn Shunt (superior vena cava venous return directly to pulmonary artery) and a Fontan palliation (conduit from inferior vena cava directly to pulmonary artery). At 22 weeks gestation, her EF was 40%. A multidisciplinary meeting with her obstetrician, obstetric anesthesiologists, a pediatric cardiac anesthesiologist, and a pediatric cardiothoracic surgeon determined that although she was medically managed and asymptomatic throughout her pregnancy, if she were to present in spontaneous labor or need emergency cesarean delivery, the subspecialists needed for her care would not necessarily be immediately available. Therefore, an elective cesarean delivery at 37 weeks gestation was planned.

The case was performed in a cardiac operating room with a pediatric cardiac surgeon and perfusionist on standby. A pediatric cardiac anesthesiologist and obstetric anesthesiologist were present during surgery. An arterial line was placed prior to neuraxial anesthesia. A neuraxial technique was elected for anesthesia to maintain hemodynamic stability. An epidural catheter was placed and 2% lidocaine was dosed slowly until an adequate anesthetic level was obtained. The patient's blood pressure remained stable throughout epidural dosing, surgery, and delivery. Transesophageal echocardiogram was available if the patient were to decompensate.

During closure, the patient began to complain of nasal congestion and began to sneeze uncontrollably. She was initially stable but then began to desaturate to the low 90s. She was promptly given supplemental oxygen, furosemide, and her head was elevated. The symptoms resolved. Her postoperative course was uncomplicated and she was discharged on postoperative day 3.

Discussion: Due to the widespread success of pediatric cardiac surgery, the prevalence of parturients with prior corrective cardiac surgery for congenital heart disease is increasing. In 2000, 49% of people living in the United States with severe congenital heart disease were adults, and 57% of adults with severe congenital heart disease were women.1 Understanding both the congenital heart defect as well as the palliative correction, and the resultant influences on blood flow, preload and afterload, is essential to the care of these patients during delivery and in the postpartum period. Neuraxial techniques have been successfully performed for cesarean delivery for parturients with single ventricles when done judiciously.2 Evaluation of the patient early in gestation, as well as multidisciplinary planning among subspecialists, is essential in providing safe and successful patient care.

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Abstract #: F-18

Determination of the potency of phenylephrine and metaraminol infusions to prevent hypotension during elective cesarean delivery under spinal anesthesia

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Introduction: Vasopressors are the mainstay for prevention and treatment of spinal anesthesia-induced maternal hypotension at cesarean delivery. Phenylephrine and metaraminol have not been compared. The aim of this study was to determine their ED95 and estimate the ED50, so as to estimate a potency ratio for prophylactic infusion.

Methods: A sequential up-down allocation study of women having elective cesarean delivery under spinal anesthesia. Participants randomized in blinded fashion to prophylactic intravenous infusion of phenylephrine (group P) or metaraminol (group M), the first patient starting at 150 mcg/mL (dose rate 75 mcg/min) or 600 mcg/mL (300 mcg/min) respectively. A successful infusion maintained systolic blood pressure within 80% of baseline. The concentration allocated to the next patient (incremental interval 20 mcg/mL for group P and 80 mcg/mL for group M) was based on the response of the preceding patient, using the Dixon and Mood method based on biased coin design methodology and a variation of the Narayana rule. The ED95 and confidence intervals for each drug were calculated and the ED50 estimated from the probability of being effective at each dose using pooled-adjacent-violators algorithm (PAVA) probabilities.

Results: Fifty nine participants with similar baseline characteristics – 29 group P and 30 group M - completed the study. The estimated ED95 was 106 (95% CI 50-110) mcg/min (group P) and 651 (95% CI 589-676) mcg/min (group M). The estimated ED50 of phenylephrine was 30 (95% CI 21-50) mcg/min and of metaraminol 224 (95% CI 200-360) mcg/min. Maternal side effects and neonatal acid-base status were not significantly different between groups.

Conclusion: This study demonstrated a potency ratio of 7.4, when comparing phenylephrine with metaraminol as an infusion to maintain systolic blood pressure after spinal anesthesia for cesarean delivery.

Abstract #: F-19

Development of a new interdisciplinary teamwork assessment scale for obstetric crisis management

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Introduction: It is now recognized that non-technical errors are a cause of morbidity and mortality in obstetric health care.1 2004-2012 Root Cause analysis data from the American Joint Commission showed that communication is responsible for greater than 50% of overall sentinel events, with 82% events in 2010, 61% in 2011, and 58% in 2012. Of note, communication errors contributed to 50% of maternal sentinel events.2
An extensive literature search showed that there is currently no validated interdisciplinary obstetric teamwork assessment scale used in the simulation setting. Our aim was to design a new obstetric interdisciplinary teamwork scale and establish its face and content validity using a modified Delphi technique.

Methods: After REB approval, a new assessment scale was designed. The scale was sent out electronically to an international selected panel of experts comprising of obstetric anesthesiologists, obstetricians and nurses. The Delphi process required participants to indicate agreement for or against each component of the scale, and also volunteer additional relevant comments. Each statement was analyzed quantitatively by the percentage of agreement ratings and each comment reviewed by the blinded investigators. The assessment scale was then modified, with components of less than 80% agreement removed from the scale. This was sent to the experts again for the 2nd round. It is now being sent out for the 3rd round.

Results: Twenty four external raters were invited to take part in the Delphi process, of which 14 participated. The initial scale comprised of 7 main domains: Shared Mental Model, Communication, Situational Awareness, Leadership, Followership, Workload Management, and Positive/Effective Behaviors and attitudes. In addition, there was a Global score. The initial total number of items was 40. In the 1st round 3 items were removed, and 10 items rephrased. In the 2nd round, 4 items were removed and five items rephrased. The results of 3rd round are awaited and will be presented at the SOAP meeting.

Discussion: Using a modified Delphi technique, we have obtained a consensus agreement on the items in our new teamwork scale. We have established face and content validity that focuses on non-technical skills.

1. Wong CA. Saving mothers' lives: the 2006-8 anaesthesia perspective. British journal of anaesthesia. Aug 2011;107(2):119-122.
2. The Joint Commission: Sentinal Event Data Root Causes by event type 2004-2012. 2012.

INTERDISCIPLINARY TEAMWORK ASSESSMENT SCALE

CATEGORY		COMPONENT	RATING (1-3/NA)	COMMENTS
SHARED MENTAL MODEL	1.	Shared understanding of emergent situation		
	2.	Team working towards common goals		
	3.	Team strives for the safety of both the mother and the fetus		
COMMUNICATION	1.	Clear exchange of pertinent information between team members		
	2.	Clear communication of important tasks and roles		
	3.	Acknowledgement of important communication (closed loop)		
	4.	Assertive communication during critical times		
	5.	When communication is not clear, items/issues are restated aloud and rectified		
	6.	Interdisciplinary communication of information and action plans		
	7.	Errors are recognized and verbalized		
SITUATIONAL AWARENESS	1.	Active information gathering		
	2.	Ongoing assessment of situation by team		
	3.	Changes in significant clinical indicators noted by team		
	4.	Team members demonstrate adaptive behaviors to changing clinical situation		
LEADERSHIP	1.	Leader/s make appropriate assertive decisions during critical times		
	2.	Leader/s delegates appropriate roles and tasks to team members		
	3.	Leadership roles are shifted as appropriate		
	4.	Leadership role is adopted by a team member at critical times		
FOLLOWERSHIP (non-leader members of the team)	1.	Members understand their individual roles within the team		
	2.	Members follow the intent of their team leader/leaders		
	3.	Members contribute to team functionality		
	4.	Members ask for clarification or help when required		
	5.	Members voice their concerns or provide recommendations when required		
WORKLOAD MANAGEMENT	1.	Team shows ability to prioritize important tasks		
	2.	Resources are identified & utilized as required by team		
	3.	Team members follow established guidelines/protocols		
	4.	Team effectively manages the critical events		
	5.	Team members verbalize/discuss treatment options		
POSITIVE/ EFFECTIVE BEHAVIOURS AND ATTITUDES	1.	Team members are supportive of each other as much as possible		
	2.	Team members show mutual respect for each other		
	3.	Team members question appropriately if events change		
	4.	Team leaders/members value input from each other		
	5.	Team leaders/members actively assist others who need help		
	6.	Team members try to avoid exhibiting negative behaviors (aggressive behavior, panicking, shouting, pushing etc.)		

RATING SCALE		
Good	3	Performance of team was of a consistently high standard, enhancing patient safety
Acceptable	2	Performance of team was of a satisfactory level with room for improvement for patient safety
Poor	1	Performance of team was poor and potentially endangered patient safety
N/A	N/A	Not Applicable

Abstract #: F-20

Do Springwound Epidural Catheters Reduce Epidural Catheter Replacement Rate – Year 2013 analysis of 6124 deliveries

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Introduction: Epidural and combined spinal-epidural analgesia are commonly used for labor analgesia, however the incidence of catheter malfunction/failure has been reported to be over 10% by various authors. Springwound epidural catheters have been shown to reduce venous puncture compared with traditional nylon catheters because of their softness and flexibility. It is postulated that these same characteristics allow the springwound catheter to remain midline in the epidural space during insertion and are less likely to dislodge; leading to lower rates of catheter malfunction and/or replacement. Catheter data for both springwound and nylon closed tip epidural catheters was prospectively collected and analyzed for characteristics of malfunction or failure.

Method: After IRB approval, an analysis of effects of springwound vs nylon epidural catheter on obstetric anesthesia outcomes was conducted using quality assurance (QA) data collected from Jan 1-Dec 31, 2013. Data were compared between 2 periods–Jan to June (Nylon), when nylon closed tip epidural catheters were used versus July to Dec (Spring), when springwound ones were used. The ongoing QA program collected data on all complications (IV, intrathecal, neurological, and other systemic issues), epidural failures/malfunction, replacement, and time to replacement. Incidence of complications and their characteristics were compared between the Nylon and Spring groups. Interval data were analyzed by ANOVA ,while nominal data was analyzed by Chi-squares and Fisher's exact test as appropriate with $P<0.05$ considered significant.

Results: There were total of 6124 deliveries (4331 vaginal, 1793 cesarean), with 4468 neuraxial procedures (1986 epidural and 2482 CSE) performed. Overall epidural catheter replacement rate was 147/2169(6.8%) for Nylon and 108/2299(4.7%) for Spring ($P<0.003$) while the IV catheter rate was reduced from 73/2169(3.4%) to 12/2299(0.5%) ($P<0.001$). However, excluding IV catheters, the replacement rate, due to inadequate analgesia, was not different (4.9% -Nylon vs. 4.4% -Spring), as well as no difference in other complication rates (Table 1).

Conclusion: Our results show that springwound catheters do not reduce the epidural replacement rate in patients who did not have an inadvertent venous placement for both CSE and traditional epidural. However, the results do confirm that the inadvertent IV catheter rate was reduced by almost 7 fold following the introduction of springwound catheters.

		Group Nylon	Group Spring		P-Value
	Study Time Period	**Jan 1 to June 30, 2013**	**July 1 to Dec 31, 2013**	**Whole year 2013 Combined**	**Comparing Gp Nylon vs Gp Spring**
Total # of Tradition Epidural Procedures		1000	986	1986	
	# (%) Replaced Labor Epidural Catheters	94/1000 (9.4%)	68/986 (6.9%)	162/1986 (8.2%)	**0.05**
	#(%) Replaced Labor Epidural Cath (Exclude IV)	74/1000 (7.4%)	62/986 (6.2%)	136/1986 (6.8%)	NS
	% of Replaced Malfunction Labor Epidural Catheter Replaced Early (<90mins) (Exclude IV cath)	23/70 (32.9%)	26/56 (46.4%)	49/126 (38.9%)	NS
	# (%) Inadvertent Tuohy Dural Puncture	8/1000 (0.8%)	10/986 (1.0%)	18/1986 (0.9%)	NS
	Total # (%) IV catheters (included ones cleared and ones needed replacement	33/1000 (3.3%)	8/986 (0.8%)	41/1986 (2.1%)	**<0.001**
	# (%) IV catheters required replacement	20/1000 (2.0%)	6/986 (0.6%)	22/1986 (1.1%)	**0.011**
	# Labor Epidural needed for C/S	146	152	298	
	# (%) Labor Epidural Failed when needed for C/S	13/146 (8.9%)	14/152 (9.2%)	27/298 (9.1%)	NS
Total # of Combined Spinal Epidural (CSE) Procedures		1169	1313	2482	
	# (%) of Replaced CSE Epidural Catheters	53/1169 (4.5%)	40/1313 (3.1%)	93/2482 (3.8%)	0.066
	#(%) Replaced Labor Epidural Cath (Exclude IV)	32/1169 (2.7%)	39/1313 (3.0%)	71/2482 (2.9%)	NS
	% of Replaced Malfunction CSE Epidural Catheter Replaced Early (<90mins) (Exclude IV Cath)	9/19 (47.4%)	10/27 (37%)	19/46 (33.9%)	NS
	# (%) Inadvertent Tuohy Dural Puncture	14/1169 (1.2%)	8/1313 (0.6%)	22/2482 (0.9%)	NS
	Total # (%) IV catheters (included ones cleared and ones needed replacement)	40/1169 (3.4%)	4/1313 (0.3%)	44/2482 (1.8%)	**<0.001**
	# (%) IV catheters required replacement	21/1169 (1.8%)	1/1313 (0.1%)	22/2482 (0.9%)	**<0.001**
	# Labor CSE Epidural needed for C/S	113	145	258	
	# (%) Labor CSE Epidural Failed when needed for C/S	1/113 (0.9%)	5/145 (3.5%)	6/258 (2.3%)	NS
Total # of All Neuraxial Procedures	**(Including both Epidural and CSE Epidural Catheters)**	2169	2299	4468	
	# (%) of Replaced Epidural Catheters	147/2169 (6.8%)	108/2299 (4.7%)	255/4468 (5.7%)	**0.003**
	#(%) Replaced Labor Epidural Cath (Exclude IV)	106/2169 (4.9%)	101/2299 (4.4%)	207/4468 (4.6%)	NS
	% of Replaced Malfunction Epidural Catheter Replaced Early (<90mins) (Exclude IV Cath)	32/89 (36.0%)	36/83 (43.4%)	68/172 (39.5%)	NS
	# (%) Inadvertent Tuohy Dural Puncture	22/2169 (1.0%)	18/2299 (0.8%)	40/4468 (0.9%)	NS
	Total # (%) IV catheters (included ones cleared and ones needed replacement)	73/2169 (3.4%)	12/2299 (0.5%)	85/4468 (1.9%)	**<0.001**
	# (%) IV catheters required replacement	41/2169 (1.9%)	7/2299 (0.3%)	48/4468 (1.1%)	**<0.001**
	# (%) Labor Epidural needed for C/S	259 (11.9%)	297 (12.9%)	556 (12.4%)	NS
	# (%) Labor Epidural Failed when needed for C/S	14/259 (5.4%)	19/297 (6.4%)	33/556 (5.9%)	NS

Table 1. .Obstetric Neuraxial Anesthesia/Analgesia Outcomes between Springwound (Spring)Epidural Catheter and Nylon Epidural Catheter (Nylon)

Abstract #: F-21

Does the Time of Day Affect the Decision to Incision Interval for Cesarean Section?

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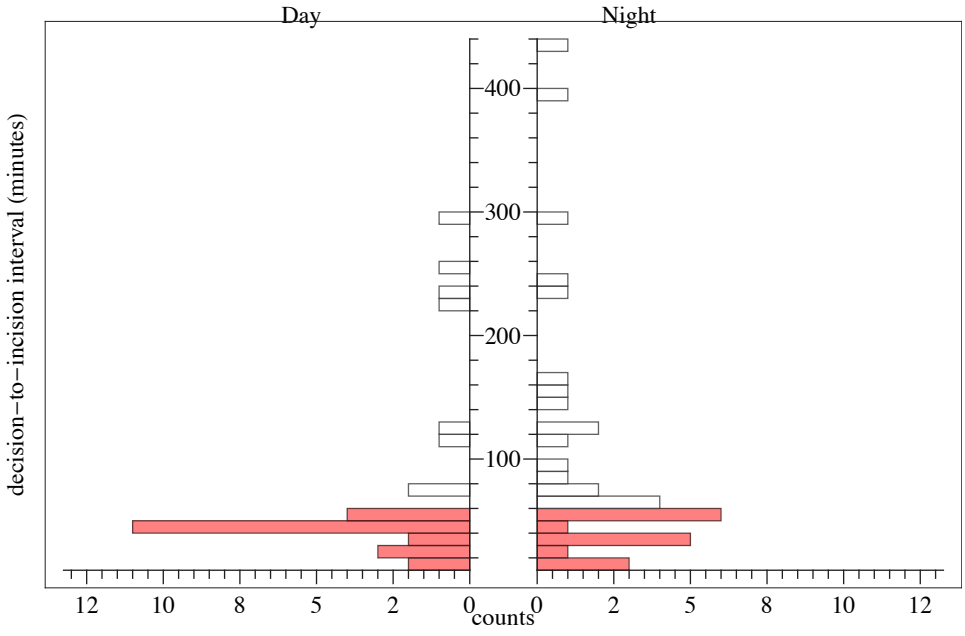
Introduction: Preparation for non-elective cesarean section (CS) requires numerous steps and levels of coordination across a several disciplines. During the day, different resources may be available to perform and coordinate these steps when compared to resources available at night. While in an emergency all resources are likely to be mobilized regardless of the time of day, for urgent, but not emergency CS, a difference in resources might affect the time interval from decision to skin incision. Although many obstetricians use a guideline of 30 minutes for decision to incision interval (DII) in emergency CS, no such guideline is widely accepted for urgent, non-emergency CS. We questioned therefore whether time of day affects what we considered to be a reasonable and an attainable goal of a 60 minute DII for urgent CS at an academic institution.

Methods: Data were collected from electronic obstetric and anesthesia records for all non-elective cesarean deliveries from September 2013- January 2014. We eliminated true "stat" CS (total of 12) as defined by the obstetrician. DII was calculated. The time of day during which the case was performed was categorized as either Day or Night shift based upon the time of anesthesia staff shift change. For the Day vs. Night comparison, we estimated the difference in the fraction under 60 minutes Day vs. Night and computed confidence intervals under a binomial distribution.

Results: Total number of urgent CSs included 30 during the Day and 35 at Night. The fractions under 60 minutes Day vs. Night were 0.73 vs. 0.46, with an estimated difference of 0.28 (95% C.I. 0.05 to 0.50), Figure.

Discussion: A smaller proportion of urgent CS performed at night had a DII below 60 minutes. The reasons for this are likely multifactorial. Potential contributing factors include reduced staffing at night, increased length of time to obtain lab results and relative differences in skill levels of respective providers (both nurses and physicians) working certain shifts. This finding is unlikely to be due to differences in patient population, as patients present to Labor and Delivery at random times. As we continue to collect data, we anticipate that we will find other factors that contribute to a prolonged DII. Although a 60 minute DII appears to be attainable, the clinical benefit of a targeted DII for urgent CS requires further investigation.



Abstract #: F-22

Effect of Temperature on Combined Spinal-Epidural Dosing on Labor Analgesia Duration

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Background: Previous studies have illustrated the influence of local anesthetic temperature on baricity and viscosity; and cold solution may prolong intrathecal analgesic duration. On the contrary, recent studies have shown cold epidural solution has a shortened duration of analgesia. The goal of this study is to compare the analgesic duration of intrathecal medication at different temperatures used for combined spinal-epidural (CSE) in laboring patients.

Methods: After IRB approval, informed consent was planned from 60 women presenting for vaginal delivery requesting epidural analgesia. Patients were randomized to either a room temperature (RT) group or a cold temperature (CT) group. Spinal doses consisted of one mL of bupivacaine 1.75 mg plus fentanyl 15 mcg. CSE was performed in a sitting position using LOR with saline technique at L3-4/L4-5 level with a 17 –G Tuohy needle and a 27-G Whitacre spinal needle via needle thru needle technique. Spinal dose was administered after spontaneous clear CSF return. The temperature of the spinal drug was measured by an infrared thermometer prior to injection. Subsequently, epidural catheters were not tested or dosed until patient request. The primary outcome was intrathecal analgesia duration. Patients were monitored for vital signs, VAS pain scores, sensory level, and side effects (pruritus, N/V) every 5 mins for 15 mins, then every 15 mins until patients requested more analgesia. Unpaired t-test, Chi-squares and Mann-Whitney U test were applied as appropriate with $P<0.05$ considered significant.

Preliminary Results: Twenty-nine of the total 60 patients (17 in RT group, 12 in CT group) were enrolled (all 60 pts to be completed by April 2014). Mean intrathecal analgesic duration was 72 min ± 26 min for RT group and 94 min ± 28 min for CT group ($P< 0.039$). Demographics and secondary outcomes were similar between groups (Table 1).

Conclusion: Results suggest a trend toward prolonged labor analgesia with cold intrathecal CSE solution without increasing side effect. The extended duration may be due to the change in drug baricity and viscosity, whereas temperature dependent changes in pH may be more important with epidural application. Our study supports previous findings and suggests this phenomenon persists even with small volume concentrations of intrathecal medications. However, one limitation is that the effect of temperature on the pharmacodynamics of intrathecal opioid is not known.

	Room Temp CSE Group (n=17)	Cold Temp CSE Group (n=14)	*P* Value
Injectate temperature, F, mean (SD)	73.9 (1.9)	38.3 (6.7)	0.001
Demographics			
Age, yr, mean (SD)	25 (3)	29 (7)	NS
Weight, kg, mean (SD)	87 (19)	82 (14)	NS
Height, inches, mean (SD)	65 (2)	64 (3)	NS
Fetal weight, grams, mean (SD)	3502 (521)	3705 (433)	NS
Gravida, median	2	1.5	NS
Parity, median	0	0.5	NS
EGA, wks, mean (SD)	40 (1)	40 (1)	NS
Use of pitocin, n (%)	14 (82)	10 (83)	NS
Use of IV pain meds prior to CSE, n (%)	4 (24)	3 (25)	NS
VAS prior to CSE, mean (SD)	7.5 (2)	7.6 (2)	NS
Cervical dilation prior to CSE, cm, median	4	3	NS
Time from CSE to 10cm cervical dilation, min, mean (SD)	324 (8)	363 (8)	NS
Time from CSE to delivery, min, mean (SD)	389 (1)	465 (10)	NS
Vaginal delivery, n (%)	16 (94)	9 (83)	NS
Primary Outcome			
Duration of intrathecal analgesia†, min, mean (SD)	72 (26)	94 (28)	0.039
Secondary Outcomes			
Onset of Analgesia Measure:			
VAS <=3 at 5 minutes, percent	81	80	NS
VAS <=3 at 10 minutes, percent	94	100	NS
VAS <=3 at 15minutes, percent	100	100	NS
VAS at 5 min after CSE, mean (SD)	1 (1)	2 (3)	NS
Highest dermatome level at 5 min, median	T8	T8	NS
VAS at time of additional analgesics, mean (SD)	5 (1.7)	5 (1.6)	NS
Pruritus score 30 minutes after CSE§, mean (SD)	2 (2.3)	1 (1.3)	NS
Incidence of nausea or vomiting at any time, n (%)	1 (6)	0 (0)	NS
Motor block at 15 minutes, n	0	0	

Table 1. VAS = Verbal Analogue Scale for pain assessment (0-10); † = elapsed time from CSE injection to request of additonal analgesics; § = pruritus score based on analogue scale of increasing intensity using values of 0 to 10.

Abstract #: F-23

Efficacy of Neuraxial Analgesia for Labor in Women with a History of Surgical Correction for Scoliosis: A Prospective Observational Study

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Introduction: Data on neuraxial labor analgesia failure rates in women with surgical correction for scoliosis range from 6-50% and are pooled from case reports and retrospective series.1-5 We performed a prospective observational study evaluating analgesic efficacy of combined spinal-epidural (CSE) or traditional epidural techniques in laboring women with spinal instrumentation for scoliosis repair. We hypothesized that women with prior spinal instrumentation (SI) would require more epidural bupivacaine to attain effective analgesia than case-matched controls (CONT).

Methods: In this case-matched cohort study, 41 SI and 41 CONT subjects were needed to detect a difference of bupivacaine consumption 2.2 mg/h of labor analgesia. The CONT subject was case-matched for anesthesia provider and recruited after neuraxial placement in the SI subject. At the anesthesiologist's discretion, analgesia was initiated with CSE or epidural technique and maintained with patient controlled epidural analgesia with bupivacaine 0.625%/fentanyl 2 μg/mL (bolus 5 mL q10 min, basal rate 15 mL/h). For supplemental analgesia, bupivacaine 0.125% (15 mL) was given and the infusion changed to bupivacaine 0.11%/fentanyl 2 μg/mL. Secondary outcomes included: switching to a more experienced provider, needle redirections and interspaces attempted, supplemental analgesia, analgesic failures and complications. Groups were compared using $\chi 2$ or Mann-Whitney U tests. $P < 0.05$ was significant.

Results: Data were evaluated for 82 patients. Gravida, parity, BMI, time to delivery and mode of delivery were not different between groups. There was no difference in bupivacaine consumption (SI 16.0 mg/h vs. CONT 15.2 mg/h, median difference 0.9 (95% CI -1.4 to 2.9)(P=0.43)) or supplemental analgesia requirements. The number of redirections, interspaces attempted and time to placement were longer in the SI group; 5 cases in the SI group and 0 in the CONT group required a more experienced provider due to difficult placement or analgesic failure (P=0.01). There was one dural puncture in the SI group. (Table)

Conclusions: Women with spinal instrumentation for scoliosis repair have equivalent hourly bupivacaine consumption as those without prior back surgery for neuraxial labor analgesia; however, the neuraxial procedure is technically more difficult.

1) Anesth Analg 2009;109:1930-4
2) Reg Anesth 1990;15:280-4
3) Can J Anaesth 1989;36:693-6
4) Ann Fr Anesth Reanim 2003;22:91-5
5) Int J Obstet Anesth 2003;1

Outcome Measure	SI (N=41)	CONT (N=41)	*P*
Demographics			
BMI [kg/m^2]	27.3±3.5	27.9±4.5	0.92
Mode of Delivery [n (%)]			
NSVD	36 (88%)	30 (73%)	0.19
Instrumental delivery	3 (7%)	5 (12%)	
Cesarean delivery	2 (5%)	6 (15%)	
Bupivacaine consumption [mg/h (IQR)]	16 (12.6-18.7)	15.2 (11.8-16.4)	0.43
Supplemental analgesia [n]	9	11	0.79
# of redirections [n (IQR)]	1 (1-4)	1 (0-1.5)	0.007
# of interspaces [n (IQR)]	1 (1-2)	1 (1-1)	0.004
Time to placement [min (IQR)]	6 (4-10)	5 (2-7)	0.03
Switch to more experienced provider [n (%)]	5 (12.2%)	0 (0%)	0.01
Analgesic failure	2		
Difficult placement	3		
Unintentional dural puncture [n]	1	0	

Abstract #: F-24

Elective Extracorporeal membrane oxygenation in a laboring parturient with Eisenmenger's Syndrome

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Case: A 29-year-old NYHA class 3 parturient with Eisenmenger's syndrome (ES) presented at 18 wks gestation despite medical recommendation for termination. An echocardiogram showed bidirectional flow across a large PDA, moderately decreased RV function, preserved LV function and suprasystemic PA pressure.

Antepartum, the patient progressed to dyspnea at rest and treatment consisted of inhaled Iloprost, prophylactic thromboprophylaxis, bedrest, furosemide and supplemental O2.

At 34 wks, arterial, central venous and L4/5 epidural catheters, and 27 Fr bicaval dual lumen ECMO cannulas were placed in the OR. V-V ECMO was initiated at 2L/min after heparinization (aPTT 40-60) and post ductal SpO2 improved from 88% to 100%. The epidural catheter was tested and an infusion started. Induction of labor commenced with a cervical ripening balloon/oxytocin and cervical dilation progressed over 48 hrs.

Acutely, the patient developed tachycardia, hypertension and hypoxia while laboring (pre-ductal SpO2 of 75%), despite her denial of pain, which was treated with 100% oxygen, inhaled Iloprost and nitric oxide 20ppm. The patient's preductal SpO2 improved to 88% but she underwent cesarean section (CS) secondary to maternal instability (FHR was reassuring). Epidural lidocaine (15cc of 2%) was titrated to a T6 level, while a femoral artery catheter was placed for V-A ECMO if necessary. Milrinone, phenylephrine and vasopressin were required for inotropic/vasopressor support after epidural loading, which was increased after delivery following a 1000cc blood loss and oxytocin administration.

In the post-operative period the patient developed an early peritoneal hematoma necessitating surgical evacuation, DIC, respiratory failure, acute renal failure necessitating CVVH, and cardiogenic shock requiring conversion to VA ECMO. The patient was discharged post-partum day 54 on 4L O2 and returned a month later ambulatory.

Discussion: This is the first report of utilizing ECMO electively to mitigate the hemodynamic instability of labor in a PH/ES parturient and her fetus. Multidisciplinary discussions concluded that a vaginal delivery (VD) would be attempted because the literature, and our experience, support decreased blood loss, surgical stress, hemodynamic instability and mortality when CS is avoided in ES parturients. Labor was unlikely to be tolerated with profound right to left shunting across her PDA, suprasystemic PAP, and RV dysfunction. ECMO was initiated to provide better-oxygenated blood to the uteroplacental unit during labor, which likely resulted in increased fetal stability and decreased maternal decompensation during labor. CS for maternal indications still occurred however.

The use of ECMO to permit survival of this ES parturient, and delivery of a healthy child, when known mortality is unacceptably high, should be tempered against some expected complications of mechanical support, including renal failure and hemorrhage (both experienced by this patient).

Abstract #: F-25

Elective LSCS and pre op G&S, should we follow NICE guidance?

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In 2012, NICE (National Institute for Clinical Guidance, UK) issued clinical guideline number 132 for the management of Caesarean sections1. In which they state that:'Pregnant women who are healthy and who have otherwise uncomplicated pregnancies should not routinely be offered the following tests before CS: Group and save (G&S), Cross matching of blood'.

This guidance is based on one study, by Ransom et al2 which was a retrospective case review of 3,962 caesarean sections. 3.3% of women required a blood transfusion during their hospital stay. Most of the blood transfusions were related to previously identified risk factors and they conclude the overall urgent blood transfusion rate without risk factor at 0.8/1000.
At our hospital there was some concern over the safety of patients not having a pre op G&S sample prior to elective LSCS. We have over 6,000 deliveries with over 600 elective LSCS per year.

We retrospectively looked at the previous 5 years worth of elective LSCS and women who had required a blood transfusion. Our aim was to assess the appropriateness of applying NICE guidance to our patient group.
We used the blood banks data base to look at all patients who had received a blood transfusion from 2008-2012, and were then able to filter this to only patients who had undergone a LSCS. From the data set all notes were requested and data was collected from only the elective LSCS.

There were 3,091 patients who underwent elective LSCS in the years 2008-2012. Only 8 patients required an intra-operative or postoperative blood transfusion (within the first 24hours). 7 of these patients had previously identifiable risk factors, these were: placenta praevia x2 patients, fibroids x3 patients, anti-coagulated for anti-thrombin III deficiency and previous post partum haemorrhage. One patient required urgent blood transfusion in the post anaesthetic care unit after her elective LSCS. The patient had no previously identifiable risk factors, but had a 1.5L haemorrhage secondary to uterine atony. This gave us an urgent blood transfusion rate, without identifiable risk factors of 0.32/1000.

NICE guidelines are issued with the advice that "providers are reminded that it is their responsibility to implement the guidance, in their local context"1. The introduction of a national protocol or procedure to local departments should be considered carefully. As with any change in practice it is vital to evaluate the service provided and the demands of the patient population. We were able to use audit as a tool to satisfy our concerns and answer the question- should we follow NICE guidance? Yes.
If we implement NICE guidance our trust could save £7,640 per year.

1. NICE CG 132 Caesarean Section, http://guidance.nice.org.uk
2. Cost-effectiveness of routine blood type and screen testingfor caesarean section. Ransom SB, Fundaro G, Dombrowski MP. J Reproductive Medicine

Abstract #: F-26

Expecting the unexpected: What does it mean to carry death instead of life?

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A 20 year old G2P0100 with poorly controlled type 1 diabetes mellitus, and pregnancy complicated by severe cardiac and intracranial anomalies presented in labor at 34 weeks and 4 days EGA and was diagnosed with stillbirth shortly after admission. She initially requested cesarean to expedite delivery, but the obstetrician dissuaded her. Subsequently, she underwent a 52 hour labor complicated by chorioamnionitis, which culminated in a very difficult, physical, and emotionally exhausting breech extraction, ultimately necessitating cephalocentesis.

A week later, a 29 year old G1P0 with a 7 year history of infertility presented to the labor and delivery floor for induction of labor at 37 weeks EGA for lethal fetal anomalies. These including severe hydrocephalus and hypoplastic left heart syndrome, which were initially diagnosed at 20 weeks and 4 days EGA. Initially, she refused to have cesarean delivery or any potentially fetal destructive procedures, such as cephalocentesis. She had outlined a very thorough birth plan designed to allow her and her family to spend quality time with their baby regardless of how long she would live. Her induction lasted 3 days, finally necessitating cesarean delivery for arrest of dilation. After a brief assessment by the neonatologist, their were able to hold and bond with their baby until she died 5 hours later.

Although very different, both cases present very similar emotional and psychological challenges. While pregnancy and childbirth are typically joyful experiences, 6 of 1,000 expectant mothers face the harsh reality of stillbirth, with an additional 3/1,000 expectant mothers learning they are carrying fetuses with significant anomalies. Diagnosis of stillbirth or lethal fetal anomalies is overwhelming traumatizing for women, often leaving them feeling isolated, abandoned and misguided with a loss of personal autonomy. Consequently, they are at a five times increased risk of prolonged psychological effects. Obstetric management has evolved to address many of the medical challenges, and knowledge regarding the psychological aspects has grown exponentially during the past decade. Yet, anesthesiology literature has not kept pace with this evolving knowledge and contains little guidance on the care of these mothers. As obstetric anesthesiologists, we serve a pivotal role in reducing physical pain and suffering these women experience during labor described as "insufferably hard". Likewise, we find ourselves uniquely positioned to serve as healers in a different sense. Developing a deeper understanding of the obstetric and ethical challenges and a greater awareness of women's experiences and the psychological effects, the obstetric anesthesiologist is better equipped to attend to the physical, psychological, and emotional suffering these mothers experience during the peripartum period.

Abstract #: F-27

Faces of Amniotic Fluid Embolism

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Introduction: Amniotic fluid embolism (AFE) is a rare unpredictable and unpreventable catastrophe during pregnancy or delivery. Amniotic fluid (AF) enters maternal circulation through endocervical veins, placental insertion site or areas of uterine trauma. AFE is characterized by sudden and devastating onset of hypotension, hypoxemia and disseminated intravascular coagulation (DIC). We present four cases to highlight various presentations of this syndrome.

Case #1 – 30 year old G4P3003 40 weeks admitted for induction of labor with vaginal prostaglandin. At 0600 fetal bradycardia for 4min, BP 97/55, O2 sat 100%. Enroute to OR at 0606, she became unresponsive and cyanotic. Upon intubation, O2 sat 75%, EtCO2 16. Within 2 mins of ACLS: BP from 50 to 150, O2 sat 90. Baby by C/S at 0614 Apgars 2, 6 and 7. In OR: 8 PRBC, 6 FFP, 20 cryo, 1 platelets, 8 L LR, EBL 4500, urine 1100. Discharged 10 days later.

Case #2: 36 year old G7P3033 induction for postdates and polyhydramnios with prostaglandins. BP 125/83, P121, R20, Hct 34 platelets 172 WBC 8.1. Five hours later, painful contractions, headache and tingling of left arm. SROM followed by profuse vaginal bleeding. She grunted, became unarousable and developed seizures. O2, MgSO4, lorazepam and phenytoin. Labs: hct 40, platelets 66K, PT 60 PTT 113 INR 5.7. Baby by C/S with Apgars 4 and 7. Hysterectomy for intractable hemorrhage. Fluids: crystalloids 7K, PRBC 15, FFP 9, platelets 6, cryo 7. Cryptogenic embolic stroke was due to paradoxical embolism confirmed by positive "bubble test". Mother and baby well, patient back to work.

Case #3: 33 year old G6P5005, 40 weeks gestation underwent amniotomy for induction of labor. Sudden cardiopulmonary arrest from which the patient never recovered. A healthy baby was delivered by postmortem C/S.

Case #4: 36 year old G3P2002 stopped talking, became unresponsive and cyanotic during C/S. O2 sat 60%, BP 70/45, P42. The patient coughed, opened her eyes and started breathing spontaneously, HR rose from 40 to 90, BP 100/50, O2 sat 95%. She had no memory of what happened.

Discussion: AFE can occur like a bolt of lightning on a clear day. Severity may depend on size of embolic material. High index of suspicion can lead to prompt initiation of supportive care before irreparable damage occurs.

Abstract #: F-28

Feasibility of the Focused Rapid Echocardiographic Examination in Parturients

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Background: This is original research designed to test the feasibility of a Focused Rapid Echocardiographic Examination (FREE) in parturient patients. The FREE was previously used at the University of Maryland to assess volume status, overall cardiac function, and answer clinical questions of care for critically ill patients. This echocardiogram is a modified version of a traditional transthoracic echocardiogram involving four views designed to produce information regarding global cardiac function, volume status, volume responsiveness, stroke volume and cardiac output, and basic valvular function which can then be used to make real time clinical decisions that impact patient care. The FREE has been demonstrated to change care in the critically ill.(1) It is our hypothesis that this exam can be applied to parturients with the hope that it will ultimately assist in their care.

Methods: Study participants were term gravida admitted to Labor and Delivery for labor, induction of labor, or cesarean section. Informed consent was obtained and a FREE was completed on all subjects before delivery and within 24 hours after delivery. Four standard transthoracic views were obtained on 10 patients: 1) parasternal long axis, 2) parasternal short axis, 3) apical four/five chamber and 4) subxyphoid. Patients were in the supine position during the examination with left uterine displacement.

Results: We were able to successfully obtain all four views mentioned above on all 10 patients. We were able to calculate stroke volume, cardiac output and systemic vascular resistance in the majority of the patients. Assessment of systolic and diastolic function was made and the aortic, mitral, and tricuspid valves were evaluated. Estimates of volume status were made based on the LV internal dimension and stroke volume variation measurements. All patients had small or partially to fully collapsed IVC.

Conclusion: Cardiac disease now encompasses a large proportion of maternal mortality in the developed world. At our institution, we care for a large number of high-risk obstetric patients with both obstetrical disorders as well as comorbidities that may impact cardiac function and anesthetic management. Some of which include obesity, pre-existing cardiac dysfunction or abnormalities, hypertension and diabetes. It is our hope that the application of this study to parturients, if proven feasible, can assist in real-time clinical decision-making and will impact patient care, reducing maternal mortality from cardiac disease.

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Abstract #: F-29

FLOSS before you fly: a novel intrauterine resuscitation care bundle

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Introduction: Intrauterine fetal resuscitation (IUFR) improves fetal oxygen delivery during acute compromise(1). We show that although medical staff on our unit have good knowledge of IUFR measures, they are rarely implemented in the preoperative period after a decision to deliver. We designed a novel IUFR care bundle, with the mnemonic 'FLOSS' (Fluid, Left lateral position, Oxygen, Stop syntocinon, Stop contractions). After educational sessions, we demonstrated improved uptake of these measures.

Methods: Medical staff members on our delivery unit, including obstetricians and anaesthetists of all grades, and midwives, were approached by an author and questioned as to what actions they would take if they suspected acute fetal distress (pre-intervention questionnaire). Subsequently we audited emergency Caesarean sections performed for fetal distress (pre-intervention audit). The implementation of IUFR measures was analysed by the anaesthetist at the time of entering the OR. After analysis of results, a brief teaching session on IUFR measures was delivered during staff handover periods, and the OR audit repeated (post-intervention audit).

Results: Pre-intervention questionnaire responses were obtained from 21 midwives, 16 obstetricians and 19 anaesthetists and were grouped into five categories: administration of intravenous fluid (midwives 81%; obstetricians 81%; anaesthetists 84%), adopting the left lateral position (midwives 100%; obstetricians 94%; anaesthetists 95%), administration of oxygen (midwives 5%; obstetricians 31%; anaesthetists 84%), stopping syntocinon (midwives 62%; obstetricians 50%; anaesthetists 58%), and starting tocolytics (midwives 5%; obstetricians 13%; anaesthetists 16%).

Results from the pre-intervention audit showed that in parturients with suspected fetal distress (n=26): 58% had received intravenous fluid, 27% were in the left lateral position, oxygen was given to 8%, syntocinon was stopped in 46%, and tocolytics were given in 4%.

After the delivery of teaching sessions to midwives at daily handover sessions, and the deployment of the 'FLOSS' care bundle, the post-intervention audit results (n=10) were as follows: IV fluid administered in 100%, left lateral positioning employed in 100%, and syntocinon stopped in 100%. No patient was administered oxygen nor tocolytic drugs.

Discussion: We demonstrated that in spite of good knowledge of IUFR measures by medical staff on labour ward, they were infrequently implemented. By developing a simple acronym for an IUFR care bundle, we improved uptake of three of the key interventions. Further work may be required to improve uptake of oxygen and tocolysis, though the former has caused controversy(2).

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Abstract #: F-30

IL-8 production in lung endothelial cells after exposure to preeclamptic plasma

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Preeclampsia effects 5-7% of the pregnant population (1). Pulmonary edema is one of the most common morbidities in women with Pre-E (2). We hypothesized that factors in the plasma of women with Pre-E modulate endothelial functions, including permeability, inflammation, and increase endothelial cell production of soluble endoglin (sEng).

Methods: We obtained samples from Magee Womens Research Institute. Blood was collected in EDTA tubes of normal preterm women (n=5) and preterm Pre-E (n=5) women. Samples were matched for GA, race, smoking, parity, and BMI. Female cadaveric human lung microvascular cells were used for all experiments. Lung endothelial cells were exposed to 5% plasma and incubated 27 hours. Transendothelial resistance, a surrogate for permeability, was measured repeatedly over time using electric cell-substrate impedance sensing (ECIS). Cytokines (IL-8, IL-6) and sEng were measured in endothelial culture supernatants by ELISA.

Results-IL-8 production was significantly increased in the lung endothelial cell after exposure to Pre-E plasma compared to normal plasma ($p < .007$). IL-6 levels were similar in both groups. There was no significant difference in sEng production in endothelial cells, but there was a significant increase in sEng in Pre-E plasma ($p < .004$). Transendothelial resistance was not significantly different between cells treated with normal vs. Pre-E plasmas.

Conclusions: Treatment of endothelial cells with plasma from women with Pre-E results in increased production of IL-8, an inflammatory mediator that induces chemotaxis to promote migration of neutrophils to the site of infection. Endothelial cell production of this cytokine could potentially contribute to the increased endothelial cell permeability and consequently pulmonary edema seen clinically in Pre-E. Although, there was not a significant difference in sEng production in the endothelial cell. Literature supports increased production sEng in placentas of women with Pre-E. Our future studies will explore stimulation of lung endothelial cells with sEng and determine the downstream production of factors in the endothelial cell affecting permeability and vascular tone.

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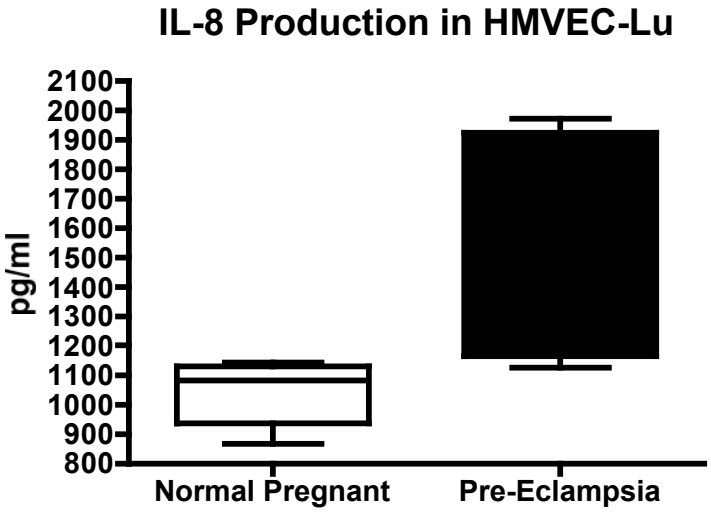

Abstract #: F-31

Impact of an Obstetric Hemorrhage Protocol on Post-operative Patient Outcomes in a Tertiary Care Medical Center

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Background: We previously reported that implementation of an obstetric hemorrhage protocol (OHP) was associated with a lower RBC:plasma ratio, and improved post-resuscitation coagulation markers and laboratory monitoring. However, the impact of OHP on short-term patient outcomes has not been well described. We conducted a secondary data analysis to examine the impact of this OHP, implemented in November 2010, on duration of post-operative invasive positive pressure ventilation (IPPV), length of intensive care unit (ICU) admission, and time to hospital discharge following surgery (LOS).

Methods: We included patients that delivered at our institution between January 1, 2003 and September 26, 2012 and were transfused ≥ 1 unit of packed red blood cells (PRBC) intraoperatively. Data was collected on patient demographics, PRBC units transfused, pre-operative hemoglobin (Hb), need for and duration of IPPV, duration of ICU admission and LOS. We further subdivided our patient population into severe hemorrhage vs. less severe hemorrhage based on whether they died, received 4 or more units PRBCs, underwent hysterectomy, embolization, or Bakri balloon placement.

Data were summarized as mean (SD), median (25th, 75th quartiles) and number (%) and were compared pre- and post-protocol using the t-test, Wilcoxon-Rank Sum test or chi-squared test. Using multiple linear regression, we estimated the effect of OHP on LOS while adjusting for preoperative Hb, date of surgery, PRBCs units transfused and severity of hemorrhage.

Results: 122 patients met inclusion criteria (75 pre-protocol, 47 post-protocol). Overall there were no significant differences in patient demographics, ICU admission, need for IPPV, duration of IPPV or length of ICU stay for patients managed pre- and post-protocol (Table). However, patients managed post-protocol had a significantly shorter LOS ($p = 0.02$) (Table). In the severe hemorrhage group (n=61), there were no significant differences in outcome measures pre- vs. post-protocol (Table). However, in the less severe hemorrhage group (n=61), there was a statistically significant shorter LOS post-protocol ($p = 0.004$) (Table). The shorter LOS post-protocol was still observed after adjusting for severity of hemorrhage and the other covariates ($p=0.0125$).

Conclusions: Shortened LOS was seen in less severe obstetric hemorrhages after OHP implementation. There were no observed differences in other short-term outcomes, particularly in those with severe hemorrhage.

		Pre-Protocol		Post-Protocol		
		N	Statistic	N	Statistic	p-value
Age (years)		75	30 (7)	47	31 (7)	NS
BMI (kg/m^2)		75	34.0 (10.6)	47	31.9 (9.8)	NS
Gestational age (weeks)		75	37.0 (32, 39)	47	36.5 (32, 40)	NS
Parity		75	1 (0, 3)	47	2 (0, 3)	NS
Pre-operative hemoglobin (g/L)		75	10.3 (8.9, 11.3)	47	10 (7.8, 11.9)	NS
ASA Status		75	2 (2, 3)	47	2 (2, 3)	NS
Race	African-American	75	34 (45%)	47	18 (38%)	NS
	Caucasian	75	22 (29%)	47	13 (28%)	NS
	Hispanic	75	18 (24%)	47	12 (25%)	NS
	Other	75	1 (1%)	47	4 (8%)	NS
ICU admission (y/n)	**All Cases**	75	25 (33%)	47	14 (30%)	0.68
	Less Severe	37	7 (19%)	24	1 (4%)	0.10
	Severe	38	18 (47%)	23	13 (57%)	0.49
Need for post-op IPPV (y/n)	**All Cases**	75	20 (27%)	47	12 (26%)	0.89
	Less Severe	37	4 (11%)	24	1 (4%)	0.36
	Severe	38	16 (42%)	23	11 (48%)	0.66
Hours on IPPV	**All Cases**	20	18 (11, 24)	11	16 (8, 58)	0.73
	Less Severe	4	19 (13, 33)	1	19 (19, 19)	0.82
	Severe	16	18 (11, 23)	10	15 (8, 58)	0.77
Hours in ICU	**All Cases**	24	31 (22, 43)	9	29 (12, 95)	0.95
	Less Severe	7	31 (22, 47)	1	160 (160, 160)	0.19
	Severe	17	31 (21, 41)	8	29 (11, 84)	0.70
Time to discharge (days)	**All Cases**	75	4 (3, 7)	47	4 (3, 5)	**0.02**
	Less Severe	37	4 (3, 6)	24	3 (3, 4)	**0.004**
	Severe	38	4 (3, 7)	23	4 (3, 5)	0.66

Statistics are n (%), median (25th, 75th quartiles) and mean (SD).

Abstract #: F-32

Inability To Thread The Epidural Catheter: A Provocative Hypothesis

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Background: Occasionally, despite a convincing loss of resistance (LOR), an epidural catheter will not thread into the epidural space. Flushing saline through the epidural needle has been advocated [1] with the premise that it will displace dura or epidural contents from the tip and facilitate catheter insertion. Alternatively, the benefits of cephalad angulation of the epidural needle [2] have been examined. However, no study has evaluated how much of the needle orifice must traverse the ligamentum flavum in order for the catheter to thread into the epidural space. We sought to create a model to identify how much of the epidural needle must pass through the ligamentum flavum to allow insertion of the catheter.

Methods: We created a durable cardboard model of the ligamentum flavum. We advanced the epidural needle through the model and attempted to obtain LOR to saline, as well as ability to pass an epidural catheter into a virtual "epidural space." We photographed our attempts using a macro lens and Canon Rebel T3i digital SLR camera. We used photo-editing software to examine the high-definition images and measure the epidural needle tip at various points of insertion.

Results: Using this model, we demonstrated that it is possible to obtain a convincing LOR to saline (Figure 1A) when the needle tip has barely traversed the ligamentum flavum, but it would be impossible to thread a 19 gauge epidural catheter. We determined that passage of the epidural catheter could not occur (Figure 1B) unless the point at which the width of the elliptical opening of the needle equals the diameter of the catheter traversed the ligamentum flavum (Figure 1C). Measurement of the 19 gauge epidural catheter diameter demonstrated that it was approximately 1 mm. Analysis of our photographs revealed that the point at which the 17 gauge epidural needle orifice measures 1 mm in length occurs at a width of 1.1 mm, 1.3 mm from the tip (Figure 1D). We also examined the effects of needle angulation and close proximity of the dura, as well as the flexibility of different epidural catheters.

Conclusion: Our model demonstrates that passage of the epidural needle tip of less than 1.3 mm through the ligamentum flavum will not allow epidural catheter insertion despite LOR. Cephalad angulation facilitates flexible epidural catheter insertion; stiff catheters pass regardless of insertion angle.

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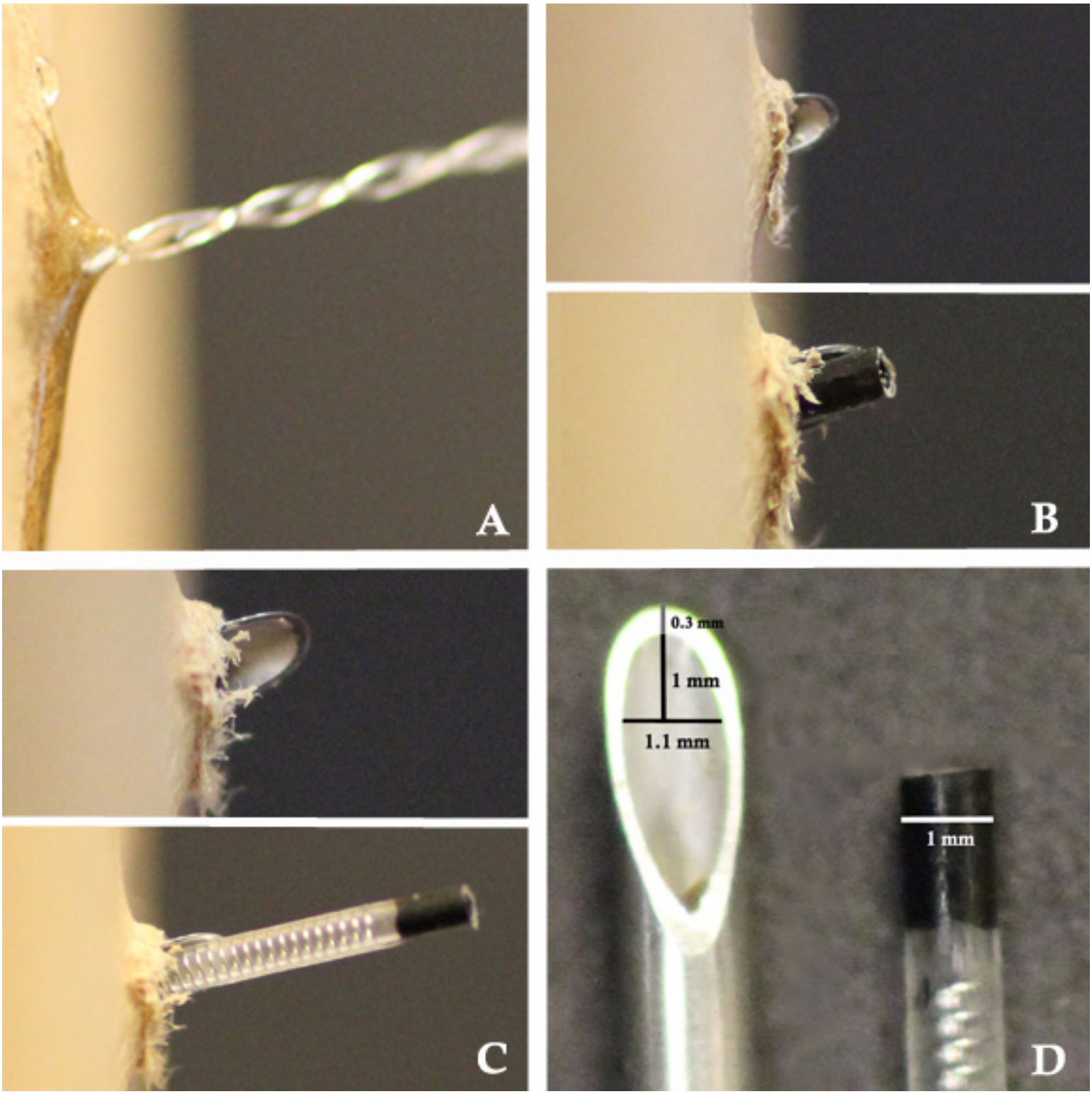
Abstract #: F-32



Abstract #: F-33

Inter professional relationships on labour ward: how well do anaesthetists and midwives get along?

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Introduction: Anaesthetists and midwives work in close collaboration in the unique and often highly charged environment of labour ward. In such settings, effective inter professional relationships are key to the delivery of high quality care and consequently better patient outcomes. Successful collaborative practice can be negatively impacted by barriers such as lack of clarity on the scope of roles of team members, poor communication, or stereotyping. We conducted a survey in our maternity unit to reflect upon this working relationship and to see how it may be improved.

Methods: A questionnaire was designed and distributed to midwives and anaesthetists of all grades. Questions were asked on their understanding of each other's professional role and on their perception of the quality and effectiveness of their working relationship. A total of 55 responses were collected (28 anaesthetists and 27 midwives).

Results: The majority of respondents were reasonably experienced with 57% of anaesthetists and 59% of midwives having worked for more than 5 years on maternity units. When asked whether they felt they understood the scope of responsibilities of midwives on labour ward, only 32% of anaesthetists felt they understood it fully. In contrast, 55% of midwives believed they fully understood the scope of the anaesthetist's responsibilities.
Thirty three percent of midwives felt that collaboration with anaesthetists was 'very easy', compared to only 13% of anaesthetists who felt the same about collaboration with their midwife colleagues. While 14% of anaesthetists found this collaboration 'difficult', none of the midwives did (0%). Sixty four percent of anaesthetists felt their input was 'usually' well-received by their midwife colleagues, in contrast to 51% of midwives who thought their input was 'usually' well-received by the anaesthetist. Both professions were asked how they perceived the general quality of communication between them. The majority of anaesthetists (47%) perceived it as 'fair', while 10% regarded it as 'poor'. 84% of midwives felt it was either 'very good' or 'good'. None of the midwives (0%) felt it to be 'poor'. Questions were asked on the types of obstacles they encountered in their professional interaction. Most anaesthetists (65%) agreed that they found fixation on tasks and exclusion of others to be a challenge, followed by delayed or non-communication of important issues (42%). Twenty nine percent of anaesthetists felt they rarely got a comprehensive handover from the midwife while only 33% of midwives felt they always understood the rationale behind the anaesthetists' decisions.

Conclusion: Despite both specialties working in close proximity, the survey identified several gaps in communication. Working towards enhancement of the professional relationship between members of the team providing maternity services will help facilitate their collaboration and will reflect positively on the performance of both professions.

Abstract #: F-34

Intrathecal Hematoma after CSE for Labor Analgesia

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Case: A 30 year old G1P0 at 39w3d was admitted in active labor. Due to antithrombin III deficiency, she was on Heparin 10,000U BID with the last dose being 6 hours prior to CSE. CBC was normal at admission, though a PTT was not checked. CSE placement was uneventful, labor analgesia was effective, and she delivered a healthy baby 4 hours later. She was discharged on postpartum day (PPD) 2 in good condition, and medications included enoxaparin 40mg BID. By PPD 4-5 she began to experience positional headaches, photophobia, meningismus, fever, lower back pain with radicular irritation, and mild subjective leg weakness. On PPD 6 she returned to the hospital and was thought to have postdural puncture headache (PDPH) in addition to possible meningitis or other infection, and thus IV antibiotics were started. As part of the infectious workup, lumbar puncture (LP) was done and revealed frank blood (RBC=82K). Notably, all of her symptoms were greatly exacerbated after the LP procedure. Anesthesia evaluation occurred after the LP and recommended immediate lumbar MRI, which revealed subarachnoid blood filling much of the lumbar cistern (up to L2). Neurosurgery and anesthesia agreed that her back pain and other symptoms were due to intrathecal hematoma and PDPH. Given that her symptoms were slowly improving, conservative management was recommended. She continued to slowly improve symptomatically and was discharged after 5 days (PPD 11). At her 1 month follow-up with neurosurgery she was noted to be asymptomatic. Repeat MRI done 11 months postpartum showed resolution of the hematoma.

Discussion: Intrathecal hematoma after neuraxial anesthesia is a very rare complication that may have an acute onset,(1) though may have a more gradual onset as it did as in this case.(2,3) Symptoms suggestive of spinal hematoma should prompt immediate lumbar MRI and neurosurgical evaluation, as timely diagnosis and treatment may be crucial in determining outcome.(1-3) Treatment may involve surgical decompression,(1,2) though conservative management may be recommended if symptoms are not severe or are improving.(3) The presence of fever and neck stiffness likely led to the initial focus on possible meningitis and performing an LP procedure prior to lumbar MRI. Fortunately, the delay in diagnosis did not lead to permanent neurologic injury.

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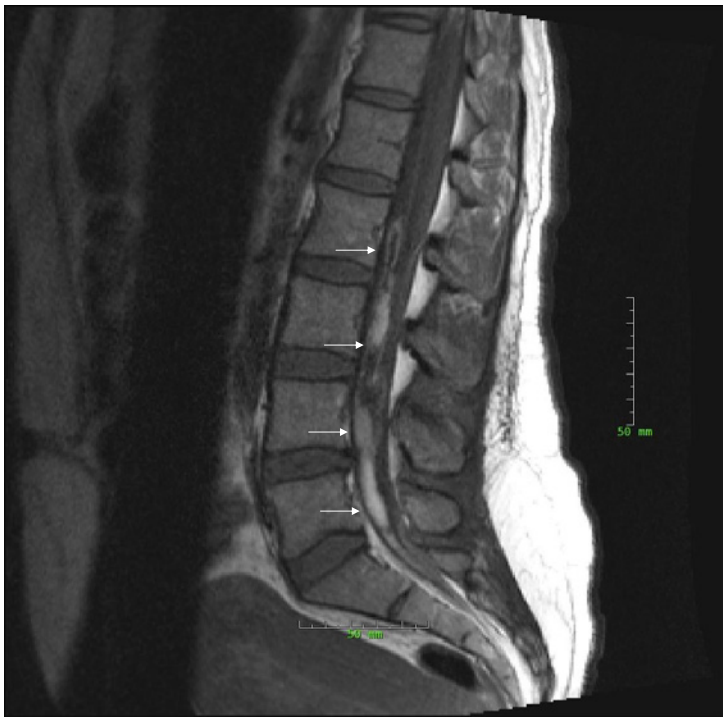

Abstract #: F-35

Intrathecal Morphine Reduces Wound Hyperalgesia in Women Undergoing an Elective Cesarean Delivery

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Introduction:Wound hyperalgesia is associated with acute post-cesarean pain (1) and chronic post-surgical pain (2). In addition, opioid-induced hyperalgesia (OIH) has been suggested to occur when intrathecal (IT) fentanyl is added to the spinal solution in women undergoing elective cearean deliveries (3). This study was designed to evaluate whether IT morphine affects wound hyperalgesia.

Methods: At the time of a clinical practice change in our hospital of adding IT morphine (100mcg; M) to a standard spinal solution containing bupivacaine (12mg; B) and fentanyl (20mcg; F) for elective cesarean deliveries, we decided to prospectively enroll all consecutive women between March and December 2013. According to day allocation, women either received BF&M on Monday-Tuesday-Wednesday, or BF only on Thursday. Breakthrough pain was treated with paracetamol 1g q8h, ibuprofen 600mg q12h, dipyrone 1g q4h. Outcome measures included: average post-op pain scores (verbal numeric rating score; 0-100) at rest, upon movement, uterine cramping at 24h and 48h, and number of analgesic requests. Extent of wound hyperalgesia was evaluated with a von Frey filament (180g of pressure) 48h post-op around the area of the scar as previously described (1), by an investigator blinded to the IT solution. Statistical analysis included t-test for equality of means ($p<0.05$).

Results: Out of the 185 enrolled women during the study period, 36 received BF only and 149 BF&M. Adding M to the IT solution not only significantly reduced pain severity at 24h and the number of analgesic requests as expected, but also reduced the wound hyperagesia index (Table).

Table. Pain outcomes according to IT solution

	Fentanyl (n=36)	Fentanyl & Morphine (n=149)	P value
Pain at rest @24h	46 ± 32	7 ± 14	<0.001
Pain at mobilisation @24h	64 ± 32	20 ± 23	<0.001
Uterine cramping @24h	44 ± 37	12 ± 20	<0.001
Pain at rest @48h	23 ± 25	22 ± 26	0.85
Pain at mobilisation @48h	44 ± 37	40 ± 25	0.31
Uterine cramping @48h	23 ± 25	36 ± 28	0.78
Analgesic requests @24h (N)	1.1 ± 1.2	0.8±1.4	0.001
Analgesic requests @48h (N)	2.9 ± 1.8	1.5±1.4	0.8
Wound hyperalgesia index	1.5 ± 1.7	0.8±1.4	0.01

Data presented as mean ± standard deviation
Pain scores represent average pain on a scale from 0-100, during the 1st 24h (@24h) and between 24-48h (@48h)
Analgesic request is reported as the number of breakthrough episodes for which women requested and took pain medication

Conclusion: IT morphine added to IT fentanyl reduced post-operative wound hyperalgesia at 48h. Further studies are needed to evaluate whether this measurable decrease in post-operative wound hyperalgesia correlates with overall better long term outcomes. Within the setting of this study design, there was no evidence for OIH in women receiving IT morphine.

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Abstract #: F-36

Inverse takotsubo cardiomyopathy in the peripartum period

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Introduction: Takotsubo cardiomyopathy (TCM), also known as broken heart syndrome, is a stress induced cardiomyopathy, thought to be caused by excessive catecholamine release due to acute medical illness or emotional or physical stress. The word takotsubo is a Japanese word meaning "octopus pot," which is used to trap an octopus. This pot resembles the shape of the left ventricle during imaging which shows apical ballooning, left ventricular akinesia or hypokinesia combined with basal hyper-contractility. Inverse TCM is a variant of TCM with similar pathophysiology but with different presenting symptoms and reverse features on imaging i.e. basal hypokinesia. TCM and its inverse variant were first reported in the Japanese literature and its awareness in the Western population is more recent.

Case presentation: A 29-year-old Turkish lady presented for an emergency lower segment caesarean section (LSCS) which was conducted under spinal anaesthesia. During the LSCS and in the immediate postoperative period she complained of chest pain. There was no clinical evidence of pulmonary edema. Upon investigation, she was found to have ECG changes suggestive of non-ST elevation myocardial infarction with positive results for troponin I. Hence, she was initially treated as a case of acute coronary syndrome. However, a subsequent coronary angiogram showed no obstruction or spasm of the coronary arteries while an echocardiogram showed a left ventricular ejection fraction of <25% with basal hypokinesia. Further evaluation with cardiac magnetic resonance imaging, with gadolinium, showed a delayed myocardial uptake of gadolinium with hypokinesia of the basal segments. Hence, a diagnosis of inverse TCM was made and the patient was treated appropriately.

Conclusion: TCM is treated with aspirin, β-blockers, angiotensin converting enzyme inhibitors and diuretics, with recovery of left ventricular function typically occurring in 2-4 weeks. As TCM is caused by catecholamine overload, the use of inotropes and vasopressors can cause haemodynamic instability. The aim of reporting this case was to raise awareness of TCM and its inverse variant in the general population and in the obstetric population in particular.

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Abstract #: F-37

Is magnesium sulfate a risk factor for postpartum hemorrhage at the time of cesarean delivery?

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Background: Uterine atony is the most common cause of postpartum hemorrhage (PPH). Magnesium sulfate is considered to be a risk factor. However, review of the literature reveals a paucity of data in support of this claim. To better understand the role of magnesium on uterine tone, we sought to determine if intrapartum magnesium is a risk factor for PPH at the time of cesarean delivery.

Methods: This was a retrospective case control study. The study period was 1/2006 to 8/2011. Selected patients had preeclampsia, received intrapartum magnesium, and underwent cesarean delivery. The next sequential cesarean delivery after each case was selected as a control. Demographic and obstetric data were collected (Table 1). PPH was defined as a ≥ 10 point decrease in hematocrit and/or blood product transfusion. Categorical variables were compared using Pearson chi squared tests. Continuous variables were compared using Kruskal-Wallis equality-of-populations rank tests. Statistical significance was defined as $p<0.05$. Statistical analysis was performed with STATA Statistics/Data Analysis software (v13.0 StataCorp).

Results: The total number of cesarean deliveries meeting inclusion criteria was 634 (312 cases, 322 controls). More cases than controls had a ≥ 10 point decrease in hematocrit, required transfusion, or required uterotonics, but none of these differences were statistically significant. 22.1% of cases met criteria for PPH, compared to 16.6 % of controls ($p=0.07$). Logistic regression showed that intrapartum magnesium did not predict a ≥ 10-point decrease in hematocrit ($p=0.29$). This was also true for PPH ($p=0.24$). Oxytocin amount was related to PPH among controls, but not cases ($p=0.028$ vs 0.67). All cases received magnesium prior to delivery, with a mean total dose of 40g. There was no association between magnesium amount and PPH ($p=0.13$). When controlling for age, fetus number, gestational age at delivery, parity, and BMI, there was no difference in ≥ 10 point decrease in hematocrit ($p=0.22$) or PPH rates ($p=0.18$).

Conclusions: We found no association between magnesium use and a decrease in hematocrit by ≥ 10 points or PPH. This relationship held true for the subgroup of patients who labored prior to cesarean delivery. In preeclamptic patients receiving magnesium, we could not confirm a relationship between total amount of oxytocin and PPH.

References
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Demographics	Case	Control	P value
Age (years)	28.1	26.5	0.001
Gestational age (days)	234.3	266.6	0.0001
BMI (kg/m^2)	36.1	33.3	0.0002
Length of stay (days)	5.93	4.05	0.0001
Surgery length (minutes)	64.8	70.0	0.061
Race			
Asian % (n)	0.3 (1)	2.1 (7)	
African-American %	26.0 (81)	22.6 (75)	
Caucasian % (n)	62.5 (195)	52.4 (174)	
Hispanic % (n)	9.9 (31)	17.2 (57)	
Others % (n)	1.3 (4)	5.7 (19)	
Obstetric data			
Multiparous % (n)	38.1 (119)	67.2 (223)	0.000
Fetus number	1.06	1.04	0.036
Singleton % (n)	93.3 (291)	96.4 (320)	
Twin % (n)	6.7 (21)	3.0 (10)	
Triplets % (n)	0 (0)	0.6 (2)	
Intra-operative data			
Admission Hct (%)	36.2	35.8	0.12
Hct decrease (%)	6.99	6.73	0.85
10 point decrease in Hct % (n)	22.1 (69)	16.6 (55)	0.07
Transfusion % (n)	7.8 (24)	4.9 (16)	0.13
PPH % (n)	24.7 (77)	18.4 (61)	0.051
Uterotonic use % (n)	16.5 (54)	15.8 (49)	0.81
Oxytocin use (milliunits)	31,968	18096	0.0002
EBL (ml)	764.7	816.5	0.21

Abstract #: F-38

Is MRI Warranted for the Pregnant Achondroplastic Patient? ACHONtroversial Topic

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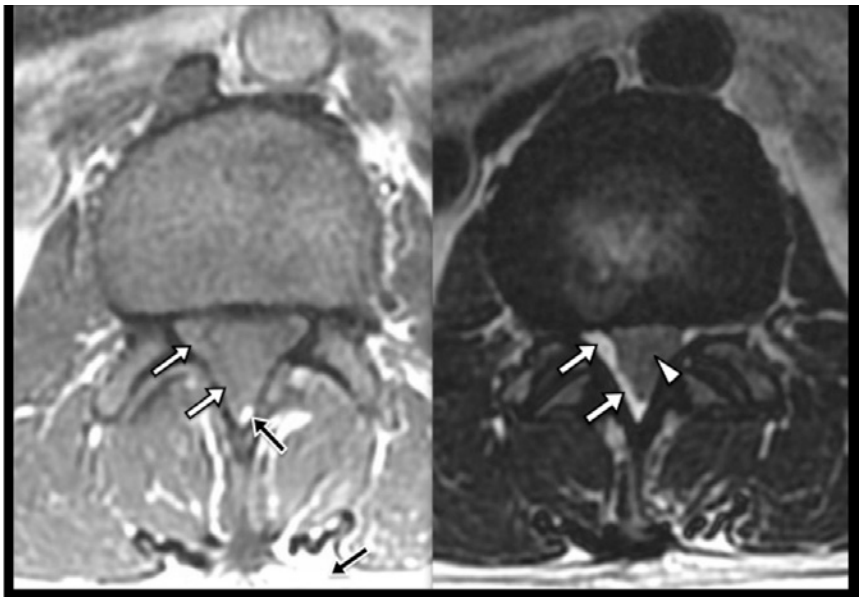
Introduction: Achondroplasia is the most common form of non-lethal skeletal dysplasia, short-limb dwarfism1. The anatomic features of these patients can pose difficulties for administration of general or neuraxial anesthesia. We present the management of an achondroplastic patient where an MRI helped tailor our anesthetic plan and may explain some of our intraoperative observations.

Case: A 35 year old nulliparous achondroplastic patient, 4 feet tall (121.9 cm) and 52.2 Kg was referred to our anesthesia consult service. She denied any medical problems. Physical examination revealed a Mallampati 2 airway, suitable mouth opening, and full range of neck motion. Spinous processes were palpable in the midline. Surgical history included laparoscopic surgery during which an awake fiberoptic intubation had been electively performed. The patient strongly desired to be awake during the cesarean delivery. MRI ordered prior to the consultation revealed "diffuse congenital spinal stenosis-severe (L1-L3) to mild (L5-S1)-consistent with achondroplasia;" of note, there was a "loss of subarachnoid space at the L1-L2 level"(Figure1). The patient presented at our institution in preterm labor at 36 weeks 5 days gestation. A CSE anesthetic was performed at what was presumed to be the L4-L5 interspace; 2.5 mg bupivacaine and 5 mcg fentanyl were injected intrathecally. This had no effect on her labor pain over 10 min. A surgical T4 level of anesthesia was obtained with a total of 15ml of 2% lidocaine/epinephrine/HCO3, titrated 3ml at a time at 4-5 min intervals.

Discussion: The endochondral premature ossification in achondroplastic patients translates into a narrow spinal canal with areas of spinal stenosis2. The MRI allowed us to identify these areas of spinal stenosis, identify areas of relatively normal spinal anatomy, and to predict that spinal anesthetic spread could be compromised at L1 level. This was confirmed when our spinal "labor analgesia dose" only achieved a T12/L1 level after 10 minutes of administration and failed to relieve labor pain. Unusual spread of spinal local anesthetics has been reported before in achondroplastic patients, and may be related to spinal stenosis or other abnormalities. Neuroimaging technology might be useful to "personalize" neuraxial anesthetic techniques for these patients.



Axial T1 (left) and T2 (right) images obtained without fat saturation at the level of L1/L2 demonstrate severe spinal canal stenosis with a paucity of normal CSF signal within the subarachnoid space (arrowhead). An extra-dural T1 isointense and T2 hyperintense fluid collection (white arrows) compresses the thecal sac. The isointense T1 signal within the collection differs from the normal epidural fat and subcutaneous fat (black arrows).

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Abstract #: F-39

Left Ventricular Non-Compaction Syndrome in a Parturient

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Introduction: Left ventricular non-compaction (LVNC) is a rare congenital cardiomyopathy characterized by prominent trabeculations of the left ventricle. Patients may be asymptomatic or present with symptoms of congestive heart failure, atrial and ventricular arrhythmias or thromboembolic disease. We describe a case of a parturient with LVNC who presents for cesarean section(C/S) in the setting of worsening cardiac function.

Case Report: The patient was a 31 year old G4P1 diagnosed with LVNC after her first pregnancy. At that time, ejection fraction (EF) was 41%, mean pulmonary artery pressure (MPAP)=40mmHg at rest. The patient remained asymptomatic. Against medical advice, the patient became pregnant again. At 30 weeks gestation she began experiencing dyspnea and orthopnea. Transthoracic echocardiogram (TTE) revealed EF of 38%, decreased right ventricular function and unchanged MPAP. At 34 weeks her symptoms worsened and decision was made to perform a C/S. The patient was admitted to the cardiothoracic ICU the night before surgery, a pulmonary artery catheter was placed and TTE was performed that revealed EF =23% and severe pulmonary hypertension (PUL HTN) (MPAP =58mmHg). In the OR, standard ASA monitors and an arterial line were placed. Prior to induction dobutamine was started to maximize LV function and improve forward flow. Rapid sequence induction of anesthesia was achieved with etomidate 20 mg and succinylcholine 120mg and the anesthetic was maintained with isoflurane, Fi02 100%, and remifentanil infusion. A healthy male was delivered with Apgar score of 8 at both 1 and 5 min. Oxytocin 20units/hr was started. The patient developed systemic hypotension and increased MPAP. Vasopressin was bolused and an infusion started at 2units/hr. The uterus remained atonic and methylergonovine 0.2mcg was administered with improvement in uterine tone. The surgery was completed in 50 minutes, the trachea was extubated, and she was transported to the CTICU. The patient was weaned off all pressor agents on post-op day (POD) 1. The patient was discharged to home in stable condition on POD 4.

Discussion: Mode of delivery in patients with LVNC is determined by obstetrical indications and maternal functional status. C/S was recommended in this patient with worsening cardiac status. Anesthesia for C/S can include neuraxial or general anesthesia. General anesthesia was selected for this patient with LVNC and PUL HTN. Anesthetic goals in this patient required management of systolic heart failure and PUL HTN. Increases in PVR and systemic hypotension must be avoided. The critical time in regard to cardiac function is generally after delivery when cardiac output increases as occurred in our patient. A multidisciplinary approach is essential in caring for these patients. The C/S was performed in the cardiac OR, with capability of extracorporeal life support, and cardicardiothoracic surgeons on standby. This team dynamic contributed to a successful outcome.

Abstract #: F-40

Management of SVT in a Parturient with a Thyroid Goiter

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Co-Author: Kalpana Tyagaraj M.D. - Maimonides Medical Center - Brooklyn, New York

Case Presentation: 29 years female a history of thyroid tumor, currently in euthyroid status, with tracheal deviation and s/p neck injury resulting in instrumentation and fusion of C3-4 and C4-5 cervical vertebrae, presented in active labor. Fetal heart rate decelerations were noted in triage, but recovered, and the patient was admitted to delivery room. The anesthesia team was consulted for placement of an epidural. On examination, the patient was noted to be tachycardic with a heart rate of 180 bpm and blood pressure of 105/65 mm of. Cardiology was consulted, and a STAT EKG was ordered. As the patient has a difficult airway and a high likelihood of needing a C-Section, the decision was made to place an epidural catheter for pain control. An epidural catheter was placed under aseptic pre-cautions and as the EKG was being obtained, it was slowly loaded with a solution of bupivacaine 0.1% and fentanyl 2mcg/mg, 3ml every 5 minutes to a total of 10ml. The patient had adequate pain relief, however, she continued to be tachycardic to 180s with blood pressure of 101/54. EKG (Figure1)was suggestive of AVnRT. Patient reported episodes of rapid heart rate which were relieved by Valsalva maneuver which did not relieve her tachycardia this time. The patient was successfully cardioverted, first with 6mg of adenosine and then with 12mg of adenosine IV. Later on, patient underwent an emergent C-Section for nonreassuring fetal heart rate under epidural anesthesia. An arterial line was inserted for close hemodynamic monitoring. Multiple doses of esmolol were administered for control of tachycardia. There were no further complications. She underwent catheter ablation after the delivery.

Discussion: Pregnancy predisposes patients to tachyarrhythmias. As intravascular volume increases, so does the atrial and ventricular size, and an increase in the resting heart rate both of which may contribute to arrhythmogenesis. A-fib and AF can occur in pregnant women, however these are extremely rare and is usually associated with structural heart disease. Treatment guidelines for pregnant patient with SVT are the same as those for non-pregnant patients. As there is a paucity of large randomized trials looking at effects of anti-arrhythmogenic drugs on fetuses, the benefits of pharmacologic treatment must be weighed against the uncertain side effects. Therefore, only symptomatic SVTs are usually treated.
The decision to proceed with neuraxial anesthesia is a challenge since it is known to cause sympathectomy, vasodilation and a decrease in the preload and afterload; in the presence of a tachyarrhythmia with limited cardiac output, this may produce hemodynamic collapse. However, not proceeding with these measures can exacerbate tachyarrhythmia through increased adrenergic stimulation due to pain and leave the providers to deal with a difficult airway in a patient needing an emergency C-Section. Vigilance and careful monitoring are essential for optimal outcomes.

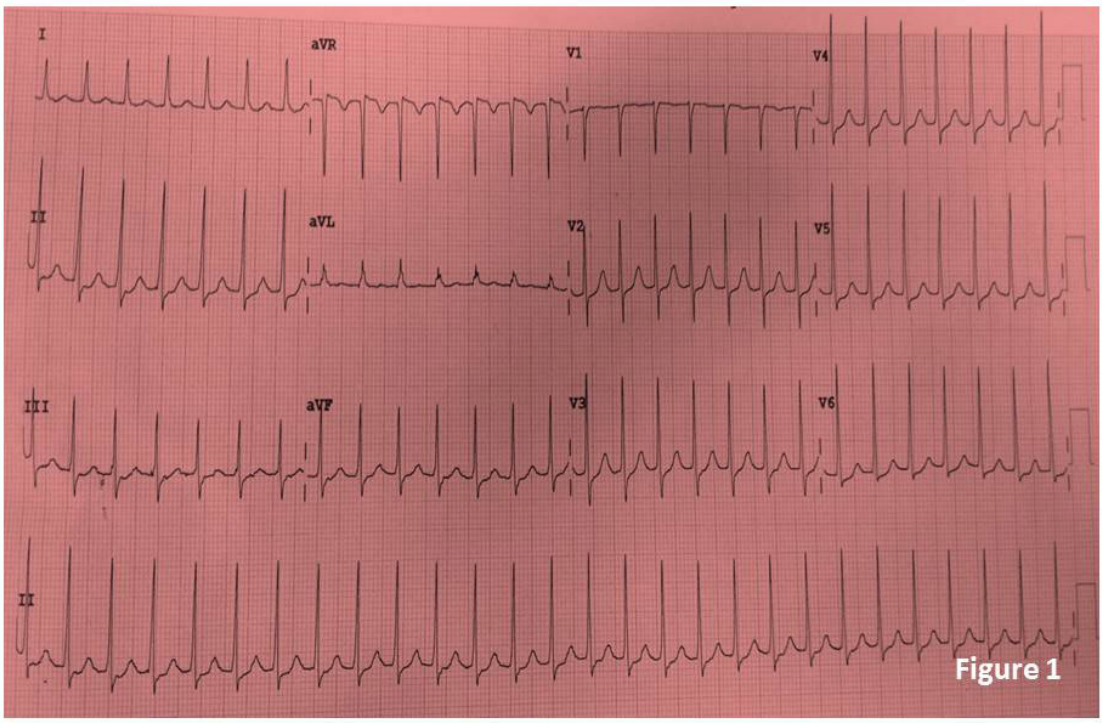

Figure 1

Abstract #: F-41

Managing Thrombocytopenia in a Jehovah's Witness Parturient

Presenting Author: Christina N Mack MD
Presenting Author's Institution: Brigham and Women's Hospital - Boston, MA
Co-Author: David L Hepner MD, MPH - Brigham and Women's Hospital - Boston, MA

Introduction: Chronic isolated macrothrombocytopenia (CIMT) is a heterogenous group of disorders resulting in giant platelets with varying degrees of platelet function (1). It can account for up to 13 percent of cases of thrombocytopenia in pregnancy.

Case Report: A 29 year-old G3P0 with CIMT presented for anesthesia consultation at 22 weeks gestation. At initial presentation her platelet count was 49 x 103 x μL-1. Review of her records showed a platelet count in the 30-50 x 103 x μL-1 range. She reported easy bruising but denied a history of spontaneously bleeding. The patient was offered the option of a platelet transfusion if she desired a neuraxial analgesic. She is a Jehovah's witness and initially refused transfusion of blood products. She was offered intravenous (IV) analgesics for labor pain.

She presented at 41 weeks' gestation for induction of labor at which time she expressed a wish to receive platelets in case of a life threatening event. A fentanyl patient-controlled analgesia (PCA) pump was started for labor analgesia: 15 microgram (mcg) bolus, 7 minute lockout, 1 hour maximum dose 180 mcg. The patient was comfortable for several hours, reporting a pain score ≤4/10. As her labor progressed the patient was more uncomfortable despite increasing her fentanyl PCA bolus dose to 20 mcg. Dexmedetomidine was added for additional pain relief starting with a bolus of 0.5 mcg/kg followed by an infusion rate at 0.2 mcg/kg/hr. Dexmedetomidine was titrated up to 0.6 mcg/kg/hr with prn boluses of 0.25 mcg/kg. Nevertheless, the patient continued to complain of severe pain despite being very sedated. The patient and her husband had a discussion regarding blood products since she desired epidural analgesia. They eventually consented to platelet transfusion. Following transfusion of 10 units of platelets, her platelet count increased from 38 to 58 x 103 x μL-1 to 72 x 103 x μL-1. An epidural was placed uneventfully and the patient was comfortable for the remainder of labor.

Discussion: This report demonstrates the dilemma of having a Jehovah's witness parturient with an uncommon form of thrombocytopenia desiring adequate analgesia during labor. A protocol of fentanyl and dexmedetomidine previously used in a parturient did not provide adequate analgesia for our patient (2). There is the ethical concern of receiving consent for transfusion of blood products from a Jehovah's witness parturient while in pain and sedated. There are reports of parturients being able to consent to an epidural while in pain and sedated but this may not necessarily extrapolate to a Jehovah's witness patient receiving a blood transfusion. In this particular case, relying on the patient's autonomy throughout the process proved to a sound decision as the patient and her husband were pleased with her outcome and anesthetic care.

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Abstract #: F-42

Maternal Infectious Morbidity and Antenatal Corticosteroid Therapy in Women with Preterm Premature Rupture of Membranes.

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Introduction: Preterm premature rupture of membranes (PPROM) precedes 25% of all preterm births, a leading cause of major perinatal morbidity and mortality.(1) Antenatal corticosteroids are integral to the clinical management of PPROM. However, it is unclear whether the risk of maternal chorioamnionitis is increased in women with PPROM who receive multiple courses of corticosteroids compared to women receiving a single corticosteroid course.(2) Among women with PPROM, we investigated whether a single corticosteroid course vs. repeat corticosteroid course influences the risk of maternal chorioamnionitis.

Methods: This is a secondary analysis from a multicenter trial in women at risk of preterm delivery who received antenatal magnesium sulphate versus placebo.(3) We identified a cohort of women with singleton pregnancies with PPROM between 24 and 31+6 weeks' gestation, and compared the risk of chorioamnionitis in women who received one course of antenatal steroids with those receiving a single repeat steroid course. For secondary analysis, we compared neonatal anthroprometric indices and morbidities (sepsis, RDS, NEC, IVH and NICU admission) in babies born to women receiving a single course vs. repeat steroid course. Chi-square test, Fisher's Exact test, Student's t-test and the Mann-Whitney U test were used for between group analyses, as appropriate. We used univariate and multiple logistic regression to assess the association between steroid courses and maternal chorioamnionitis; $P < 0.05$ as statistically significant.

Results: Within a cohort of 1652 women, 1507 women and 145 women received a single steroid course and a repeat steroid course respectively. The incidence of chorioamnionitis was similar among those who received a single and a repeat steroid course (12.3% vs. 11.0%; P=0.8). After adjustment for maternal and obstetric confounders, we observed no increased risk of chorioamnionitis in women receiving a repeat steroid course vs. a single steroid course (aOR = 1.18; 95% CI = 0.97-1.02) (Table). We observed no significant differences between the two groups for neonatal anthroprometric characteristics or morbidities.

Conclusion: Compared to women with PPROM who receive a single course of antenatal steroids, women who receive a repeat course of steroids may not be at increased risk of chorioamnionitis or adverse neonatal morbidity.

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Table. Univariate and Multivariate Analyses for Maternal Chorioamnionitis

	Univariate Analyses		Multivariate Analyses	
	OR (95% CI)	***P* value**	**aOR (95% CI)**	***P* value**
Number of steroid courses				
One	Ref		Ref	
Two	1.08 (0.63. 1.86)	.8	1.18 (0.67, 2.10)	.6
Maternal BMI[a]	0.99 (0.96, 1.00)	.2	1.0 (0.97, 1.02)	.5
Maternal age, y				
< 20	Ref		Ref	
20-33	0.89 (0.57, 1.40)	.6	0.78 (0.46, 1.32)	.3
≥ 34	0.66 (0.38, 1.14)	.1	0.63 (0.33, 1.17)	.1
Race				
Caucasian	Ref		Ref	
African-American	0.84 (0.60, 1.16)	.3	0.84 (0.59, 1.19)	.3
Hispanic	0.86 (0.55, 1.36)	.5	0.80 (0.49, 1.30)	.4
Gestational age at ROM[b]	1.10 (1.04, 1.16)	<.001	1.12 (1.06, 1.19)	<.001
Diabetes	0.66 (0.36, 1.23)	.2	0.59 (0.30, 1.14)	.1
Antibiotics administered	0.27 (0.06, 1.10)	.07	0.22 (0.05, 0.93)	.04
Pre-term labor	1.07 (0.70; 1.61)	.8	0.97 (0.63, 1.50)	.9

BMI = Body mass index; ROM = rupture of membranes.

[a] BMI was reported in 1,460 women

[b] Gestational Age at the Time of Rupture of Membranes reported in 1,607 women

Abstract #: F-43

Methods for Improving the Management of High Regional Block in Obstetrics

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Co-Author: Margaret Craig MD - UT Southwestern - Dallas, TX

Introduction: High spinal is a rare complication during labor epidural placement, with the reported incidence ranging from 0.006% (Jenkins 2005) to 0.02% (Crawford 1985). Though infrequent, the adverse effects have far-reaching consequences, harming both mother and fetus.

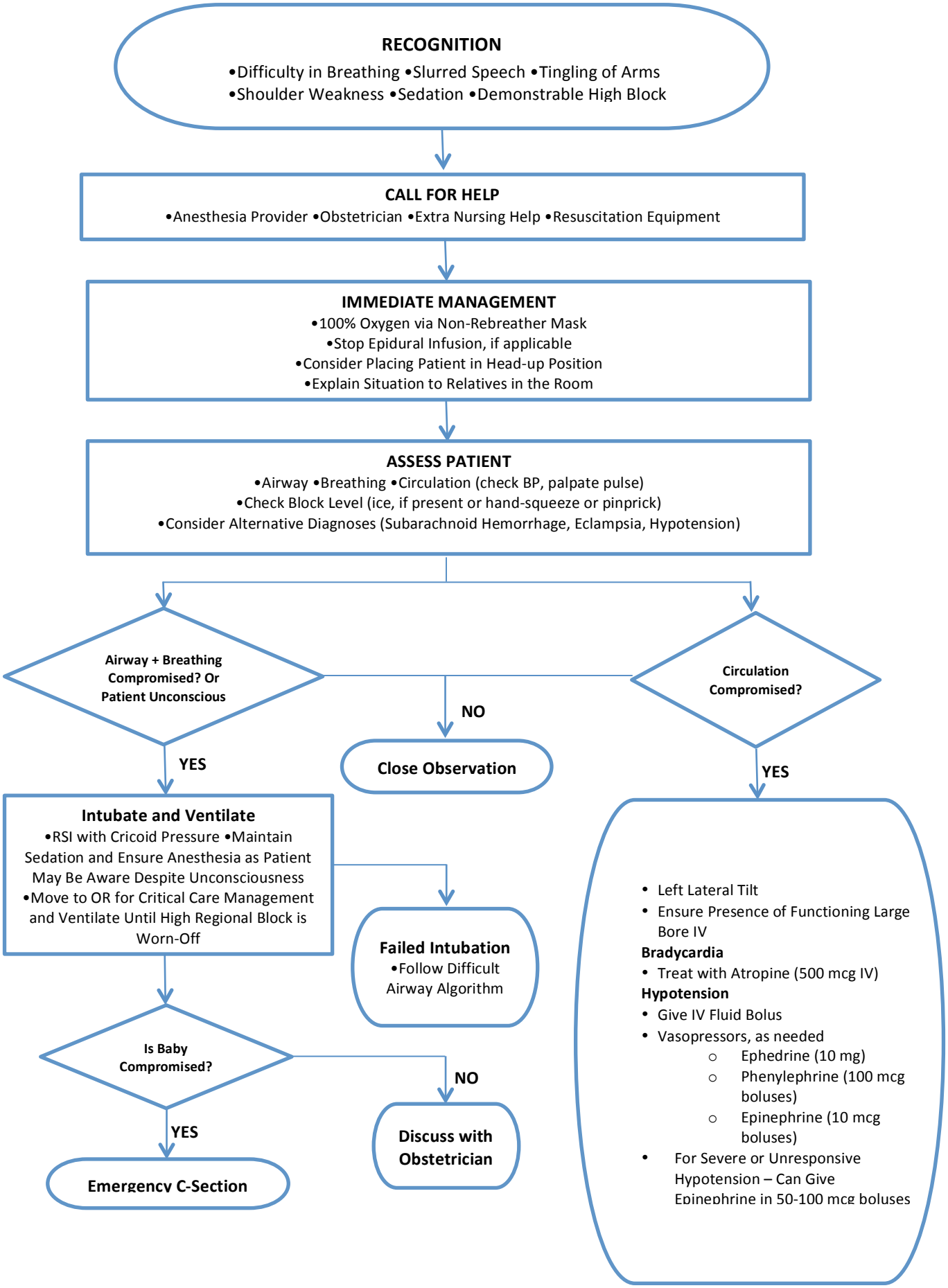
Case Description: A 24 y.o. G2P1 at 39 weeks gestation presents to L&D in early labor. On the first epidural attempt, the epidural space is located at 8 cm using a LOR to saline. Aspiration and test dose is negative. Upon removing the sterile drape, the epidural catheter is inadvertently removed, and thus, the resident attempts epidural placement again. Again, the epidural space is 8 cm in depth, and the catheter threads easily. A second test dose is negative (no change in HR, no paresthesias). The epidural catheter is bolused. Ten minutes later, the patient's BP is noted to be 10% below baseline, and a fluid bolus is started. Twenty minutes after the second test dose, anesthesia evaluates the patient who complains of breathlessness. The patient becomes less responsive and stops breathing. A high spinal is diagnosed. Intubation is performed at the bedside, bilateral breath sounds are auscultated, and fogging is noted in the ETT. No end-tidal carbon dioxide detector is available. Fetal HR in the 80's is noted. The patient is transferred to the OR for an emergent C-section. The baby weighs 3070 g with Apgars of 8 and 9. The patient is reintubated in the OR for persistent hypoxia and receives one round of ACLS with epinephrine for PEA. A post-op MRI is performed in the ICU to evaluate for ischemic encephalopathy.

Discussion: The first area of improvement would be to create a teaching algorithm to be displayed on epidural carts, which could be utilized in training residents.

In addition, the use of team-based training could be quite beneficial in such scenarios. Simulation has been shown to improved adverse outcomes by 37% in the obstetric population (Riley 2011). The nursing staff was not familiar with the location of airway supplies in the code blue cart. Succinylcholine was requested, but not available at the bedside. There was difficulty in locating the carbon dioxide detector. All of these incidents point to a common theme – the need for multi-disciplinary mock drills.

Conclusion: High spinal block is just one of several emergency situations. Learning algorithms and participating in mock code drills provide knowledge and practice in emergency situations.

MANAGEMENT OF A HIGH REGIONAL BLOCK IN OBSTETRICS



Abstract #: F-44

Mode of Anesthesia in Women undergoing Preterm Birth by Cesarean Delivery: An Epidemiologic Analysis

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Yair Blumenfeld MD - Stanford University School of Medicine - Stanford, CA

Introduction: Preterm birth (PTB), birth before 37 weeks' gestation, occurs in 11.5% of all U.S. births.(1) The rate of preterm cesarean delivery (CD) is higher than the rate of CD at term.(2) However there are limited data on mode of anesthesia and risk factors for general anesthesia for women undergoing preterm CD. Using the NIH-Maternal Fetal Medicine Unit (MFMU) Cesarean Registry, we performed an epidemiologic analysis of mode of anesthesia for preterm CD.

Methods: We performed a secondary analysis of the MFMU Cesarean Registry which contains data on 57,182 women who underwent CD at 19 academic centers between 1999-2002.(3) Inclusion criteria for the current study were women who underwent CD between 24+0 to 36+6 weeks' gestation. We calculated rates of GA and neuraxial anesthesia (NA). Using multivariate logistic regression, we identified risk factors for GA based on demographic, medical, obstetric, and intrapartum characteristics. Emergency CD was defined by the presence of at least one of the following conditions: placental abruption, cord prolapse, placenta previa with antenatal bleeding, uterine rupture, a non-reassuring fetal tracing, failed vacuum delivery, or failed forceps delivery.

Results: Our cohort comprised 50,090 women who underwent preterm CD. Rates (95% CI) of NA and GA were 82.4% (81.7%-83.1%) and 17.6% (16.9%-18.3%) respectively. The following characteristics were associated with an increased risk of GA: gestational age at delivery (aOR =0.88 per 1 week increase in gestational age), an emergency indication for CD (aOR=3.42), HELLP syndrome (aOR=2.72), African-American race (aOR=1.93), Hispanic ethnicity (aOR=1.5), and other races (aOR = 1.37) (Table). Among women who underwent emergency preterm CD, the following indications were more common in those who underwent GA vs. NA: placental abruption (6.3% vs. 1.2%), cord prolapse (5.2% vs. 0.4%), previa + antenatal bleeding (1.2% vs. 0.09%); $P<0.05$ respectively.

Conclusion: In this large retrospective cohort, nearly 1 in 5 women underwent GA at preterm CD and the adjusted risk of GA increased with decreasing gestational age. Further etiologic research is needed to investigate how gestational age at delivery influences the risk of GA among women undergoing preterm CD.
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Table. Risk for General Anesthesia in Women Undergoing Preterm Cesarean Delivery

Variables	aOR	95% Confidence Interval
Gestational Age at Delivery (per 1 week increment)	0.88	0.85 – 0.90
Maternal Age (y)		
<20	Referent gp.	
20-34	0.88	0.73 – 1.07
>34	0.95	0.76 – 1.20
BMI at delivery (n=865 missing)		
<25	Referent gp.	
25-29.9	0.91	0.77 – 1.07
≥30	0.81	0.69 – 0.95
Race:		
Caucasian	Referent gp.	
African-American	1.93	1.70 – 2.20
Hispanic	1.50	1.26 – 1.79
Other	1.37	1.04 – 1.82
Type of pregnancy:		
Singleton	Referent gp.	
Multiple gestation	0.79	0.66 – 0.95
Type of CD:		
Primary CD	Referent gp	
Repeat CD	0.76	0.67 – 0.86
Diabetes (n=3 missing data)	0.88	0.72 – 1.07
Hypertensive disease of pregnancy: (n=3 missing data)		
None	Referent gp.	
Gestational HBP	0.62	0.43 – 0.90
Pre-eclampsia	0.71	0.61 – 0.84
HELLP or eclampsia	2.72	2.13 – 3.48
Preterm labor[a] (n=2 missing data)	1.08	0.93 – 1.25
Labor or planned induction of labor	0.92	0.81 – 1.04
PPROM (n=2 missing data)	0.91	0.79 – 1.06
Birthweight		
1st quartile	Referent gp.	
2nd quartile	1.09	0.90 – 1.33
3rd quartile	1.06	0.83 – 1.37
4th quartile	0.89	0.66 – 1.18
Presentation at Delivery (n=36 missing data)		
Vertex	Referent gp.	
Breech	1.0	0.87 – 1.15
Other	1.26	0.95 – 1.66
Emergency indication for CD[b] (n=344 missing data)	3.42	3.02 – 3.88

[a] Refers to women who received tocolysis or hospitalization for preterm labor only.

[b] Emergency Cesarean delivery is defined by at least one of the following conditions or events: placental abruption, cord prolapse, placenta previa with antenatal bleeding, uterine rupture, a non-reassuring fetal tracing (coded as major indications for Cesarean delivery in the cesarean registry), failed vacuum delivery or failed forceps delivery.

Abstract #: F-45

Obstetric Anesthetic Management of a Parturient with an Acute ST Elevation Myocardial Infarction: A Case Report

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Acute myocardial infarction (AMI) is a rare occurrence during pregnancy which has been documented to occur in approximately 1 in 10,000 live births.1 Multiple etiologies have been recognized with the most common cause of AMI in this patient population being atherosclerosis with other notable causes including coronary artery thrombosis, coronary artery spasm, coronary artery dissection, vasculitis, collagen vascular disease, and pheochromoctyoma.2 Pregnancy has been noted to increase the risk of AMI 3- to 4-fold. Maternal age, maternal gravidity, stage of pregnancy, as well as progesterone-induced biochemical and structural changes have been identified as pregnancy-specific risk factors which cause an increased incidence of AMI in this population. The following case report presents a 28-year old parturient with acute onset chest pain and negative cardiac risk factors who was found to have an acute ST-elevation myocardial infarction (STEMI) in the 35th gestational week and the associated obstetric anesthetic management. Patient denied any previous past medical history and her past surgical history was only significant for a previous classical cesarean section in 2005. STAT EKG demonstrated diffuse ST-segment elevation in leads I, aVL, V2, and V3 consistent with an acute anterolateral myocardial infarction. Cardiac catheterization revealed an ostial 70 – 80% occlusion of the LAD, a 50 – 60% lesion of the mid LAD, and very high suspicion of spontaneous dissection extending from the ostial LAD to the distal LAD. Patient was subsequently medically managed per acute coronary syndrome (ACS) protocol. Cardiothoracic Surgery service was consulted and planned for a 2-vessel CABG after cesarean section. Patient was urgently delivered via repeat cesarean section secondary to labile blood pressures and irregular contractions. A General Anesthetic was chosen as the obstetric anesthetic regiment to allow for stricter control of the patient's hemodynamics. Apart from acute hemodynamic changes involved with direct laryngoscopy, the patient did extremely well intra-operatively post delivery of the healthy newborn as well as post-operatively. On Day 6 of admission, the patient subsequently had an uneventful CABG performed and was discharged 10 days after admission.

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Abstract #: F-46

Patient and Family Satisfaction Following Emergency Obstetric Crisis: Validity and Reliability of a Novel Questionnaire

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Background: Despite consistent standard of care, obstetric emergencies carry high morbidity and mortality and often cannot be predicted or averted. There is growing recognition and consensus that the rapid-response system concept is readily transferrable to inpatient obstetric care with significant expected benefit for maternal/fetal morbidity. In June of 2005, Magee-Women's Hospital of the University of Pittsburgh Medical Center was one of the first hospitals in the United States to implement such a system (Condition O) for emergent fetal and/or maternal conditions. Fetal and maternal emergencies that may trigger Condition O include postpartum hemorrhage, non-assuring fetal heart rate, abruption, shoulder dystocia, and emergency caesarian section. Increasingly, patient satisfaction questionnaires have been used as important indicators to support quality improvement in hospital settings. In our study, we wish to develop and assess the validity and reliability of the Patient and Family Satisfaction Questionnaire in obstetric crisis, as a proxy for quality of care and outcome measurement.

Methods: We modified a validated tool known as the Family Satisfaction in the Intensive Care Unit questionnaire (FS-ICU) in order to measure patient and family satisfaction following emergent obstetric crisis. A prospective study was performed examining 66 patients and 55 family members' completed questionnaires. Our version contains two different sections—the first segment, composed of 16 items, focuses on satisfaction with overall care and the second, composed of 10 items, assesses satisfaction with regard to medical decision-making. All questions employ Likert-5 response scales. During development, items were pretested for clarity and readability. The same scoring algorithm will be utilized to assess the modified version of the FS-ICU, given their similar constructs. Content and consensual validity were ensured by the manner of construction by an interdisciplinary panel including clinicians, MET responders, coordinators, as well as education specialists. Cronbach's alphas (α) were calculated to examine internal consistency reliability. The test-retest reliability of the instrument, as expressed by Pearson's r and intraclass correlation coefficient.

Results: Over 90 % of respondents had complete items for each of the sub- scales.The average overall satisfaction score was 94.2 ± 5.3. Internal consistency assessed by Cronbach's alpha was consistently high across the two contructs: $\alpha=0.932$ for the patient model and $\alpha=0.887$ for the family model. The test and retest values were highly correlated for both models: ($r = 0.78$, $p < 0.001$) with intraclass coefficient of 0.89 for the family model.

Conclusion: The Patient and Family Satisfaction Questionnaire in Obstetric Crisis is psychometrically sound with regards to measurement of satisfaction with care and medical decision-making of patients and families.

Abstract #: F-47

PCP and Preeclampsia in the Parturient: A Recipe for Intracranial Hemorrhage and Hemodynamic Instability

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Background: Intracranial hemorrhage (ICH) affects 4.3/100,000 pregnancies [1], with an increased risk in the setting of pre-eclampsia [2]. Phencyclidine (PCP) is also a known cause of hemorrhagic stroke, possibly due to its hypertensive effect [3] and by weakening the walls of cerebral arterial vasculature [4]. ICH can result in hemodynamic instability and complications for the parturient, especially in the peripartum period.

Case: We present a 39 year old morbidly obese G6P2 parturient at 33 weeks gestation transferred to our institution with a PMH of chronic hypertension, no prenatal care and a drug screen positive for PCP and benzodiazepines. The patient presented to the outside hospital with sudden-onset left-sided weakness, headache, and diplopia. Her blood pressure was 258/120, and labs confirmed a diagnosis of preeclampsia. CT of the head demonstrated an acute thalamic ICH, measuring 1.6 x 1.1cm. Anti-hypertensive and magnesium infusions were initiated and transfer to our hospital was requested. Our transport team noted repetitive late decelerations on the FHT, and immediate delivery was recommended. The transferring hospital refused to deliver the fetus, and, the patient was transferred to our institution. Upon arrival, the patient was also tachypneic, dyspneic, and could not lie flat. A radial arterial line was placed and an emergent caesarean delivery was performed under general anesthesia. Although induction of anesthesia and endotracheal intubation were uneventful, following delivery of the fetus, the patient developed prolonged hemodynamic instability with hypotension and bradycardia to the 30s, requiring boluses of epinephrine and a phenylephrine infusion. After a prolonged recovery, the patient was discharged to a rehabilitation facility on PPD 11 with improved neurologic function.

Discussion: The combination of preeclampsia and PCP use may create an increased risk of intracranial hemorrhage in the parturient. The emergent nature of the fetal delivery complicated the management of the patient's ICH which has sequelae of cardiac failure and hemodynamic lability. When caring for parturients with ICH in the peripartum period, providers should prepare for marked hemodynamic instability.

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Abstract #: F-48

Perioperative management of a parturient with severe preeclampsia, lymphangioleiomyomatosis, and respiratory failure on veno-venous extracorporeal membrane oxygenation (ECMO) undergoing cesarean section.

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Extracorporeal membrane oxygenation (ECMO) provides a bridge for oxygenation and ventilation for patients with cardiopulmonary failure. ECMO has been used in pregnancy to manage acute respiratory distress syndrome (ARDS) secondary to H1N1 influenza infection, with one case describing successful cesarean section (CS) performed while on ECMO (1,2). We describe the first case of a parturient with hypoxemic respiratory failure secondary to H1N1 influenza and lymphangioleiomyomatosis (LAM), requiring ECMO support, who underwent urgent CS for preeclampsia and HELLP syndrome. A healthy 37 year old G2P0010 parturient at 21 weeks gestation was admitted to an outside hospital for H1N1 pneumonia following 5 days of cough and fever. She developed severe ARDS, was intubated, and then transferred to our facility for further management. Chest CT demonstrated diffuse cystic changes consistent with lymphangioleiomyomatosis. Veno-venous ECMO was initiated on day 16 for refractory hypoxemia secondary to diffuse alveolar hemorrhage, but anticoagulation was withheld to prevent further bleeding. On hospital day 21, at 24 weeks 3 days gestation, the patient developed severe preeclampsia and HELLP syndrome and was taken to the operating room for urgent CS. Perioperative anesthetic management focused on mitigating the potential risks of disseminated intravascular coagulation (DIC), severe hemorrhage from surgical bleeding and uterine atony, and cardiovascular collapse from ECMO circuit thrombosis. A balanced anesthetic with isoflurane, fentanyl, and dexmedetomidine minimized the risk of iatrogenic uterine atony. Vascular cystic lesions consistent with LAM were noted within the myometrium during hysterotomy, and ongoing bleeding was noted from the hysterotomy site after repair. A full complement of blood products and uterotonics were administered for estimated loss of 25% of total blood volume; DIC did not develop. Adequate ECMO flow rates and oxygenation were maintained throughout the case. She remained intubated postoperatively and was successfully weaned from ECMO 3 days later. LAM is a rare estrogen-responsive systemic disease found primarily in women of childbearing age, characterized by abnormal smooth muscle proliferation and cystic destruction of the lungs, uterus, and other organs (3). Hormonal and immunosuppressive therapy may slow disease progression, but severe cases may require lung transplantation. The juxtaposition of hypoxemic respiratory failure with risk of massive hemorrhage and thrombosis encountered in this challenging case is of particular interest to the obstetric anesthesiologist.

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Abstract #: F-49

Post Partum Diagnosis of Pott Disease

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34 y.o. African female with IVF pregnancy was admitted at 23 wks gestation with suspected chronic abruption. Patient had a history of a positive skin tuberculin test but a negative chest Xray. Past surgical history was significant for a bilateral salpingectomy secondary to multiple tubo-ovarian abscesses. After one month of conservative management, at 27 weeks gestation, patient developed abrupt onset heavy vaginal bleeding. Fetal heart tracing showed minimal variability and occasional late decelerations. The decision was made to proceed with urgent cesarean delivery.

A CSE technique was performed utilizing a 17G epidural needle with a 26G spinal needle at the L3-L4 interspace. Standard sterile precautions were followed. Intrathecal injection of 1.4ml of 0.75% Bupivacaine, 15mcg of Fentanyl and 100mcg of PF Morphine provided a T4 anesthetic level 5 minutes after injection. A live female infant with Apgars of 6,7 was delivered and the procedure proceeded without any complications. On PPD3 patient complained of fevers. IV site was noted to be erythematous and indurated. Blood and Urine cultures were negative and patient was started on PO Cephalexin for probable cellulitis. After 48 hrs afebrile, patient was discharged. One week after discharge, patient was seen in clinic and reported fevers, once again. Antibiotics were continued to treat a probable endometritis.

On PPD#33, patient presents to the ER complaining of generalized malaise and high fevers. CT scan depicted an inflammatory reaction encompassing the L1-L2 vertebrae with adjacent psoas muscle abscess. Patient was admitted to the medicine service, PICC line placed and broad-spectrum antibiotics started for suspected osteomyelitis. The case was referred to the OB Anesthesia service as a possible complication from the neuraxial procedure performed at the time of delivery. After much deliberation, the patient agreed to a CT guided drainage of the Psoas muscle abscess but declined a vertebral bone biopsy. Analysis of the aspirate isolated genetic material of M. Tuberculosis. In light of these findings, the L1-L2 vertebral osteitis and diskitis were taught to result from chronic tuberculous disseminated disease and not, as initially assumed, the CSE. Patient was started on aggressive therapy with Izoniazid, Rifampin, Pyrizinamide and Ethambutol.

Pott disease has been highlighted in the past after placement of an epidural catheter in an obstetrical patient (1,2). Because of the temporal relation with the neuraxial procedure, these cases continue to be initially misdiagnosed as osteomyelitis arising from seeded skin bacteria such as Staph Aureus. When presented with a patient whose symptoms are insidious, especially in areas with large immigrant populations, providers should consider Pott Disease in their approach when managing possible infectious complications of neuraxial procedures.

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Abstract #: F-50

Postdural puncture headache complicated by intracranial hemorrhage

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MM, a 38 yo G7 P5 Hispanic female @ 36 4/7 wks gestation, no significant medical history, presented to the obstetrical unit in early labor. Patient was augmented with oxytocin and requested an epidural for pain relief. A CLEA was placed, but complicated by an accidental dural puncture. Pt had an uneventful SVD.

Postpartum day (PPD) #2, the patient began to complain of a frontal headache (HA), 2-10/10 VAS that was positional. Exam revealed patient was normotensive, bradycardic in the 60's (on admission: 75 BPM), and no focal neurological deficits. Evaluated by anesthesia service with recommendations for IV hydration, caffeine, and ibuprofen for pain. On PPD #3, her headache persisted and now involved the occiput. Again, no neurological deficits appreciated, normotensive, and bradycardic. Options were discussed with patient and she opted for an epidural blood patch. Early afternoon on PPD # 3, obstetrical team was notified of BP, 160/78; PIH labs were ordered. Thirty minutes later, obstetrical team was paged for a heart rate of 50 and the patient complained of neck pain in addition to HA. Patient was transferred to extended care unit for further management. This was not communicated to the anesthesia service.

Anesthesia service proceeded with an uneventful epidural blood patch of 23 mL with immediate relief of HA. Within 10 minutes, patient complained of severe right-sided face and neck pain. On exam per OB team, she was noted to have hives over her chest, Benadryl was ordered. Ten minutes later, the anesthesia service was called emergently to evaluate. Pt continued to c/o severe pain over the face and neck, BP was noted to be elevated, 160/90, and pulse 50 BPM. IV fluids, morphine, stat PIH labs, and stat CT of the head was ordered. Over the next two hours, patient remained hypertensive and bradycardic, treated with hydralazine per OB team; had a progressive decline in mental status to unresponsiveness, emesis, increased urine output, and right-sided facial droop. CT scan revealed a large left frontal intracerebral hemorrhage with involvement/compression of the motor strip and Broca's area (3 cm x 4 cm x 5 cm) with a 4 mm midline shift. Neurosurgery was consulted and patient transferred to the ICU. The following morning, PPD #4, patient's neurological exam worsened, she was emergently intubated, and taken to the OR for an emergent craniectomy. Five-hundred (500 mL) of blood was evacuated. On POD #6 patient was transferred to the impatient stroke rehab unit and discharged home on POD #57. Eight months later, patient was discharged from physical therapy after meeting goals, independently performs ADLs, but remains with RUE weakness and speech deficits.

Hemorrhagic strokes are rare in obstetrical patients. However, this case highlights that despite a "classic" presentation of a disease, other pathologies may co-exist. Proper communication may have allowed this patient to be diagnosed earlier with immediate intervention.

Abstract #: F-51

Qualitative analysis of parturients' preferences for information on neuraxial analgesia

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Introduction: Hispanic and African-American patients are less likely than white patients to anticipate and use neuraxial labor analgesia. Previous work has demonstrated that Hispanic patients may have increased misunderstandings of the risk of neuraxial analgesia than non-Hispanic white women. The objective of this qualitative study was to evaluate the sources of information used by patients, the content of antepartum analgesic counseling, and patients' preferences for analgesic counseling in a racial/ethnically diverse group of women.

Methods: An expert panel developed a semi-structured interview guide. Using stratified purposeful sampling; white, Hispanic, and African-American women were interviewed on postpartum day 1. Interviews were conducted in English and Spanish. Interviews were conducted until thematic saturation was achieved. Transcripts were transcribed verbatim. Responses were analyzed using content analysis. Two Spanish-speaking obstetric anesthesiologists developed an initial coding scheme, and the coding schemes were compared. A final coding scheme was developed and applied to all transcripts. Inter-rater reliability was 100%. Descriptive statistics were used to characterize counts and percentages.

Results: A total of 45 participants were interviewed. There were 15 white, 15 Hispanic, and 15 African-American women in the study.

The two most commonly used antepartum sources of information were obstetric providers and the Internet. Thirty-five of the 45 women had an antepartum discussion with their obstetric provider about analgesic options. Analgesic choices were discussed with 20 women, neuraxial analgesia alone was discussed with 9, and 6 women were only asked about their analgesic plans without any further discussion. These discussions occurred mostly in the 2nd and 3rd trimester of pregnancy. White women were the most likely to use the Internet as a source of information (47%), followed by African-American (34%), and Hispanic (19%) women.

All of the women were seen by an anesthesiologist intrapartum, yet this was not ideal for several patients. One patient stated, "When I was having the contractions and they were going over the side effects, I mean I was definitely listening… but you just kinda don't care at that point."

Thirty-three of the 45 women stated that they ideally would want counseling on analgesic options from their obstetrician, either in the 2nd or 3rd trimester (75% of respondents).

Conclusions: Our results indicate that patients receive and prefer to be counseled about labor analgesia by their obstetric providers before the onset of labor. Future work should evaluate obstetric provider knowledge and comfort with analgesic counseling.

Funding: RWJF 69779

Abstract #: F-52

Science or Fiction: Do Barometric Pressure Changes Really Affect Initiation of Labor?

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Background: A common belief is that more babies are born during storms; this is supported by the anecdotal experiences of clinicians working on Labor and Delivery units. If changes in barometric pressure (BP) can indeed initiate labor, the phenomenon could have significant implications for staffing levels on delivery units. The objective of this study was to determine if either the absolute or change in BP affects the initiation of labor and the number of spontaneous deliveries.

Methods: With IRB approval, the number of daily deliveries from 2008-2010 was obtained from Brigham and Women's Hospital. Scheduled cesarean deliveries and inductions were excluded for this analysis. Hourly BP data for the same time period, measured at Logan International Airport in Boston (which is approximately 7.6 kilometers from the hospital), was obtained from the National Climatic Data Center database (http://cdo.ncdc.noaa.gov/qclcd/QCLCD?prior=N). For each day during the study period, the mean BP (measured in inches Hg) was calculated, as well as the magnitude of BP change during the course of that day. The ranges of daily mean BPs, and of daily upward or downward trends were divided into quartiles. The mean number of daily births in each quartile of BPs and change in BP were calculated. ANOVA tests were used to statistically evaluate these associations. A $p<0.01$ was considered significant to account for multiple comparisons.

Results: During the study period, daily mean BPs ranged from 29.01 to 30.62. The mean number of daily births (±SE) for each BP quartile (from low to high) were (1)10.75±0.20, (2)11.05±0.20, (3)11.04±0.22, (4)10.80±0.20; difference between groups $p=0.627$. For days with an upward trend in BPs, within-day fluctuations in BPs ranged from 0.05-1.00. Births for each quartile were (1)11.48±0.39, (2)10.80±0.33, (3)10.19±0.32, (4)10.31±0.33; difference between groups $p=0.042$. For days with a downward trend in BPs, the fluctuation range was 0.05-1.10. Births for each quartile were (1)10.99±0.36, (2)10.82±0.40, (3)11.00±0.31, (4)11.45±0.34; difference between groups $p=0.617$.

Discussion: There were no significant correlations between average BP or changes in BP and unscheduled births. Neither absolute BP nor change in BP appears to act as a trigger for spontaneous labor.

Abstract #: F-53

Seizure during epidural blood patch

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Introduction: Seizures caused by an epidural blood patch are extremely rare and can be a sign of an additional underlying diagnosis. We report a patient with a suspected post dural puncture headache (PDPH) who had a tonic clonic seizure during an epidural blood patch.

Case Report: A 28 year old G1P0 had an emergency lower segment caesarean section, following failed instrumental delivery, under spinal anaesthetic with 12.5mg hyperbaric bupivicaine and 300 micrograms diamorphine. She had no complaints on post operative anaesthetic follow up and was discharged on day 2. She returned on day 10 with a postural headache that had worsened over the preceding 5 days and not responded to simple analgesia. She also had photophobia and neck stiffness. Neurological examination was normal. A diagnosis of PDPH was made. The following day she underwent an epidural blood patch with 20ml of autologous blood in the left lateral position. On completion of the procedure she complained of a "fullness" in her right ear and immediately had a tonic clonic seizure which was treated with airway support and 100mg thiopentone. The seizure resolved rapidly and her GCS returned to normal after 30 minutes. She had residual left face and limb weakness. The CT scan (see figure) revealed a right frontal lobe lesion with 15mm midline shift and early hydrocephalus. She subsequently had debulking of a grade 4 glioblastoma multiforme and is having ongoing chemotherapy. Her neurological symptoms have recovered but she continues to have headaches.

Discussion: This is a late presentation for PDPH where symptoms present typically much earlier. In one large series all post dural puncture headaches presented within 72 hours. Late presentation of PDPH may warrant radiological imaging prior to epidural blood patch, to exclude other pathology. There are several case reports of seizures as a consequence of PDPH in the absence of other causes. Cases described where a seizure occurred during the epidural blood patch are rare and in all of these cases the first and only seizure occurred during the procedure. Often another diagnosis was later made.

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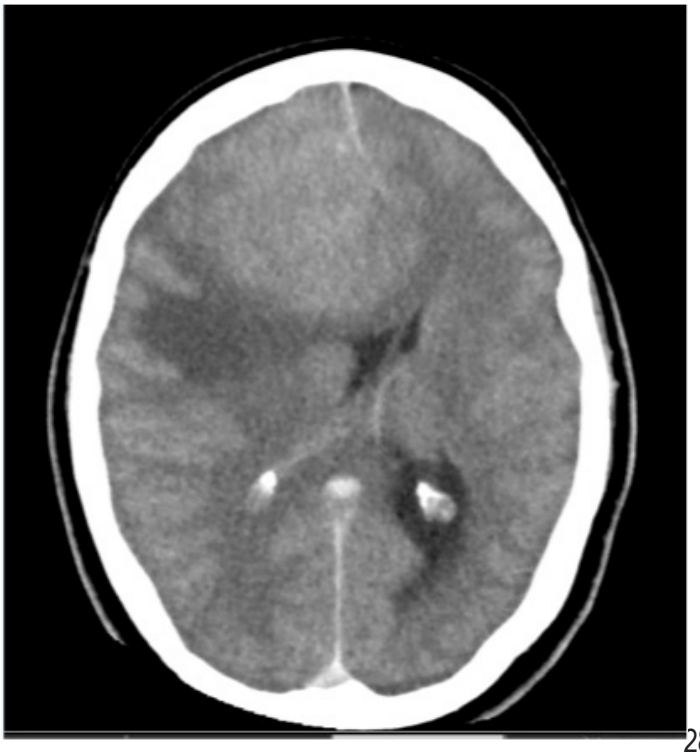

Abstract #: F-54

Severe Mitral Regurgitation with Decompensated Heart Failure Due to Preeclampsia

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Introduction: Though mitral regurgitation (MR) is often well tolerated by the parturient, because of the decreased afterload and mild tachycardia of pregnancy, this is not always the case. We discuss a parturient with severe MR who had tolerated two previous term deliveries but presented with decompensated heart failure in the setting of increased afterload due to preeclampsia.

Case: A 39-year-old G4P2 Honduran female with two previously uncomplicated term deliveries presented at 39 weeks gestation with two weeks of increasing dyspnea, an oxygen requirement, and pulmonary edema on chest x-ray. Echocardiogram demonstrated severe MR consistent with pre-existing rheumatic heart disease and a dilated left atrium. She was also diagnosed with preeclampsia. She was admitted to a cardiac unit for diuresis and fetal monitoring. She failed to improve and, overnight, a Caesarean section was performed under neuraxial anesthesia with arterial and central lines. During autotransfusion, central venous pressures rose, systemic pressures fell and she endorsed worsening dyspnea. She was stabilized with further diuresis, CPAP and norepinephrine and admitted to an ICU for post-operative monitoring. The remainder of her hospital course was uncomplicated, and she underwent uneventful mitral valve replacement 5 months post-partum.

Discussion: Management goals for the parturient with severe MR include decreasing afterload to maintain forward flow, maintaining moderate tachycardia to decrease time for backflow, avoiding myocardial depressants, and maintaining sinus rhythm (1,2,3,4). Neuraxial techniques decrease afterload and support forward flow (1,2,3,5). "Autotransfusion" from placental contraction may cause decompensation due to acute fluid overload. It may also lead to increase atrial stretch and arrhythmia, which should be treated with immediate cardioversion. This may be managed with preemptive diuresis and respiratory support (e.g., CPAP) (6).

This patient presented with a chronic lesion, as evidenced by the atrial dilation and echocardiographic features consistent with rheumatic heart disease. However, her dyspnea, pulmonary edema, and previously uncomplicated deliveries suggested an acute process. We hypothesize that increased afterload and increased pulmonary capillary permeability due to preeclampsia (which was not present in previous pregnancies) was the precipitant factor for her decompensated heart failure during this pregnancy. Preeclampsia has not previously been described as a precipitant cause of decompensated heart failure in the parturient with severe MR.

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Abstract #: F-55

Sleep quality before elective cesarean delivery is not associated with postoperative pain

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Background: Sleep quality is negatively associated with depression, pain tolerance and chronic pain (1-3). The Pittsburgh sleep quality index (PSQI) questionnaire is a validated tool that evaluates sleep characteristics on a scale from 0 to 21, with a score above 5 consistent with bad sleep (4). In a recent study, PSQI was in the order of 7±3 in nulliparous women evaluated in late 3rd trimester (5). To our knowledge, sleep quality has not been investigated in the context of post-cesarean pain. We designed a prospective observational study in women scheduled for cesarean delivery to investigate whether sleep quality influences acute postoperative pain.

Methods: 133 women scheduled for a cesarean delivery with a standardized spinal anesthetic (bupivacaine 12mg, fentanyl 20mcg, morphine 100mg) were enrolled. PSQI was recorded preoperativlely (19 items generating 7 composite scores; sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medications and daytime dysfunction). Outcome measures included: average and peak pain at rest, upon movement and uterine cramping during the first 24h (numerical rating scale; 0-100). Statistical analysis included t-test for equality of means ($p<0.05$). Pearson correlation coefficients were calculated to assess the association between PSQI and postoperative pain.

Results: The average PSQI in our cohort was 8.2 ± 4.0, and 39 women had a PSQI >5 (Table). There was no association between PSQI score and postoperative pain (Table). Pearson correlation coefficients were also not statistically significant for any of the postoperative pain measures.

Conclusions: Based on previously established criteria, we found that 70% of women were 'poor sleepers', however this does not seem to influence acute post-cesarean pain. This finding is somewhat contrary to our expectation, and further evaluation may be needed to identify whether other parameters such as anxiety or chronic sleep deprivation impact more significantly acute post-cesarean pain.

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Table. Demographics and pain outcomes during the first 24h according to PSQI score

	PSQI ≤ 5 (n=39)	PSQI > 5 (n=94)	P value
Age (years)	33.5 ± 4.5	34.3 ± 4.0	0.33
Weight (kg)	76.9 ± 14.6	81.6± 15.4	0.11
Nulliparous women (%)	15.4 %	11.7 %	0.57
Peak pain at rest (0-100)	13.3 ± 18.0	14.6 ± 21.0	0.75
Peak pain with movement (0-100)	31.6 ± 25.3	38.9 ± 27.7	0.16
Peak uterine cramping (0-100)	21.3 ± 23.2	27.2 ± 30.6	0.28
Average pain at rest (0-100)	5.1 ± 11.0	6.8 ± 14.5	0.52
Average pain with movement (0-100)	16.7 ± 19,3	20.9 ± 24.7	0.35
Average uterine cramping (0-100)	9.2 ± 17.9	11.5 ± 20.6	0.55

Data presented as mean ± standard deviation
Mean pain scores recorded on a verbal scale from 0-100 (0=no pain, 100=worst pain imaginable)

Abstract #: F-56

Status of Obstetric Anesthesiology Fellowship Research Education in North America: A Survey of Fellowship Program Directors

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Introduction: Very little information is known regarding the research education of obstetric anesthesia fellows. The main objective of the current investigation was to evaluate the status of research training in obstetric anesthesia fellowship programs in North America.

Methods: Survey responses were solicited from 46 obstetric anesthesia fellowship directors in the United States and Canada. The list of fellowship program directors was obtained from the SOAP website and those who attended fellowship directors meeting at the 2013 SOAP meeting. Questions evaluated department demographic information, faculty research activity, departmental research resources and funding, the characteristics of fellow research education and fellow research productivity, departmental support for fellow research, and perceived barriers to fellow research education.

Results: Thirty-six of 46 fellowship directors (78%) responded to the survey. Seventeen of the responding programs are ACGME accredited (47%). Fifty-three percent of programs provide a structured research curriculum for obstetric anesthesia fellows. Fellows in programs with a structured research curriculum spend an average of 2.26 (SD 1.28) months pursuing research compared with 2.81 (SD=1.64) months for fellows in programs lacking a structured research curriculum (P=0.28). Over the past two years, fellowship programs utilizing a structured curriculum published a mean of 3.2 (SD 2.6) manuscripts in a peer-reviewed journal with a fellow as any author compared with 3 (SD 2.4) manuscripts in programs that did not have a structured curriculum (P=0.89). While many program directors disagreed (10 out of 36 (28%)) or were neutral (11 out of 36 (30%)) in response to the statement that "upon graduation fellows are adequately trained to pursue research activities," only a minority of program directors (3 out of 36 (8%)) thought an extra year of fellowship dedicated to research should become a requirement. Twenty-eight of 36 program directors (78%) agreed that research activity should be required for graduation from obstetric anesthesia fellowship. Important barriers to fellows' research education identified by the fellowship directors included high clinical demands, lack of funding and technical support as well as lack of research time for faculty.

Conclusion: A structured research curriculum is not associated with increased dedicated research time or improved research productivity in obstetric anesthesia fellowship programs. Current ACGME accreditation for obstetric anesthesia fellowship mandates 3 months of dedicated research time and a formal research curriculum. A future study should examine if, over time, these requirements are associated with increased fellow research productivity.

Abstract #: F-57

Successful use of Thromboelastography (TEG) as point of care for epidural analgesia in a parturient with single Ventricle (s/p Fontan repair); with platelet count is 76000 and severe scoliosis corrected with Harrington rod from T6-L3

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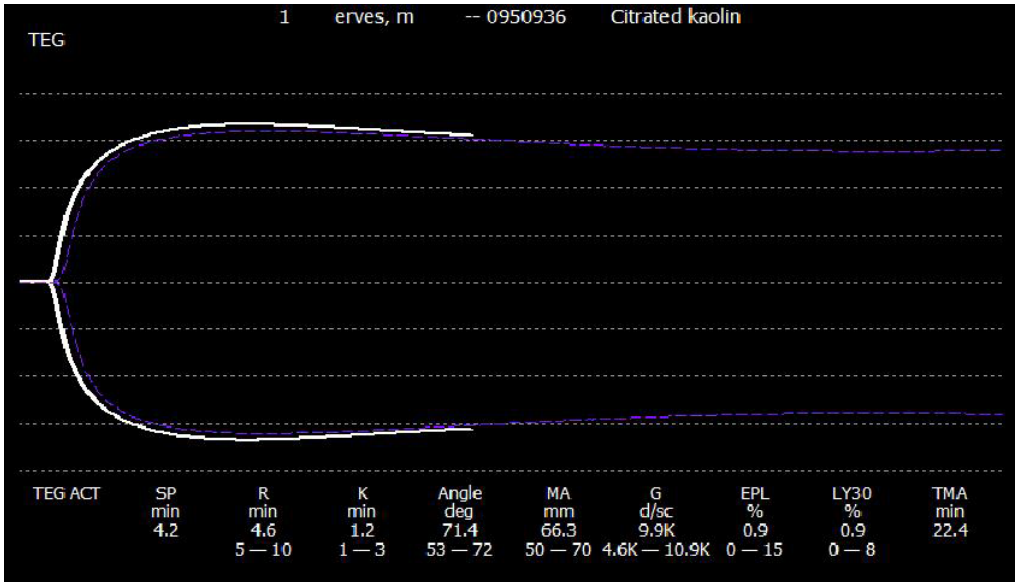
Introduction: Parturients with single ventricle physiology presents unique challenges to the anesthesiologist (1). It can be complicated by other medical conditions such as severe thrombocytopenia and corrected scoliosis with Harrington rod placement. We present successful use of labor epidural analgesia in a parturient with single ventricle s/p Fontan repair; with platelet count of 76000 and severe scoliosis corrected with Harrington rod at T6-L3 level, using Thromboelastography (TEG) as point of care. TEG proved to be an invaluable tool in the anesthetic management of this high risk patient.

Case Report: A 21-year-old G1 parturient at 39 1/7 weeks gestation with past history s/p Fontan repair for congenital dextrocardia with hypoplastic left heart and mitral valve atresia and severe scoliosis corrected with Harrington rod placement admitted for vaginal delivery in consultation with cardiologist. On admission patient's platelet count was 85000 and on arrival to the L&D suite platelet count had decreased further to 76000. TEG was done which showed normal platelet function and coagulation status. Given the patient's cardiac condition, we decided to proceed with epidural for labor analgesia; continuous spinal catheter if epidural failed. After reviewing the patient's previous spine radiograph, epidural was successfully placed at the L4/L5 level. Following the negative test dose, epidural infusion started with 0.1% ropivicaine with 2mcg/ml of fentanyl at 10cc/hr with good pain relief. Approximately 24 hrs after the induction labor, she had a vacuum assisted vaginal delivery of a live male infant with 9/9 APGAR scores and discharged home in stable condition.

Discussion: Parturients presenting for labor with single ventricle is rare. Managing these patients required a multidisciplinary team approach and understanding the patient's single ventricle physiology is of utmost importance. Our plan to proceed with labor epidural analgesia was clouded by the patient's previous back surgery and more acutely by new onset thrombocytopenia. This complex patient was successfully managed with epidural analgesia utilizing TEG as point of care.

Conclusion: TEG is an indispensable tool when considering neuraxial block for peripartum anesthetic management in these high risk obstetric patients.



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Abstract #: F-58

Technical Case Report: Continuous ultrasound guided spinal placement in a patient with severe scoliosis

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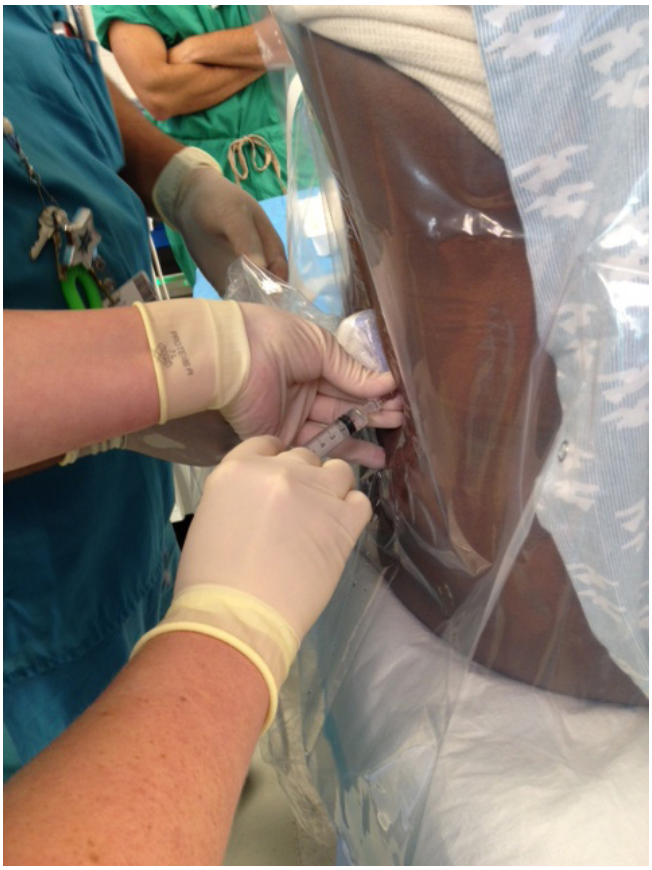
Ultrasound guidance (USG) may increase accuracy of neuraxial anesthesia (NA) placement in patients with anatomical challenges such as morbid obesity and scoliosis. In scoliosis, vertebral bodies rotate toward the convex side of the curve resulting in deviation of the epidural space toward the convexity and larger interlaminar spaces on that side. Failed or inadequate blocks are more common and visualization is difficult. A direct path to the epidural space exists on the convex side using a paramedian approach. Capturing bony and soft tissue landmarks using continuous US facilitates accurate paramedian needle trajectory. Where static USG may give information on depth of structures and confirm vertebral levels, continuous real-time US imaging may enhance accuracy.



We used continuous real-time USG in a parturient with a severe 63˚ thoracic dextroscoliotic curve (compensatory lumbar levocurvature) to place a spinal for C/S. Basic US techniques, landmarks, and pitfalls are described for transverse midline, paramedian oblique and paramedian longitudinal approaches. We explain these US views and highlight the differences between our severely scoliotic parturient and a normal spine. These views can complement each other, allowing identification of the optimal level, angle of placement, and distance from skin to epidural space. Despite significant anatomical variations in our patient, many landmarks were still obtainable.

Continuous real-time imaging of anatomy during placement of NA may be a practical way to increase success rates in parturients with scoliosis. This population has a higher incidence of operative delivery and compromised pulmonary function, placing them at further risk of morbidity if GA becomes necessary.

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Abstract #: F-59

The birth partner: Surveying their experience and assessing their anxiety.

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Introduction: There is evidence that the birth partner's anxiety has a role in the level of pain and anxiety experienced by the mother during cesarean delivery (1). Our survey aims are to evaluate the information given to the birth partner before cesarean delivery, examine their experience during the procedure and assess their level of anxiety. To assess severity of anxiety we utilised the Beck Anxiety Inventory (BAI), a 21-question multiple-choice self-reported questionnaire(2). The BAI identifies the cognitive and somatic components of anxiety.

Methods: Identical questionnaires were completed by birth partners on the postnatal ward following their partner's cesarean delivery. The first part of the questionnaire is summarised in the table. From the birth partners BAI responses their level of anxiety was graded minimal, mild, moderate and severe.

Results: Twenty-five questionnaires were completed. 19/25 of the respondents were husband/partners whilst 6/25 were a family member or friend. The majority of the partner's anxiety (15/25) were graded at mild, 6/25 minimal and 4/25 moderate. There were no respondents who graded at severe anxiety. Chi square test was performed to compare the anesthetic pre-op attender group to the non-attender group. $P < 0.05$ was defined as significant. 44% of non-attenders suffered moderate anxiety whilst no one in the attender group experienced moderate anxiety ($P = 0.0036$)

Discussion: Our survey demonstrates that attending a cesarean delivery as a birth partner is an anxious experience. 76% (19/25) of our birth partners graded their anxiety mild/moderate. Only just over half of the birth partners were present at the surgical and anesthetic pre-operative discussions. It was noted that the four birth partners that rated their anxiety as moderate did not attend either of the pre-operative discussions and did not feel they were given adequate information.
However, during the procedure the majority of partners felt well supported, were given adequate explanation of events and felt included in the delivery. This survey highlights the importance of providing information to the birth partner before the procedure.

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	Positive responses (yes)
Birth Partner present at anesthetic pre-op discussion?	64% (16/25)
Felt they were given adequate anesthetic information?	72% (18/25)
Birth Partner present at surgical pre-op discussion?	56% (14/25)
Felt they were given adequate surgical information?	76% (19/25)
Adequate explanation during delivery?	88% (22/25)
Felt supported during delivery?	96% (24/25)
Felt included in delivery?	80% (20/25)
Felt unwell in theatre?	24% (6/25)

Abstract #: F-60

The clinical outcomes following the introduction of an emergency cascade bleep system for emergency cesarean sections

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Introduction: A single cascade bleep system was introduced at University College London Hospital (UCLH) in November 2012 to inform all team members simultaneously that an emergency cesarean delivery (CD) was about to occur. Prior to this, all team members had to be contacted individually by the labor ward coordinator. A senior anesthesiologist would only attend the CD if specifically called by the anesthetic resident on labor ward. We wanted to review the clinical outcomes for staffing and fetal wellbeing following the introduction of the bleep.

Methods: A 22 month (11 month pre bleep and 11 month post bleep introduction) retrospective review of women undergoing emergency CD under general anesthesia (GA) was performed. Information collected included the grade of the most senior anesthesiologist present, decision to delivery interval (DDI) according to national audit standards (1) and umbilical cord gases. We excluded any failed spinals and epidural top ups as these themselves would delay the DDI, and also any parturients given a primary regional technique as the true urgency of the CD may be called into question. Statistical analysis included Mann-Whitney U and Student t tests.

Results: 51 cases were identified and analysed. There was a significant increase in the attendance of senior anesthsiologists after the introduction of the bleep (P=0.014), especially out of hours. Although there was a non significant reduction in the DDI, there was a significant improvement in umbilical artery (UA) pH.

Conclusions: We believe that the single emergency cascade bleep system produced a better co-ordinated response to emergency CD. This led to a modest reduction in DDI, and perhaps the significant improvement in the UApH. Improved communication amongst the multidisciplinary team members secondary to the bleep system resulted in more senior anesthesiologists being present without the need to call them separately. This senior experience may have contributed to the reduction in DDI and improved fetal outcomes. The impact of other confounding factors such as changes in obstetric practices and the presence of an obstetric attending was not analysed in this study.

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	Pre-Bleep (n=24)	Post-Bleep (n=27)	
DDI (min)	19[15.25-23.5]	18[15-21]	*P*=0.65
UApH	7.08+/-0.12	7.20+/-0.08	*P*=0.001
UABE	-9.02+/-5.08	-6.18+/-2.68	*P*=0.06
UVpH	7.18+/-0.13	7.22+/-0.08	*P*=0.22
UVBE	-7.77+/-5.25	-5.98+/-3.36	*P*=0.24

Data are mean +/- SD, except DDI which is median and [IQR].
UV = umbilical vein, BE = base excess

Abstract #: F-61

The effect of ondansetron on cardiac output in elective cesarean deliveries under spinal anesthesia: A randomized controlled trial

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Background: Maintenance of cardiac output (CO) is essential to ensuring adequate placental perfusion prior to delivery. A drop in cardiac preload, secondary to sympathetic block, may trigger the Bezold-Jarisch reflex (BJR) increasing maternal hypotension and bradycardia (1,2). As serotonin antagonists (e.g. ondansetron) can attenuate the BJR (3,4), we hypothesized that pre-spinal administration of ondansetron would maintain or increase maternal CO relative to placebo in elective cesarean delivery (CD) under spinal anesthesia.

Methods: Following informed consent, 52 women having an elective CD under spinal anesthesia were enrolled in this randomized, blinded, placebo controlled trial. Subjects were randomized to receive either 4mg of IV ondansetron or placebo five minutes prior to spinal anesthesia. The spinal anesthetic dose, intravenous fluids, prophylactic phenylephrine infusion, and additional vasopressor administration were standardized. CO data was acquired using the Non-Invasive Cardiac Output Monitor (NICOM®, Cheetah Medical, Vancouver, WA). The primary outcome was the maximum change in CO from baseline following spinal anesthesia until uterine incision, expressed as change in L/min and %. Secondary outcomes included maternal hemodynamic changes, phenylephrine dosage, phenylephrine side effects, umbilical cord gases, and Apgar scores.

Results: There was no significant difference between the groups with respect to the primary outcome measure (Figure). The mean (SD) maximum change in CO in the ondansetron group was -2.05 (1.43) versus -1.92 (1.41) in the placebo group ($p = 0.74$). The mean (SD) maximum percentage change in CO in the ondansetron and placebo groups was 28.2 (18) and 28.4 (20.0) respectively ($p = 0.97$). The total dosage of phenylephrine administered was similar between groups. There were no significant differences in fetal outcomes or the other secondary outcomes.

Conclusion: Administration of ondansetron 4mg IV prior to spinal anesthesia for elective CD conferred no advantage over placebo in mitigating the maximum decrease in CO. Future research directions may include examining varying doses of ondansetron or alternative serotonin antagonists.

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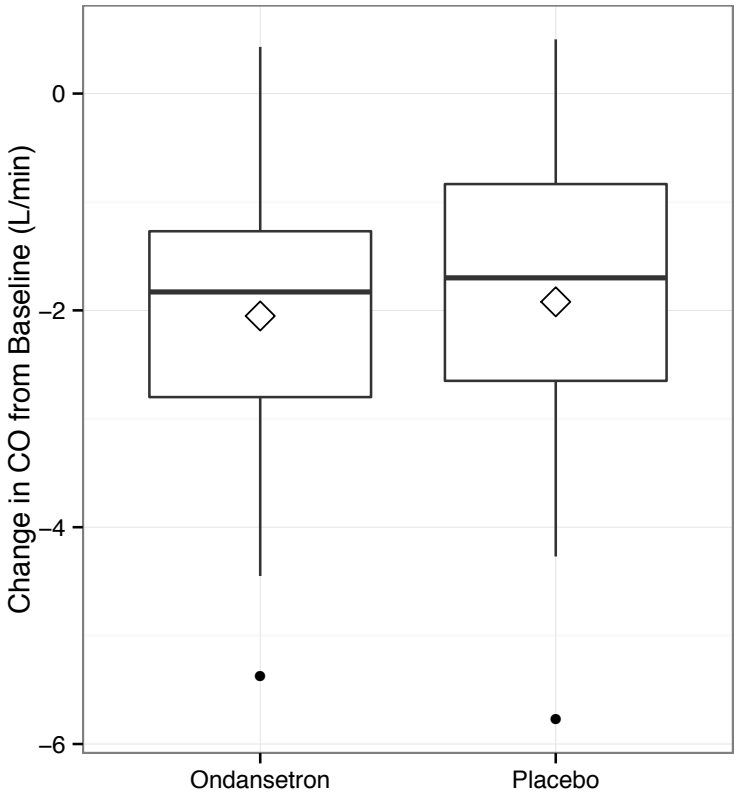
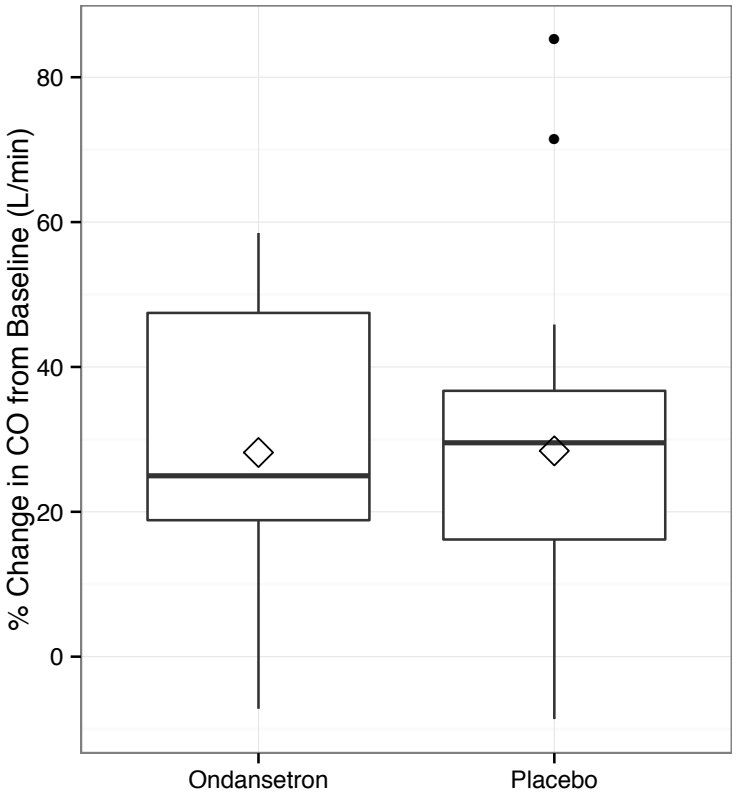

Change in CO from Baseline (L/min)
0
−2
−4
−6
Ondansetron
Placebo


% Change in CO from Baseline (L/min)
80
60
40
20
0
Ondansetron
Placebo

Abstract #: F-62

The Effect of the 39 Weeks Elective Delivery Guideline on the Rate of Unscheduled Cesarean Delivery

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Background: The Hospital Corporation of America's (HCA) "hard stop" policy (1) and American Congress of Obstetrics and Gynecology's "39 week induction rule" (2) discourage the scheduling of elective deliveries before 39 weeks' gestation because of associated worsened neonatal outcomes demonstrated in research studies (3). There are few investigations evaluating how the recommendations may affect the mother. As delayed scheduling may result in unplanned labor and delivery in the early term period, and as unscheduled cesarean deliveries (CD) may be riskier than scheduled CD, we chose to examine changes in the rate and numbers of early term unscheduled CD in the periods before (Pre-Rule) and after (Post-Rule) implementation of the "hard stop" policy on May 15, 2009.

Study Design: This retrospective chart review was conducted at Wesley Medical Center, a regional HCA women and infants' center with >6000 deliveries annually. We compared the rate and numbers of unscheduled early term (between ≥ 37 and <39 weeks' gestation) CD in the two-year Pre-Rule period to the rate and numbers in the two-year Post-Rule. Independent samples t-tests were performed for statistical analyses.

Results: The overall CD rate was 29.6% in the Pre-Rule period [3,730 CD] and 31.7% in the Post-Rule period [4,075 CD] (P= 0.0003). Despite the increase in overall cesarean sections in the Post-Rule time frame, the Pre-Rule period had more early term CD [1,022 vs. 729], and a higher early term CD rate [8.1% of all deliveries vs. 5.7%, (P <0.0002)]. As expected, the rate of unscheduled deliveries was greater in the Post-Rule period (Pre-Rule = 595 unscheduled out of 1022 total = 58.2%; Post-Rule = 487 unscheduled out of 729 total = 66.8% (P= 0.0001). Although there was also a higher rate of night-time unscheduled CD in the Post-Rule period (13.7% vs. 11.6% Pre-Rule), this difference was not statistically significant.

Conclusion: Unscheduled CDs are known to have higher morbidity and mortality (4). Our study demonstrated that implementation of the "hard stop" policy resulted in a decrease in overall early term and unscheduled early term CD numbers even though the actual rate of early term unscheduled CD was increased in the Post-Rule period. The study findings allow us to further evaluate the effectiveness of postponement of CD until ≥ 39 weeks' gestation and suggest the rule also promotes maternal safety by decreasing the total number of early term unscheduled CD.

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Abstract #: F-63

The Transgender Pregnant Male; Unique Challenges to the Transgender Peripartum Period

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H. Jane Huffnagle D.O. - Thomas Jefferson University - Philadelphia, PA
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Introduction: Transgenderism or gender identity disorder describes those whose gender identity is different from their biologic sex(1). Gender identity disorder is poorly understood and, as listed in the DSM V, is still considered a mental disorder(2). However, awareness of the condition appears to be increasing because of greater societal acceptance and available hormone treatment(1). A survey of 50 transsexual men found that the majority desire to have children(3). As a result of increased societal awareness and acceptance, healthcare providers should be an advocate for decreasing the possible discrimination these patients face.

Case: A 27 y/o AA G1P0 presented at 36 5/7wk with mild preeclampsia. This patient is a female to male transgender who was on testosterone replacement. In preparation for bilateral mastectomy prior to pregnancy, the patient stopped hormonal therapy for 2 weeks as instructed to avoid adrenal suppression perioperatively. He inadvertently conceived during this hormonal break following the mastectomy. An IUP at 20wk gestation was discovered after he sought care from his family physician for amenorrhea. Although the female fetus was exposed to testosterone as it had been restarted after the mastectomy, US showed no evidence of virilization. He was admitted and induced at 36 5/7wk for mild preeclampsia. He failed induction and had an uncomplicated cesarean section and postoperative course.

Discussion: Transgenderism is a condition in which a person experiences discrepancy between the sex assigned at birth and the gender he/she identifies with. The term transsexual man denotes a female-to-male transsexual person(3). Transgenders desire to live and be accepted as a member of the opposite sex, usually accompanied by the wish to make his or her body congruent with the preferred sex through surgery and hormone therapy. These patients frequently report adverse healthcare experiences, from insensitivity and ignorance to discrimination and hostility(4). Lombardi reports insensitive behavior among health care providers (referring to transgender women as "he" and "him") suggesting that cultural sensitivity is lacking(5). A multidisciplinary meeting involving anesthesiology, obstetrics and nursing is essential to discuss special social needs, ensuring that each healthcare provider understands the proper lingo and pronouns appropriate for the transsexual patient. Although on L&D we normally care for female patients, there should be increased sensitivity and awareness regarding the transsexual patient. As healthcare providers, we have to disprove the assumption that pregnancy is the ultimate "female signifier" and respect the transgender individual's identity.

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Abstract #: F-64

The understanding of maternal sepsis among professionals: a survey

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Introduction: Sepsis is now the leading cause of direct maternal death in the UK and one of the leading causes worldwide. (1,2) Early recognition and timely interventions are crucial to improving outcomes. Clinicians who care for parturients should, therefore, have a good working knowledge of sepsis and its initial management to underpin their practice. The Sepsis Six are a bundle of six interventions that formed part of the Surviving Sepsis campaign's official educational programme and that are associated with improved outcomes.(3)

Method: A questionnaire on sepsis recognition and initial management was developed and pre-piloted. It was distributed to midwives and physicians of all grades working on the maternity ward of our hospital. A three hour multi-disciplinary teaching session on maternal sepsis was then offered, and those attending completed the same questionnaire again after the session.

Results: The initial questionnaire was completed by 33 professionals (16 midwives, 9 anaesthetists, 8 obstetricians), 22 (67%) of whom are involved in the management of mothers requiring high dependency care. Results are shown in the table below.

Ten midwives attended teaching and completed the post-teaching questionnaire. Eight (80%) could name three or more of the Sepsis Six interventions. Six (60%) could name three or more SIRS criteria.

Conclusion: Our results indicate that understanding of the diagnosis and management of sepsis varies considerably between professional groups working on the maternity ward at a large teaching hospital. The gaps in knowledge that we demonstrated suggest that maternal sepsis outcomes may be improved through targeted education. Our study indicates that professionals are receptive to further sepsis education, and that a targeted education intervention is effective in increasing understanding of basic management of sepsis.

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	Midwives (n = 16)	Obstetricians (n = 8)	Anaesthetists (n = 9)	
Identified a correct definition of sepsis	11 (65%)	5 (63%)	7 (78%)	
Named 3 or more Sepsis Six interventions	6 (38%)	4 (50%)	9 (100%)	
Named 3 or more SIRS criteria	4 (25%)	2 (25%)	9 (100%)	
Familiar with a sepsis guideline	9 (56%)	7 (88%)	8 (89%)	
Able to name a sepsis guideline	6 (38%)	7 (88%)	7 (78%)	
Would like to receive further sepsis training	12 (75%)	6 (75%)	7 (78%)	

Abstract #: F-65

The use of transthoracic echocardiography to quantify hemodynamics in women with severe pre-eclampsia

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Introduction: Preeclampsia (PE) has debilitating cardiovascular consequences & is a significant global health burden. Severe hypertension should be treated, but amongst the safe antihypertensive agents, none is clearly superior.1 There is often clinical uncertainty as to correct fluid therapy in severe PE. Transthoracic echocardiography (TTE) is used as an initial investigation to assess hemodynamics including volume status, in non-pregnant women with malignant hypertension, but is not commonly used when managing pregnant women with PE.2 This study aimed to assess the feasibility & value of emergency TTE, & to quantify the range of hemodynamic variables in severe PE, in a large maternity hospital in South Africa.

Method: Over a 2 week period, 20 women with PE (systolic blood pressure (BP) ≥ 160 mmHg +/- diastolic BP ≥ 110 mmHg & proteinuria), requiring immediate treatment, underwent TTE during or immediately after acute treatment.

Results: Hemodynamic assessment was possible in all women (Table 1). Four (20%) women had eclampsia, one was intubated; one (5%) woman was in pulmonary oedema; nine (45%) had cerebral symptoms with either a severe headache/visual disturbance without eclampsia.

Conclusion: The majority of women with severe PE were in the third trimester of their second or subsequent pregnancy. Many were critically ill. Systolic & diastolic BP remained significantly elevated during & after initial treatment in most women. The left ventricle (LV) was not dilated & there was preservation of systolic function in all women, except in the patient in pulmonary edema, whose BP was critically elevated. Subclinical myocardial systolic impairment & the presence of a biphasic s' velocity waveform were present in the majority of women. Diastolic dysfunction was common. Structural changes included pericardial effusions & increased LV mass in most women. TTE was feasible at the time of life-threatening complications of PE. There was a wide range of values of hemodynamic variables in this cohort, & TTE could be used to assess individual women with PE. In severe cases, treatment interventions such as antihypertensive agents & fluid therapy should be guided by these hemodynamic findings.

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Table 1

Variable	Severe treated preeclampsia n=20
Age (years)	27 ± 7.9
Gestation (weeks)	35 ± 3.8
Gestation ≥ 34 weeks	11 (55)
Multiparous	14 (70)
Body mass index (kg/m^2)	34 ± 7.4
Mean arterial pressure (mmHg)	124 ± 18.7
Mean arterial pressure range (mmHg)	84-160*
Systolic blood pressure ≥ 160 mmHg	15 (75)
Diastolic blood pressure ≥ 110 mmHg	11 (55)
CI (ml/min/m^2)	3.1 ± 0.73
CO (ml/min)	5891 ± 1047.7
CO range (ml/min)	4326-8143
HR (BPM)	88 ± 16.4
SV (ml)	68 ± 13.3
SVR (dyne.s/cm^5)	1740 ± 417.0
Left atrial diameter (cm)	3.7 ± 0.40
LV end diastolic diameter (cm)	4.4 ± 0.46
LV end diastolic diameter > 5.3 cm	0
LV mass (g)	242 ± 92.9
FS (%)	41 ± 9.7
FS < 28%	1 (5)*
Septal s´ velocity (cm/s)	7.8 ± 1.6
Septal s´ velocity < 8 (cm/s)	11 (55)
Biphasic septal s´ waveform	13 (65)
MV E/Septal e´	10.6 ± 2.8
MV E/Septal e´ > 8	17 (85)
Pericardial effusion	14 (70)
Size of effusion (cm)	0.6 ± 0.16
Treatment interventions	
Intravenous $MgSO_4$ only	15 (75)
Intravenous $MgSO_4$ and diazepam	2 (10)
Intravenous $MgSO_4$ and antihypertensives	1 (5)
Antihypertensives only	1 (5)

CI=cardiac index, CO=cardiac output, HR=heart rate, SV=stroke volume, SVR=systemic vascular resistance, LV= left ventricle, FS=fractional shortening, MV=mitral valve. Data are mean ± SD, number (percentage). $MgSO_4$=Magnesium sulphate *woman with pulmonary oedema

Abstract #: F-66

Thoracic Subdural Hematoma And Intracranial Subarachnoid Hemorrhage After Placement Of Lumbar Epidural Catheter

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Introduction: Subdural hematoma (SDH) and subarachnoid hemorrhage (SAH) are ominous complications of neuraxial techniques that can mimic meningitis, epidural hematoma or epidural abscess. [1,2] We present a case of concomitant SDH and SAH after placement of a labor epidural and suggest a diagnostic algorithm (Figure).

Case: A 33 year-old G3P1 in labor requested epidural analgesia. History revealed no neurologic, musculoskeletal or hematologic disease; physical exam was notable for BMI of 40. Epidural placement required three attempts: 1) possible dural puncture, 2) catheter threaded but immediately removed due to sterility concerns, and 3) successful placement. The catheter functioned well during labor, and the patient had an uncomplicated vaginal delivery. Postpartum (PP), she was initially stable.

PP Day (PPD) 2
The patient developed back pain at the T8 level, radiating to the occiput and sacrum, most severe with weight-bearing or ambulation. There was no neck stiffness, headache, photophobia, vision change, tinnitus or neurologic deficits. Brain and spine MRI revealed trace blood ventral to the spinal cord at T12, a subdural hematoma extending from T5-L2 with ventral cord displacement but no compression, and trace intracranial blood in the lateral ventricles. Neurology was consulted. In absence of cord compression, surgical intervention was deemed unnecessary.

PPD 4
The patient developed hypertension, headache, nausea and photophobia. Preeclampsia workup was negative, and MRI was unchanged. The patient became febrile to 102°F with leukocytosis, but no motor or sensory deficits. She exhibited meningismus and bilateral abducens nerve palsies, and remained febrile despite empiric antibiotic treatment and negative cultures. A diagnostic lumbar puncture (LP) was considered, but avoided given concern for infection and potential for intrathecal spread. With no evidence of infection or preeclampsia, the patient's pain, hypertension, fever and leukocytosis were attributed to inflammation after SAH.

PPD 12
The patient was afebrile, pain-free and ambulating, but continued antihypertensive therapy.

Discussion: This case illustrates the diagnostic challenge of differentiating between meningitis, SAH and SDH. While diagnosing meningitis relies on LP, the presence of epidural blood and possibility of epidural or systemic infection is a relative contraindication to LP.

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	SAH	SDH	Meningitis
Fever	x		x
Back Pain	x	x	
Sensory Deficit	x	x	
Motor Deficit	x	x	
Headache/Neck Pain	x	x	x
Hypertension	x		
Altered Mental Status	x	x	x

Figure. Symptoms commonly noted in SAH, SDH, and meningitis. Note the overlap of symptoms between SAH and meningitis, complicating the diagnosis.

Abstract #: F-67

Tuohy Load or no Tuohy Load: That is the Question.

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Introduction: The combined spinal-epidural technique offers rapid analgesic onset and as such has gained increasing popularity for provision of labor analgesia. However, it is also associated with fetal bradycardia and unrecognized epidural catheter failure (1). This study aims to investigate the effects of epidural loading via the epidural needle prior to catheter insertion as a method for delivery of rapid analgesia while maintaining a safety profile similar to the standard epidural technique.

Methods: Healthy parturients in labor following an uncomplicated pregnancy were randomized to either the control group or the intervention group. Control patients (n=29) received 10 mL of epidural solution (0.125% bupivacaine with fentanyl 2mcg/mL) in 5 mL increments via the catheter while intervention patients (n=27) received the same dosage via the epidural needle. Patients were followed throughout the course of delivery.

Results: No significant difference was observed in the rate of pain score change (slope) between the patients receiving the epidural through the catheter and those receiving it through the epidural needle (-0.33 vs. -0.30 p=0.46) (Figure 1A). Similarly, there was no significant difference in the analgesic spread between the two groups at either T=10 (11.3 vs. 10.1 p=0.07) or T=15 minutes (9.7 vs. 9.5 p=0.72) after the initial bolus (Figure 1B). Maternal blood pressure and fetal heart rate were monitored 20 minutes after epidural administration in order to characterize the safety profiles of the intervention and control group. There was no significant difference observed in maternal blood pressure between the two groups (systolic: 125 vs. 123 p=0.66, diastolic: 69.1 vs. 68.5 p=0.52) (Figure 1C). Neither group exhibited fetal bradycardia (HR < 110) within 20 minutes.

Discussion: Initial bolus dosing via the epidural needle did not significantly affect the analgesic onset and spread compared with catheter dosing. Interestingly, one third of the patients in the catheter group (n=13) reported pain relief before receiving the initial bolus of epidural solution, which indicates influence of placebo effect. Study design may have limited effect through use of incremental divided dosing. Further investigation is warranted.

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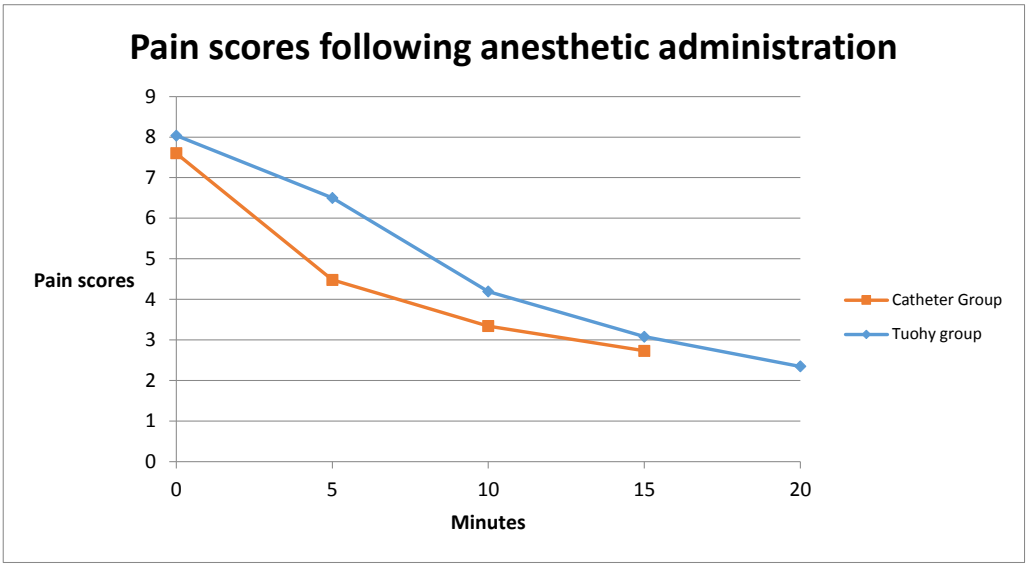

Abstract #: F-68

Unanticipated Difficult Airway Due to Succinylcholine-Induced Masseter Spasm in the Term Parturient

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Introduction: Though regional anesthesia is preferred for Cesarean delivery, conversion to general anesthesia is occasionally warranted. In these cases, rapid sequence induction with succinylcholine to facilitate intubation is customary. We present a case of unanticipated difficult airway due to succinylcholine-induced masseter spasm.

Case: A 39-year-old G2P0 at 40 weeks EGA underwent Cesarean delivery with labor epidural for failure to progress. Her airway exam was reassuring with favorable 11-point exam, and Mallampati class 2. She was comfortable with incision but experienced discomfort on further dissection. After induction with propofol and succinylcholine, she developed masseter spasm resulting in initially impossible intubation and ventilation. Emergency surgical airway was requested 2 minutes after induction, when initial mask attempts were unsuccessful. Oral intubation was established at 2 minutes 45 seconds when the spasm broke. Nadir oxygen saturation was 65%. Induction-to-delivery time was 7 minutes, and an infant with Apgars 9 and 9 was delivered. The remainder of her intra- and post-operative course was unremarkable.

Discussion: Masseter spasm after succinylcholine is defined as jaw rigidity with limb flaccidity and results from prolonged depolarization of slow tonic fibers of the masseter and lateral pterygoid. Increased masseter tone after succinylcholine is common, and it is generally mild and transient. In rare, more severe cases, it may result in inability to ventilate and need for emergent surgical airway (1). Though malignant hyperthermia is only associated with extreme cases, vigilance for this entity is essential (2).

Masseter spasm during induction of general anesthesia is particularly concerning in the laboring patient, where a full stomach, hyperemic tissues, decreased functional residual capacity, increased oxygen consumption, and concern for fetal wellbeing complicate a difficult airway. Planning for the unanticipated difficult parturient airway is essential and should include strict adherence to preoxygenation, early call for help (including emergency surgical airway), and communication with the obstetric team about maternal and fetal wellbeing, with possible need for emergent delivery. Research has shown this communication to be difficult, necessitating repetitive practice (3). Familiarity with emergency procedures and adherence to an algorithm ensures the greatest likelihood of positive outcome (4).

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Abstract #: F-69

Understanding Cultural Myths and Superstition Surrounding Childbirth

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Childbirth like many major milestones in life, can be influenced by cultural values, traditions, myths and superstitions. It has been suggested that immigrant women, in general, report less satisfaction in hospitals during childbirth (1). This observation has been speculated to result from the challenge hospitals face in acknowledging and accommodating traditional practices during childbirth.

Our institution had previously reported a case where the parturient had deliberately manipulated the surgical start time for a scheduled cesarean delivery, based on her desire for the baby to born within a certain time frame (2). The woman who was of Chinese origin, ate a full breakfast very much aware of the American Society of Anesthesiologist's fasting guidelines, resulting in a postponement of her cesarean section from 12.30 PM to 3 PM. This was done in order to ensure the baby was delivered at an ideal time, in concordance with what the Chinese believe to be 'lucky' numbers.

A 39 year old G2P1 from Saudi Arabia presented in labor at 37 weeks gestation. She had an uncomplicated pregnancy and good antenatal care. On arrival to the labor suite she was reluctant to speak to the anesthesia team but with progression of her labor, requested to have a consultation and possible placement of a labor epidural. Her main anxiety was the belief that the epidural would not provide effective pain relief because she had recently consumed camel meat. On further questioning, she revealed that it was common belief amongst the Arabic culture that consumption of camel meat, a delicacy in this region, would result in ineffective pain relief with labor epidurals. She eventually received an epidural for analgesia and had a pain free vaginal delivery of a baby girl.

To ensure the provision of quality healthcare to women of all cultures, the obstetrical anesthesia division at our institution are now collaborating with obstetricians to ensure that women who may have specific preconceived ideas of labor and childbirth due to their cultural background have opportunities to speak with the anesthesia team, social workers and labor suite resource personnel to discuss expectations and childbirth plan. As a result of this multidisciplinary approach to improve cultural awareness amongst the providers, we are able to accommodate as much as we can within the limits of patient safety. We continue to acknowledge that cultural competence is a vital component of quality healthcare delivery. As we broaden our scope of the myriad of cultural traditions, beliefs, superstitions and myths, we hope to provide safer and more satisfying healthcare to our patients.

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Abstract #: F-70

Where is the Balloon? Misadventures in Interventional Radiology For A Patient with Placenta Accreta

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Background: Postpartum hemorrhage is one of the leading causes of morbidity and mortality worldwide. Abnormal placentation is a leading cause of massive obstetric hemorrhage and peripartum hysterectomy1. In order to minimize postpartum bleeding, perioperative endovascular internal iliac or uterine artery balloon occlusion catheters may be placed. The efficacies of such minimally invasive balloons are controversial but generally accepted as safe3. We report a case of a potentially dangerous team miscommunication in the interventional radiology suite while placing prophylactic balloon occlusion catheters.

Case: The patient, a 29 year old G2P1at 34weeks gestation, with a history of one prior cesarean delivery presented for a planned repeat cesarean delivery. Antenatal ultrasound revealed placenta previa with concern for placenta accreta. A subsequent MRI was consistent with placenta increta. A plan was devised between Maternal-Fetal Medicine, Anesthesiology, and Interventional Radiology to facilitate delivery via cesarean delivery and possible hysterectomy following internal iliac artery balloon placement in the interventional radiology suite. A lumbar epidural was placed by the anesthesia service in the interventional radiology suite. The interventional radiology team then placed balloon occlusion catheters into the uterine arteries. After catheter placement, the fetal heart tones were noted to be below 100 BPM despite intrauterine resuscitation maneuvers to optimize uterine blood flow. The interventional radiology team offered to withdraw the catheters (which were in the uterine arteries) and the obstetric and anesthesia providers declined this maneuver, believing the catheters to be in the internal iliac arteries. The obstetric and anesthesiology teams decided to take the patient emergently to the operating room where a cesarean delivery was performed under epidural anesthesia with delivery of a healthy infant. The placenta separated easily and fertility was preserved.

Discussion: Complications of internal iliac and uterine artery occlusion catheters is imperative during management of obstetric hemorrhage. An occlusion catheter intended for the internal iliac artery may completely obliterate the lumen of the uterine artery, which can be 50% smaller in size. Additionally uterine artery vasospasm, precipitated by manipulation, can manifest as fetal distress2-3. Withdrawing the balloon catheters, suggested by the IR physician but not well understood by the Anesthesia and MFM team, may have prevented an emergent delivery of a patient at high risk for hemorrhage. Although there was no additional morbidity to mother or fetus, thorough knowledge and communication regarding arterial occlusion techniques may have avoided emergent cesarean delivery and minimized risk.

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ABSTRACTS- SATURDAY

Abstract #: S-01

A randomized controlled trial of epidural volume extension during a combined spinal-epidural technique for labor analgesia

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Combined spinal-epidural (CSE) is a popular method for delivering labor analgesia due to rapid onset of profound analgesia, minimal motor blockade, and high patient satisfaction. Epidural volume extension (EVE) involves injection of volume into the epidural space compressing the dural sac, causing cephalad shift of the cerebral spinal fluid (CSF). Our hypothesis is that EVE with 10 ml of normal saline during CSE will increase the anesthetic sensory block height, decrease pain scores, decrease pain scores more rapidly, and decrease motor block compared to performing CSE without EVE. METHODS: An apriori sample size was calculated. We recruited 54 healthy term laboring nulliparous parturients with cervical dilation < 5 cm. Intrathecal analgesia consisted of 2 mg bupivacaine and 10 mcg fentanyl. The subjects were randomly allocated into one of two groups: EVE received 10 ml of normal saline through the Tuohy needle prior to catheter insertion or NEVE where parturients did not receive EVE. Epidural catheters were thread 5 cm into the epidural space and a standard continuous epidural infusion was begun immediately. A blinded researcher assessed sensory dermatome level by blunt pinprick test, analgesia by numeric rating scale (NRS) 0 to 10, and motor blockade with a m-Bromage score 1 to 6 at 2.5 min intervals. The primary outcome measure was the difference in sensory dermatome level as determined by non-traumatic pinprick test. RESULTS: A total of 54 parturients were enrolled. There was no significant difference in demographic criteria, peak dermatome levels at 15 min or 30 min, the time to peak dermatome, the minimum pain score, nor the time to minimum pain score between groups. The number of parturients with a Bromage score less than 6 was less in Group EVE, but this too was not statistically significant. DISCUSSION: To our knowledge, this is the first clinical trial to study the effect of EVE for labor analgesia in parturients. We did not find a significant difference between groups with regards to sensory dermatome level nor pain scores when using EVE. Although there is a trend toward less motor block in Group EVE, this was not statistically significant. Our study demonstrates that EVE does not offer superior analgesia when using a CSE technique for parturients requesting labor analgesia, but any effect on long-term catheter function was not assessed in this study.

References: Cochrane Database Syst Rev 2012 10: CD003401, Anaesthesia 2011; 66: 341-7

Table 1

Measure	Group		p-value
	No EVE (n = 28)	EVE (n = 26)	
Age (years)	27.4 ± 4.4	25.5 ± 3.7	0.0933
BMI (kg/m^2)	29.8 ± 3.4	29.3 ± 3.1	0.5899
Cervical dilation at CSE (cm)	3.5 (1, 4)	3.5 (2, 4)	0.9517
Pain score prior to CSE (0 – 10)*	9 (5, 10)	9 (5, 10)	0.5139
Peak dermatome 15 min	T6.5 (T4, L4)	T6 (T1, L2)	0.2234
Peak dermatome 30 min	T6 (T2, L4)	T5.5 (T1, L1)	0.7589
Time to peak dermatome (min)	20 (0, 30)	15 (2.5, 30)	0.8266
Minimum pain score (0 – 10)	0 (0, 5)	0 (0, 7)	0.1958
Time to minimum pain (min)	2.5 (0, 25)	2.5 (0, 25)	1.0000
Peak Bromage score (1 – 6)	6 (4, 6)	6 (5, 6)	0.0636
Bromage score < 6	9 (32.1%)	3 (11.5%)	0.1029

Data presented as mean ± SD, median (range), or n (%)

*n = 25 for EVE group for this measure

Abstract #: S-02

Accuracy of 3D Ultrasound for Identification of Epidural Needle Skin Insertion Point in Parturients; A Prospective Observational Study

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Background: We developed a novel 3D ultrasound (3DUS) Thick Slice image processing technique and innovative epidural needle guide to facilitate real-time, single-operator, midline epidural needle insertions [1,2]. We hypothesized that 3DUS would identify an appropriate needle puncture site within a ≤ 5 mm radius as compared to the gold standard manual palpation technique in term parturients.

Methods: Based on a previous 2DUS study, power calculations determined a sample size of 20 term parturients to be recruited [3]. Subjects were seated upright on the edge of a leveled bed while L2-3 and L3-4 levels were palpated and then marked laterally. The 3DUS transducer (Ultrasonix model m4DC7-3/40) was placed in the paramedian plane with a custom-made clip-on needle guide to visualize the ligamentum flavum. An erasable marker was used to indicate where the needle, sliding in the guide, would touch the skin (picture). The skin mark was copied onto a transparency and erased from the skin. The epidural needle puncture site was then identified using the standard palpation technique, marked, and then transferred onto the same transparency. A single researcher scanned and palpated at both levels. The primary outcome was the distance (mean ± standard deviation) between the 3DUS and palpation points measured on the transparency.

Results: To date, we have recruited 19 out of 20 subjects. In 95% of our measurements (36 out of 38) 3DUS identified midline epidural needle puncture sites within a 5mm radius compared to the standard palpation technique. The mean distance between the two points was 2.9 mm and the standard deviation was 1.5mm.

Conclusion: The new 3D Thick Slice US offers reliable localization of midline epidural needle puncture sites in parturients. Future studies should assess the benefit of the 3DUS for the real time visualization of the epidural needle insertion.

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Abstract #: S-03

Activation of Complement Factor B in Minority Pregnant Women with Preeclampsia

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Introduction: Conflicting results have been reported regarding the role of activated factor B in preeclampsia. The active fragment of factor B of alternative complement pathway, Bb, was reported to be a predictor of preeclampsia in a cohort of pregnant women (65% whites, with 4.6% preeclampsia incidence).1,2 However, a conflicting report was published in a study of Caucasian pregnant women in Hungary.3 We hypothesized that the discrepancy may be due to the race/ethnic differences in those studies.

Methods: To further test our hypothesis that race/ethnic background contribute to the activation of factor B, we studied 225 minority pregnant women with high risk of preeclampsia (86% African Americans, with 10% preeclampsia incidence). We carried out Enzyme-linked immunosorbent assay (ELISA) to study the plasma levels of activated factor B and compare the profiles between preeclampsia patients and women with normal pregnancy. We have found that maternal blood Bb levels, an activated fragment of factor B, were significantly higher in preeclampsia women than those of normal pregnancy (increased 32%, P=0.007).

Discussion: These results indicate that minority patients, particular African American patients with preeclampsia, have increased levels of activated complement factor B which may contribute to the pathogenesis of pre-eclampsia.

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Abstract #: S-04

An analysis of preoperative anxiety in an obstetric population

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Introduction: Preoperative anxiety is common, unpleasant and can affect the conduct of anaesthesia, postoperative pain and outcome (1,2). Allied to the natural anxieties surrounding childbirth women undergoing cesarean section (LSCS) may experience additional stressors related to the surgery. A review by Blankfield(3) suggests that hypnosis and relaxation can shorten postoperative admission, promote recovery, and help emotional responses following surgery. Our aim was to evaluate preoperative anxiety levels amongst women having an elective LSCS. We believe maternal experience can be improved using relaxation techniques.

Methods: A single centre prospective study completed over two months. Data collection proformas were completed by nursing staff preoperatively. Using the visual analogue scale (VAS) women were asked to rate their level of preoperative anxiety. Results were divided into three categories; mild (0-39mm), moderate (40-69mm) and severe (70-100cm)(2). Data analysis was completed using GraphPad.

Results: 100 responses were collected, 45% of women were primiparous, 20% were nulliparous and 52% had had a previous LSCS. Overall 43% of women described experiencing severe anxiety preoperatively, 36% moderate anxiety and only 6% no anxiety. There was no significant difference in VAS scores between nulliparous (mean=67.1mm), primiparous (mean=51.3mm) and multiparous (mean=58.8mm) women (p=0.056 one-way Anova). Women who had a previous LSCS had a mean VAS score of 55.0mm versus 61.9mm for those never having had a LSCS (p=0.24 unpaired t-test).

Discussion: Overall 94% of women experience some anxiety preoperatively, 79% experiencing moderate to severe anxiety. Parity or previous LSCS had no influence of the degree of anxiety. We propose that more can be done to relieve maternal anxiety thus improving the birth experience for the mother and family. Introducing relaxation based therapy for mothers preoperatively should be trialed and anxiety levels reviewed post implementation.

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Table 1: Anxiety levels; previous LSCS vs no previous LSCS

Level of anxiety	Previous LSCS	No previous LSCS
None	4	2
Mild	9	6
Moderate	18	18
Severe	21	20

Abstract #: S-05

Anesthestic and Pain Management in a Parturient with Type 2B von Willebrand Disease and Severe Thrombocytopenia

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Introduction: Patients with bleeding disorders present unique challenges in anesthetic management. This case describes a patient with Von Willebrand Disease (vWD) Type 2B and severe thrombocytopenia requiring Cesarean delivery.

Case: A 30 year old G1 at 39 weeks gestation was admitted for labor induction due to vWD Type 2B and severe thrombocytopenia. A platelet count at 8 weeks gestation was 183k. By 37 weeks, this count decreased to 17k and platelets were transfused with minimal response. Induction was planned at 39 weeks given persistent severe thrombocytopenia. The plan by her hematologist was to administer Wilate, a vWF/Factor VIII complex, during labor and 5 days post-partum. Platelets would be transfused to maintain a count >50k.

Induction of labor was initiated with oxytocin after 2 units of platelets were transfused and an appropriate response to Wilate was seen. On day 2, she began having regular contractions with appropriate cervical dilation. Adequate analgesia was achieved with patient administered inhaled nitrous oxide for a period of time until membranes ruptured; at this time, her pain was intolerable. IV opioids, hydrotherapy, and TENS unit were all utilized with little effect. Cesarean delivery was planned for arrest of dilation at 7cm and suspected fetal occiput posterior position.

vWF panel showed Factor VIII levels of 192%, vWF antigen level of 217%, and vWF activity 200% compared to 67%, 43%, and 4% on admission. She received 2 units of platelets prior to the OR given a recent count of 20k. Given her previous poor response to platelet transfusion, spinal anesthesia was not considered. General anesthesia was induced uneventfully. The obstetricians noted the incision to be "oozy" and one unit of platelets was transfused. A vigorous female in the OP position was delivered 4 minutes after anesthetic induction. A right uterine artery laceration was repaired and no significant bleeding was noted. She remained stable, intraoperative platelet count was 54k and a thromboelastography (TEG) showed normal clot formation. She was extubated and taken to recovery in stable condition. During pregnancy, labor and delivery a total of 11 units of platelets were administered.

Discussion: Type 2 vWD is characterized by a qualitative defect in plasma vWF accounting for 20-30% of vWD cases. Type 2B is characterized by increased affinity of vWF for platelet glycoprotein Ib, resulting in spontaneous binding and clearance of large vWF multimers and platelets (1). This is exacerbated in pregnancy when levels of dysfunctional vWF are elevated. This patient required 11 platelet transfusions; neuraxial anesthesia was not considered safe given this severe persistent thrombocytopenia. Alternative methods of analgesia were offered with little effect; fetal malpresentation likely contributed to length of labor, pain and need for Cesarean delivery (2).

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Abstract #: S-06

Anesthetic Management for Cesarean Delivery in a Parturient with Severe Dilated Cardiomyopathy: A Case Report

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Introduction: Significant physiologic changes in CV system during pregnancy may lead to cardiac decompensation, arrhythmia and maternal death in those with limited cardiac reserve.1 We present a case of anesthetic management for cesarean delivery (CD) in such a patient.

Case: A 44 yr-old G4P1, immigrant from Mongolia was referred at 36 wks due to worsening heart failure (HF). She had been diagnosed with DCM (EF<30%) at OSH, 2 wks prior to referral. Her HF was diagnosed in Mongolia 10 yrs ago, on metoprolol and furosemide then. She became non-compliant and came to the U.S. She had primary CD 5 yrs ago under spinal anesthesia at 37 wks. During current pregnancy, she developed chest pain at 34 wks, which prompted echo to show EF <30 % and severe global hypokinesis. She was started on heparin and referred to us. On admission, she was NYHA class III, and echo showed DCM with EF <30% and mod MR. ECG showed NSR with LBBB. She was given furosemide for 2 days and taken to the OR for repeat CD. Preop Hgb was 12 gm%. A-line and PA catheter were placed preoperatively. Vitals were BP 125/80 mmHg, HR 98/min, RR 20/min, SpO2 95% (RA), PAP 32/18 mmHg. Sequential combined spinal-epidural (CSE) anesthesia was administered at L3-4 with initial spinal doses of hyper-baric bupivacaine 4.5 mg, fentanyl 20 mcg and PF-morphine 200 mcg. Dobutamine was started. Sensory level was slowly increased to T4 in next 30 min with epidural lidocaine 2% total 7 ml, after test dose. Her BP was stable with dobutamine, which was stopped 40 min after delivery. Furosemide 10 mg was given at immediate pp. Oxytocin infusion (40 U/L) was started to facilitate uterine contraction. Surgical duration was 1hr 55min. Total IVF was 1.8L, EBL 850 ml and u/o 650 ml. She was transferred to CCU. She had uneventful recovery and underwent cardiac catherization on POD#5, which showed EF 20% and no CAD. She was discharged home on POD #6 in stable condition with medications including enalapril, furosemide, metoprolol and albuterol. Her cardiac function continued to deteriorate and BIV-ICD was implanted at 3 mo pp.

Discussion: Among pregnant women with DCM, cardiac complication is most considerable, approaching 65%, in women with moderate or severe LV dysfunction and/or NYHA functional class III or IV.2 Early medical intervention leads to better maternal and fetal outcome in these patients.3 Management principles are to reduce preload and afterload, and to increase myocardial contractility. Invasive hemodynamic monitoring helps guide fluid management, measurement of cardiac parameters and administration of inotropes. Judicious use of neuraxial anesthesia has been increasingly reported in these patients.4-6 Sequential CSE anesthesia is most suitable due to its solid quality, slow titration, and low incidence of PDPH.

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Abstract #: S-07

Anesthetic Management of A Parturient With Wolff-Parkinson-White Syndrome (WPWS) With History of Two Cardiac Arrests with Two Previous Pregnancies

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Background: Wolff–Parkinson–White syndrome (WPWS) is a pre-excitation reentrant arrhythmia caused by an aberrant conduction pathway between atria and ventricles (bundle of Kent), bypassing the normal atrioventricular (AV) conduction predisposing patients to supraventricular tachycardia, atrial fibrillation and ventricular fibrillation. As anesthetic drugs and techniques influence the physiology of AV conduction, perioperative management of WPWS is challenging. We present the successful anesthetic management of a patient with WPWS who presented in active labor with history of two previous cardiac arrests.

Case report: A 30-year old gravida 3 para 1 female presented in active labor at 40 weeks gestation and anesthesiology was consulted for labor analgesia. Past medical history was significant for WPWS diagnosed after cardiac arrest at 32nd week of her first pregnancy ten years ago, following which she underwent ablation. Four years ago, she had a second cardiac arrest secondary to hypotension from excessive vaginal bleeding from spontaneous abortion. The patient was asymptomatic at time of presentation, although she had intermittent palpitations and syncopal episodes earlier in pregnancy. Physical examination was unremarkable with regular heart rate of 66/min, NIBP 128/66 mmHg. EKG revealed short PR interval, wide QRS duration, delta waves, premature atrial complexes. 2D Echocardiogram showed normal right and left heart function with LVEF (65%). Avoiding tachycardia was pivotal and labor analgesia with combined spinal-epidural (CSE) early in labor was planned. A defibrillator, crash cart with cardiac medications (procainamide, adenosine, diltiazem, amiodarone, lidocaine, ionotropes) and telemetric EKG monitoring was made available in the labor room. A CSE was successfully performed with 25mcg intrathecal fentanyl followed by patient-controlled epidural analgesia with epidural infusion of 0.1% bupivacaine, 2mcg/ml of fentanyl at 6ml/hour with 5ml bolus every 20 minutes. Anesthetic principles involved avoidance of epinephrine containing solutions and AV nodal blocking agents throughout the labor. The patient had an uneventful vaginal delivery 3 hours later requiring only one epidural bolus dose. She was monitored for post-partum hemorrhage and off telemetric monitoring 30 hours post-delivery with stable vital signs and discharged on the second postpartum day.

Conclusion: The anesthetic goal in perioperative management of WPWS is to circumvent any factor that increases sympathetic activity such as pain, anxiety, stress response, and hypovolemia. The CSE in this patient ensured reliable, rapid onset, and prolonged analgesia with stable hemodynamics throughout labor. The emphasis on thorough preoperative evaluation, meticulous intraoperative monitoring for arrhythmias, and preparedness to manage untoward incidents cannot be overstressed.

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Abstract #: S-08

Anesthetic management of super morbidly obese parturients for cesarean section using a double neuraxial catheter technique: A case series

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Introduction: Parturients with a body mass index greater than 50 kg/m² (super morbid obesity) represent a growing segment of the patients that require anesthetic care for labor and delivery. Severe obesity and its comorbid conditions place the parturient and her fetus at greater risk for pregnancy complications and cesarean delivery, as well as surgical and anesthetic complications.

The surgical approach for cesarean delivery in these patients may require a supraumbilical vertical midline incision due to a large pannus. The dense, T4-level of spinal anesthesia can cause difficulties with ventilation for the obese patient during the procedure, which can be long in duration. Patients may also have respiratory complications in the post-operative period due to pain at the high incision.

The use of 2 epidural catheters (low thoracic and lumbar) in a super morbidly obese parturient was previously reported by McDonnell and Paech, but we are not aware of any reports of continuous spinal and epidural catheters in this population.

Case series: We describe the anesthetic management of three parturients with BMI = 77, 81 and 96 kg/m² that required cesarean delivery via a supraumbilical vertical midline incision. Continuous lumbar spinal and low thoracic epidural catheters were placed in each patient for intraoperative anesthesia and post-operative analgesia, respectively. Ultrasound guidance was used to help identify landmarks.

The patients were positioned on the operating table using an air-assisted patient transfer mat in a semi-recumbent position with the head of the bed elevated 45 degrees to allow for greater patient comfort and improved ventilatory mechanics. The spinal catheter was dosed incrementally with bupivacaine titrated slowly to a T4 anesthetic level. All patients had continuous blood pressure monitoring using a radial arterial catheter. One patient with severe sleep apnea required BiPAP during the procedure.

All three patients were monitored post-operatively in the surgical intensive care unit, and received multi-modal analgesia including a thoracic epidural infusion of bupivacaine 0.125% and fentanyl 2 mcg/ml, as well as intrathecal morphine (150 mcg) to achieve adequate post-operative pain control. Spinal catheters were removed after 24 hours to reduce the risk of post-dural puncture headache. Patients were followed for 7 days post-operatively, and none suffered a post-dural puncture headache.

Discussion: A continuous spinal catheter offers several advantages in the anesthetic management of super morbidly obese parturients for cesarean section. It allows for a dense, reliable block that can be titrated slowly to the desired level while monitoring the patient's respiratory status and can be redosed as needed throughout the case. In addition, a low thoracic epidural can be helpful to adequately manage post-operative pain and prevent respiratory complications related to splinting.

Anaesth Intensive Care (2007) 35(6): 979-983.

Abstract #: S-09

Autonomic Dsyreflexia: Management in the Laboring Patient

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Around 2,000 women with spinal cord injuries (SCI) may become pregnant each year in the United States (1). Anesthesia providers must become familiar with the proper management of SCI patients, should any of its associated complications occur during delivery, namely that of Autonomic Dysreflexia (AD).

Our patient is a 37 year old G1P0 at 36w5d with a medical history significant for C6 paraplegia following a gunshot wound to her neck in 1992. She presented in active labor, with signs and symptoms evident of autonomic hyperreflexia, including diaphoresis and vasoconstriction. A labor epidural was placed, after which the diaphoresis greatly subsided. At the time of delivery, the patient became extremely hypertensive. She responded promptly to a small bolus of nicardipine and an arterial line was placed for hemodynamic monitoring. After delivery, with the noxious stimulus resolved, the patient became profoundly hypotensive. The LEA was stopped and fluid resuscitation began, to which she responded well.

When spinal cord injuries occur at a level of T6 or higher, the spinal cord loses its ability to maintain proper autonomic control of the abdominal viscera and organs, leading to sympathetic overactivity in response to noxious stimuli caudal to the level of SCI (2). Intact sensory nerves below the SCI sense noxious stimuli and activate a sympathetic response, causing an increased blood pressure. Baroreceptors sense the increased BP and counter this with parasympathetic input. However, such input is impeded by the SCI, leading to the key presentation of AD, that of sympathetic input below the level of the SCI, and parasympathetic input above the SCI.

Typical presentation of AD includes systolic BP elevation by 20-40 mmHg above baseline, headache, bradycardia, flushing of the face, and profuse sweating above the level of the lesion with pale, cold skin below the lesion (3). Bowel or bladder distension are common causes of AD, however uterine contractions can also lead to this.

AD is best avoided in the laboring patient with early initiation of LEA (1). If this fails to control the blood pressure, it is recommended that BP be pharmacologically lowered (3). Noxious stimuli should be removed quickly, as untreated AD can lead to devastating outcomes such as stroke, myocardial infarction, coma, and death (2).

Prompt recognition and treatment are integral management strategies of Autonomic Dysreflexia, because left untreated, it can lead to deleterious sequelae.

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Abstract #: S-10

Building Quality Improvement Into Your Time-Out

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Introduction: Time out procedures may improve patient safety.1 However, research suggests that the use of a more procedure specific pre-incision safety checklist may further reduce morbidity and mortality.2 We present the creation and implementation of a quality improvement driven time out board specific to cesarean delivery on our obstetric floor.

Methods: A multi-disciplinary team including an obstetric anesthesiologist, obstetricians, midwives, nursing staff, surgical technicians and a representative from the safety office were recruited. Quality data from our unit was used to identify targets for improvement to incorporate into the time out checklist. Targets for improvement included surgical site infections and foreign body retention. The board was divided into verification, final time out and debriefing sections and an abbreviated list was created for emergency procedures. After gaining IRB exemption to use previously collected quality audit data during elective cesarean deliveries, we compared data collected in the three months prior to the time-out board implementation and three months post implementation for rates of surgical site infections and time out quality measures.

Results: In the pre and post-intervention time period, time out compliance was 100%. The final time out occurred at the correct time (defined as after draping and prior to incision) in 79 of 104 cases (75%) pre-intervention and in 105 of 131 cases (80.5%) post-intervention. The providers ceased other activities during time out in 94 of 104 procedures (90.4%) pre-intervention and in 128 of 131 cases (97.6%) post-intervention. Full verification (with two patient identifiers and surgical consents) was performed in 96 of 104 cases (92.3%) pre-intervention and in 129 of 131 cases (98.5%) post-intervention. Surgical site infections decreased from 6.4% (pre) to 3.2% (post). No retained foreign bodies were reported in the 8 months following the intervention.

Conclusion: Procedure specific time-out boards are easy to design and can be used to target areas for unit specific performance improvement. The presence of a time-out board in the operating room may improve the quality of the time out procedure.

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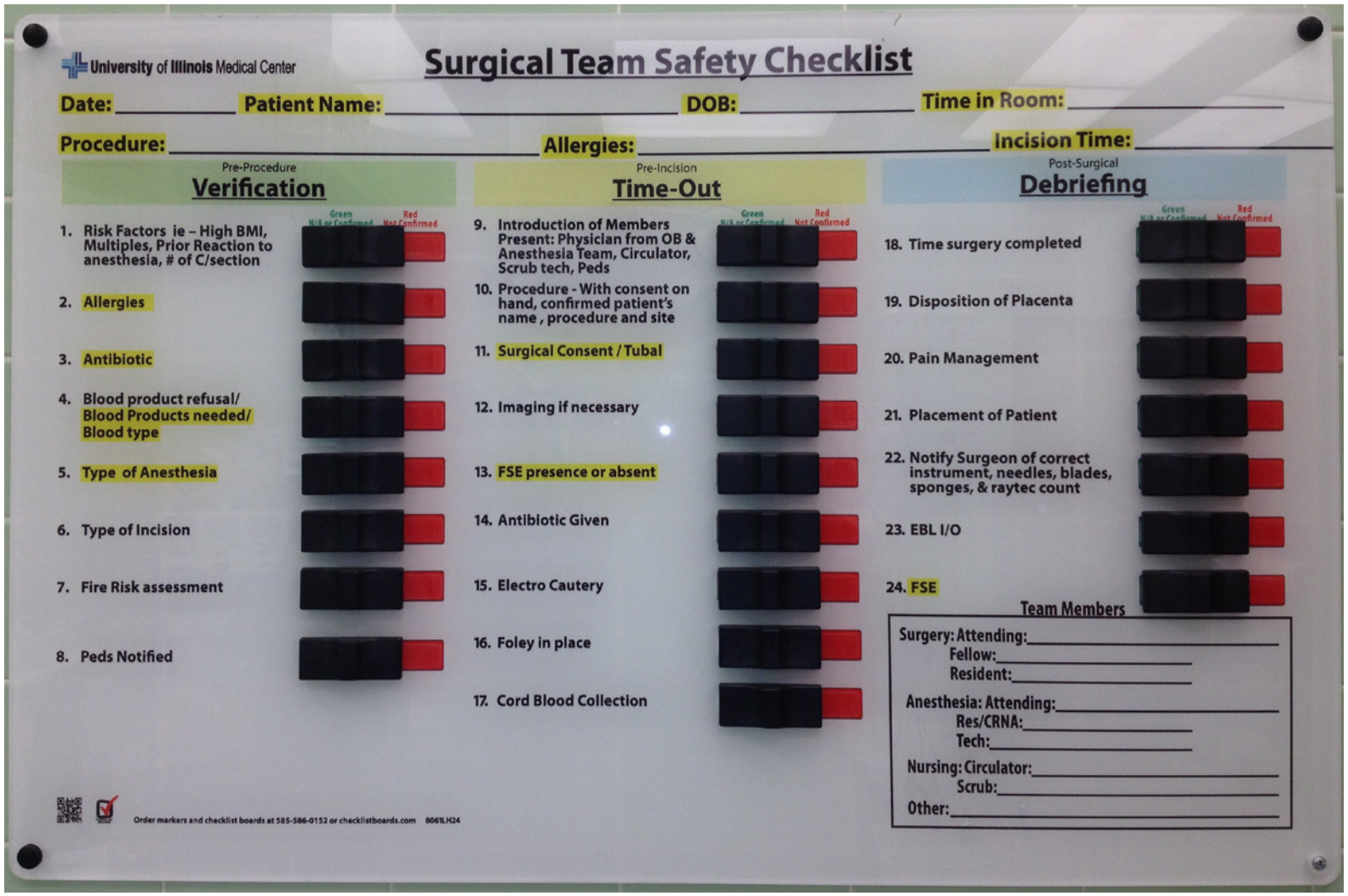
1) Conley et al (2011) J Am Coll Surgeons 212: 873-879
2) Mainthia et al (2012) Surgery 5:660-666

Abstract #: S-10



Abstract #: S-11

Changing Trends In the Management of the Obstetric Airway

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Introduction: Over the last 40 years, newer technologies (fiberoptics, LMAs, video laryngoscopes) have enabled the anesthesiologist to better manage the maternal airway. Have these devices decreased the incidence of failed intubation?

Methods: We reviewed our maternal airway database for the years 1974 – 2010 to determine the overall incidence of failed rigid laryngoscopy during general anesthesia for cesarean section and the need to use alternative airway devices.

Results: During the first decade of this review, 1974 – 1983, failed rigid intubation(FRI) occurred at a rate of 1/224 (9/2016). Airway rescue was successful in six cases after spontaneous ventilation returned followed by blind nasal intubation. Over the time span of the next twenty years, 1984- 2003, FRI occurred at a rate of 1/756 (3/2268) while preemptive sedated fiberoptic intubation occurred at a rate of 1/7 (323/2268). During the past seven years, FRI occurred at a rate of 1/57 (9/518) with the rate of sedated fiberoptic intubation at 1/18 (29/518).

Discussion : The overall rate of failed intubation is increasing. This could be due to three factors (1) Failed rigid laryngoscopy can be easily handled by alternative techniques (2)prediction of difficult rigid laryngoscopy has not improved over the past forty years (3) older skills are being lost .

	1974-1983	1984-1993	1994-2003	2004-2010
totals	2016	1543	725	518
Failed rigid laryngoscopy	9	3	0	9
Sedated fiberoptic	0	212	111	29
Elective video laryngoscope				6
Blind nasal	6			
Mask ventilation	2			
Rescue fiberoptic		2		3
Rescue LMA				5
Rescue video laryngoscopy				1
tracheostomy		1		

Abstract #: S-12

Checklists and Multidisciplinary Team Performance during Simulated Obstetric Hemorrhage: A Prospective Study

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Introduction: There is growing appreciation of the importance of simulation and checklists to optimize team performance during medical crises.1,2 However, there is limited data on multidisciplinary team performance in obstetric simulations such as severe postpartum hemorrhage (PPH). Furthermore, the impact of checklists on team performance during obstetric crises has not been previously investigated. In this study, we exposed multidisciplinary teams to checklist training to evaluate team performance and checklist use in a simulation of major PPH post-vaginal delivery.

Methods: Fourteen multidisciplinary teams, consisting of obstetricians, anesthesiologists and nurses, participated in this IRB-exempt study. Based on expert opinion and an ACOG Patient Safety Checklist,3 we developed a 15-point checklist for PPH management. Each team received checklist training prior to the simulation. We recorded individual times taken to complete all 15 tasks on the checklist; administer a 2nd-line uterotonic; activate the massive transfusion guideline (MTG); and start transfusion of red blood cells. We also assessed the frequency of checklist use, and if a 'checklist reader' was designated. The participants were unaware of the scenario topic prior to the drill and that interventions were timed.

Results: Data on the times taken to perform critical tasks and the rates of task completion are presented in the Table. The median time taken to activate the MTG was 5.14 [IQR = 3.23-6.43] min. A total of 8/14 (57%) teams completed all the tasks on the checklist within 20 min, and 12/14 (86%) teams used the checklist in each simulation (50% intermittently and 50% extensively). A checklist reader was used by 7/12 (58%) teams. Data did not allow for comparisons between checklist users and non-users.

Discussion: Our results indicate that, despite checklist training prior to a simulation, multidisciplinary teams vary in the scope of checklist use, including the use of a reader. In addition, over 40% teams failed to complete all tasks on the checklist. Although access to checklists may have important value as a management tool during obstetric crises, future research is needed to determine whether better provider education and familiarization would optimize checklist utilization.

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Table: Time taken to complete pre-determined critical tasks and all 15 tasks

Critical Tasks	Median Time (IQR; range) (mins:secs)	Number of Teams Completing Task n (%)
Administration of a 2nd-line uterotonic	3:28 (2:45-3:42; 0:54-4:10)	14 (100%)
Time of activation of the MTG	5:14 (3:23-6:43; 1:44-9:55)	14 (100%)
Time of blood transfusion (PRBC)	14:40 (12:56-17:28; 10:48-19:20)	14 (100%)
Completion of tasks on 15-point checklist*	14:30 (12:01-17:52; 10:20-19:08)	8 (57%)
Use of checklist during simulation		12 (86%)

IQR = interquartile range; MTG = massive transfusion guideline; PRBC = packed red blood cells

*= within 20 min of scenario start

Abstract #: S-13

Comparison of Palpatory and Pre-procedural Ultrasound-assisted techniques on performance of spinal anesthesia for Cesarean deliveries - A Randomized Controlled Trial

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Introduction: Pre-procedural ultrasound (US) assessment of the spine is a practical bedside resource used to facilitate the placement of spinal and epidural anesthesia in pregnant women.(1,2) Although certain sonoanatomic features can predict the difficulty of spinal anesthesia in orthopedic patients,(3) this has not been validated in pregnancy. We hypothesize that a pre-procedural US assessment of the spine will improve the ease of spinal anesthesia insertion in term pregnant women undergoing elective cesarean delivery, as compared to the traditional palpatory technique. Furthermore, we hypothesize that sonoanatomic features of the spine can predict the ease of insertion of spinal anesthesia.

Method: 100 patients scheduled for spinal anesthesia were randomized into two groups: US group or Palpatory (Palp) group. Five anesthesia fellows underwent a training program in US assessment of spine and performed all the spinal blocks. The primary outcome was successful spinal block at first needle pass; secondary outcomes were number of needle redirections and attempts, time for successful spinal insertion, bloody tap, paresthesia and pain score. Within 24 h post-procedure, a study investigator, blinded to group allocation, carried out US assessments in all patients for image quality (typical, atypical, inconclusive), and for confirmation of the intervertebral levels for needle punctures.

Results: There were no statistically significant differences between the success at first needle pass (n (%): Palp 18 (38.3), US 20 (37.7); p=0.95), number of needle redirections (mean (SD): Palp 2.8 (4.5), US 2.2 (3.1); p=0.46), > 1 needle attempts (n (%): Palp 10 (21.28), US 7 (13.21); p =0.28) or time for successful spinal insertion (median (IQR), sec: Palp 46.5(25-82), US 36(26-96); p=0.61). Based on image quality, the odds of success were 80% higher in patients with "typical" images compared to those with "atypical" or "inconclusive" image grading.

Conclusion: In Contrast to previous studies(1-3), the use of US did not improve the ease of insertion of spinal anesthesia in term pregnant women when compared to the palpatory technique. The reasons for these results remain to be clarified, however, it appears that the experience of the operators may be an important factor, as we have previously determined that transfer of knowledge for this skill may be quite challenging.4 Interspaces with better image quality were technically less challenging to perform spinal anesthesia as compared to those with poor images.

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Abstract #: S-14

Controlled Release Patterns of Liposomal Bupivacaine after Neuraxial Administration in Rats

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Objectives: In vitro slow releasing pattern of liposomal bupivacaine compared to non-liposomal bupivacaine in the artificial cerebrospinal fluid has been demonstrated previously (1). Therefore, we aimed to evaluate the in vivo effect of intrathecal administration of liposomal bupivacaine on the duration of analgesia and the motor block in rats.

Methods: After approval of the IRB for laboratory studies, bupivacaine HCl (BHCl), bupivacaine base, cholesterol, dipalmitoyl phosphatidylcholine and methanole were distillated with vacuum in rotavapor device. They were kept in an ultrasound bath to achive homogenic distribution. Two different liposomal bupivacaine formulations were made as liposomal bupivacaine (LB) and High Yield Drug Entrapment in Liposome (HYDEL) (2). Three groups consisting of 6 rats were assigned as Group 1 (BHCl), Group 2 (LB), Group 3 (HYDEL). Anesthesia induction was provided with sevoflurane inhalation at low concentrations that may allow awakening within approximately 3 minutes (min). Local anesthetic formulations were injected into the intrathecal space in volume of 30 µl (0.5 % BHCL) at lumbar region after achieving a positive indication of electrical shock-like tail movement and analgesia was assessed using the tail flick test while motor block degree was scored (0: Complete motor block, 1: Partial motor block, 2: No motor block) as described (3,4).

Results: Tail-flick latencies significantly prolonged with (HYDEL) compared to BHCl after 150 min of injection ($p<0.05$). The prolongation of tail flick latencies in BHCl and LB groups have lost their significance after 60 min though the prolongation has stayed for 150 min. in HYDEL group ($p<0.05$) (figure 1). Complete or partial motor block (0 or 1 st degree) decreased to zero in 75 min in the BHCL group but it declined to zero after 20 min in LB and HYDEL groups.

Conclusions: Controlled-release pattern was observed after intrathecal administration of HYDEL bupivacaine in rats. The longer duration of antinociceptive activity in HYDEL than bupivacaine alone without prolonging the motor block might be promising in obstetric anesthesia after further human studies.

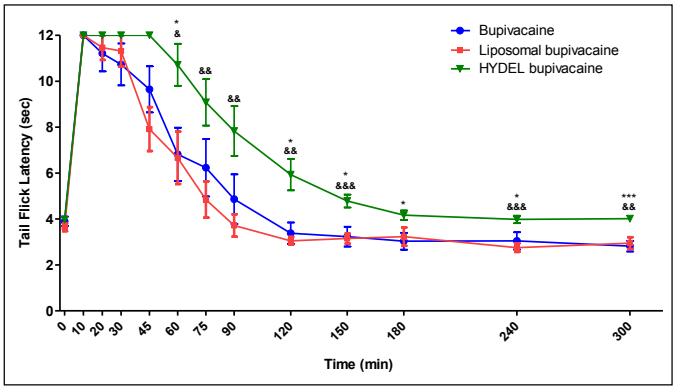

Fig 1. Changes in tail flick latency over time after intrathecal administration of different bupivacaine formulations in rats (n=6 in each group).

Results were presented as mean ± SEM and $p<0.05$ was considered as significant according to Student's t test.

HYDEL= High Yield Drug Entrapment in Liposome.

*:P<0.05 versus bupivacaine HCl group

&:P<0.05 versus liposomal bupivacaine group

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Abstract #: S-15

Diagnosis of Amniotic Fluid Embolism Delayed by Administration of Nitroglycerin

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Background: An amniotic fluid embolism (AFE) is an infrequent event with often catastrophic sequelae. The incidence ranges between 1:8,000 to 1:80,000 with a mortality rate as high as 60%.1 We present a case of AFE with resultant disseminated intravascular coagulation (DIC) during cesarean delivery (CD), but with the initial presentation of hemodynamic instability confounded by concomitant administration of nitroglycerin to facilitate delivery and a temporal relation to cessation of a phenylephrine infusion.

Case: The patient was a 25 year old G5P1131 at 39 and 2/7 weeks gestation with a history of previous CD, pseudotumor cerebri, morbid obesity, and chronic hypertension, scheduled for repeat CD.

Following neuraxial anesthesia via a combined spinal epidural technique, a prophylactic phenylephrine infusion was initiated at 50 mcg/min.2 Immediately following uterotomy, difficulty delivering the fetus ensued. Intravenous nitroglycerin (200mcg) was administered to facilitate a successful breech extraction.3 Shortly after the delivery the phenylephrine infusion was discontinued. Immediately the patient became unresponsive, abruptly hypotensive (BP = 40/20) and bradycardic (heart rate = 30s). The patient was quickly intubated and resuscitated with phenylephrine (400 mcg), ephedrine (25 mg), epinephrine (60mcg), and atropine (1mg). A consumptive coagulopathy with 5 L blood loss resulted; multiple units of blood products were transfused.

The patient ultimately did well and she and the neonate were discharged home postpartum day 3.

Discussion: The initial presentation of AFE with severe hemodynamic instability was confounded by concurrent administration of nitroglycerin and cessation of the phenylephrine infusion. The dosing of nitroglycerin and stopping of phenylephrine may be expected to cause hypotension, but not profound cardiovascular collapse initially refractory to pressors. Nor would it cause DIC. The mean maximal systolic blood pressure decrease following 800 mcg sublingual nitroglycerin has been reported as 18% within 2 minutes of administration, with a corresponding mean maximal pulse rate increase of 24% above baseline.3 Our patient received only 200mcg of nitroglycerin. It is unlikely that this dose contributed significantly to her acute hemodynamic demise. Prompt recognition of an AFE, fast resuscitation to regain hemodynamic stability, and early diagnosis and treatment of DIC are necessary for a chance at a favorable outcome.

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Abstract #: S-16

Dilated Cardiomyopathy Presenting As Heart Failure During Pregnancy

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Introduction:
Heart failure during pregnancy is associated with significant morbidity. We present a case of heart failure progressing to refractory cardiogenic shock requiring Cesarean delivery (CD) and mechanical circulatory support.

Case Discussion:
32 year old G1P0, 29 week twin gestation with a past medical history of asthma was admitted with shortness of breath, productive cough, and chills. She was treated for pneumonia, but decompensated despite therapy. TTE showed global hypokinesis with EF <20%. She was medically managed with dobutamine, diuresis and afterload reduction, and a goal of delivery at 34 weeks was established. At 32 weeks, she developed worsening cardiogenic shock with acute kidney injury, mental status changes, and nausea. Dobutamine was increased and milrinone added with only slight improvement in symptoms. Decision was made to proceed with CD.

The patient was brought to the operating room with cardiac surgery backup in the event emergent mechanical circulatory support was required. Pulmonary artery catheter was in situ, and a left radial arterial line was placed. As the patient was severely dyspneic supine, general anesthesia was induced. TEE showed severe global hypokinesis with LVEF <10%. Low dose epinephrine infusion was added. Fluids were kept to a minimum in preparation for autotransfusion following delivery. Incremental doses of fentanyl were used for analgesia. She was admitted to the ICU postoperatively and extubated later that day. However, cardiogenic shock progressed over the next several days and intraaortic balloon pump was placed with significant improvement in symptoms. Ultimately, Heartmate II left ventricular assist device was placed. She was discharged home three weeks later. Outpatient evaluation revealed familial dilated cardiomyopathy.

Discussion:
Heart failure during pregnancy is most likely to present in the late second trimester, early third trimester or around the time of delivery. Physiologic stresses of pregnancy can unmask previously undiagnosed cardiac disease. Management of heart failure is complicated by limited data regarding use of proven agents during pregnancy and lactation. Diuretics, vasodilators, and neurohormonal blockade are mainstays of treatment. However, mechanical support is used in severe cases and is offered as destination therapy, bridge to transplant or bridge to recovery.

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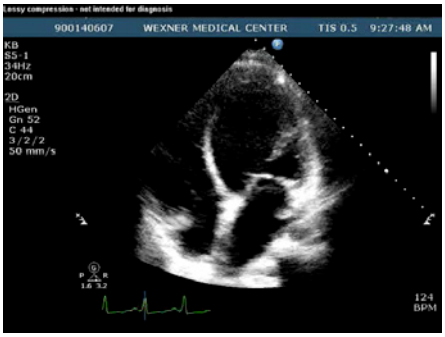

Figure 1. Transthoracic echocardiogram, apical 4 chamber view, diastole.

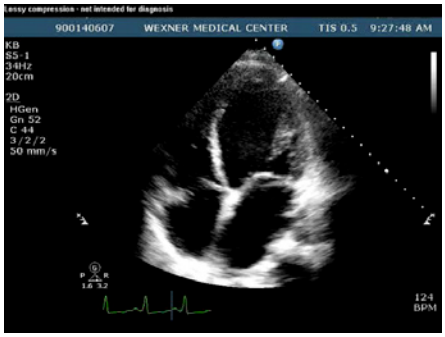

Figure 2. Transthoracic echocardiogram, apical 4 chamber view, systole. EF <20%.

Abstract #: S-17

Does Oral Acetaminophen Reduce Neuraxial Analgesic Requirement during Labor

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Background: Patient controlled epidural analgesia is commonly used for labor analgesia; however patients often require additional dosing despite a basal infusion and self-administered boluses. As the amount of epidural local anesthetic increases, their use can be complicated by maternal hypotension and motor block. Acetaminophen has been shown to be an effective adjuvant for postoperative analgesia and safe for use in pregnancy. Our hypothesis is that administration of acetaminophen during labor will reduce the amount of neuraxial analgesic drug required in a double-blind prospective control study.

Methods: After IRB approval, 60 parturients with cervical dilation <5cm requesting epidural labor analgesia were planned to be consented and randomized to receive either 1 gram acetaminophen(ACT) or placebo(PLAC), administered orally every 6 hours. This was initiated at time of epidural placement and continued until time of delivery. Epidural analgesia was performed and tested as in usual manner. EPCA setting was 6mL/hr basal infusion, 5 mL demand dose with 10 mins interval and hourly limit of 30 mL/hr of 0.125% bupivacaine with 2ug/mL fentanyl. Top-up doses were administered as needed, consisting of either 0.25% bupivacaine, or 2% lidocaine. The primary outcome measure was epidural analgesic consumption per hour. Secondary outcome data were frequency of top-ups, VAS pain scores, vital signs, including temperature, side effects, and neonatal outcomes.

Results: 23 of 60 patients were enrolled (11-ACT and 12-PLAC, remainder to be enrolled prior to SOAP meeting). Demographics were not different between groups. Average duration from initiation of epidural analgesia to delivery was 8.1 hrs (ACT) and 7.9 hrs (PLAC) and 1 patient delivered by cesarean. Preliminary results showed that the total amount of analgesic consumption was 18.9±5.6 and 20.9±4.0 mL/hr equivalence of 0.125% bupivacaine with 2ug/mL fentanyl, respectively for ACT and PLAC groups. Secondary outcomes were not significantly different between groups (Table 1).

Conclusion: Preliminary data suggest that adding oral acetaminophen as an adjunct for labor analgesia reduces epidural analgesic requirement by 10%, though it has not reached statistical significance with 23 of 60 patients. This study assesses the benefit of multimodal approach to labor analgesia; such a combination may improve the quality of pain relief, patient satisfaction, and reduce the amount of local anesthetics and associated side effects.

Table 1

Demographic Data:		ACT (n=11)	PLAC (n=12)
	Age (yr)	28 ± 5	26 ± 5
	Weight (lbs)	190 ± 29	192 ± 27
	Height (cm)	65 ± 4	64 ± 3
	Gestation (weeks) median	39 ± 1	40 ± 1
	Gravida (median)	2	1
	Parity (median)	1	0
	Fetal weight (grams)	3556 ± 614	3515 ± 498
Primary Outcome:	Mean amount of epidural drug consumed mL/hour of equivalent 0.125% bupivacaine + 2ug/mL fentanyl (mean ± SD)	18.9 ± 5.6	20.9 ± 4.0
Secondary Outcomes:	Mean total number of top ups/hr (mean ± SD)	0.1 ± 0.2	0.1 ± 0.1
	Mean duration from epidural start to delivery (mean ± SD) mins	488 ± 396	475 ± 164
	Percent patients not needing top-ups	55.00%	42.00%
	VAS before epidural (mean ± SD)	8.6 ± 1.3	7.5 ± 1.7
	Mean VAS 30 min after epidural (mean ± SD)	2.0 ± 2.8	0.4 ± 0.7
	Median cervical dilations pre epidural (cm)	3.75	3.5
	Min from epidural to 10cm dilations (mean ±SD)	378 ± 311	390 ± 142
	Percent vaginal delivery	91.00%	100.00%
	Median Bromage Score	0	0

*no statistical difference between groups in any category

Abstract #: S-18

Effect of Advanced Maternal Age on Epidural Consumption during Labor

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Introduction:
The number of parturients of advanced maternal age has increased 3-fold from 4.6% to 14.3% over the last 30 years.(1) In the non-obstetric population, older patients have an increased spread of epidural local anesthetic from the lumbar area [2] as well as a decreased epidural narcotic requirement [3]. Many OB studies have analyzed the effect of advanced maternal age (AMA, >35 y.o.) on labor patterns as well as maternal and fetal complications. However, no study has addressed epidural dose requirements as a function of age in parturients. Therefore, we examined the effect of maternal age on epidural local anesthetic consumption during labor.

Methods:
After IRB approval, a retrospective medical chart review was performed for 2008. Inclusion criteria were primigravid women aged >18 years admitted with a gestational age >36 weeks who delivered vaginally. Advanced maternal age was defined as >35 y.o., with <35 y.o. serving as controls. Epidural medications were calculated as AUC as both infusion and bolus dosing. At our institution epidural analgesia is provided by a 0.2% ropivacaine infusion without narcotic and anesthesiologist administered boluses of either ropivacaine, bupivacaine, lidocaine, or chloroprocaine with or without fentanyl. Epidural boluses were converted to ropivacaine equivalent dose in mg by minimal local anesthetic concentration equivalency. [4] Epidural AUC was divided by the epidural duration, to obtain an hourly ropivacaine equivalency rate, in order to account for differences in duration of epidural use. Unpaired T-Test and regression analysis was performed, $p<0.05$ was statistically significant.

Results:
A total of 571 parturients met inclusion criteria, with 124 with advanced maternal age and 447 in the control group. The epidural drug consumption during labor was 22.1 ± 6 mg/h in the advanced maternal age group and 22.8±7.7 mg/h in the control group, P=.36. The duration of epidural infusion was 8.8±4.1 h and 8.1±4.7 h P=0.04, and duration of labor 15.3±7.0 h and 13.9±7.0 P=0.05 for AMA and non-AMA groups. To further examine this effect, we used linear regression analysis of age vs. ropivacaine AUC, which was not correlated, $R^2 =0.003$.

Conclusion:
Advanced maternal age leads to complications of pregnancy including increased cesarean rate, preeclampsia, and hemorrhage. In our study AMA parturients required the same epidural dose per hour, yet with longer labors. Our study is the first large study examining epidural local anesthetic requirements in primiparous AMA parturients completing vaginal delivery. Advanced maternal age parturients do not follow the decreasing epidural requirement pattern seen in non-pregnant older patients. The correct dosing requirements of AMA parturients are important in this group at higher risk for obstetric and anesthetic complications.

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Abstract #: S-19

Effect of maternal betamethasone on the fetal peak middle cerebral artery Doppler velocity in a case of Duffy alloimmunization

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Betamethasone has become the standard for mothers at risk of preterm labor to decrease neonatal morbidity and mortality. As middle cerebral artery peak systolic velocity (MCA PSV) is essential in the diagnosis and management of fetal anemia, it is important to understand the effect of betamethasone on MCA PSV. We report a case of transient and significant decrease in fetal MCA PSV after betamethasone administration in a case of anti-Fya alloimmunization. Our patient was a 37 year old G4, P2002 at 27 weeks' gestation with anti-Fya alloimmunization and elevated MCA PSV of greater than 1.5 multiples of median (MoM). During the pregnancy, the patient was followed with serial anti-Fya titers along with MCA Dopplers. The titer at 25 6/7 weeks was 128 and 256 by 27 weeks. Her MCA PSV trended from 1.65 MoM at 16 4/7 weeks to greater than 2.0 MoM at 26 4/7 weeks.

The patient received intramuscular betamethasone at 26 5/7 weeks gestation. Ultrasound revealed no evidence of fetal hydrops with a MCA PSV of 1.53 MoM. Based on the borderline value for her MCA and similar findings in her previous pregnancy, a second dose of betamethasone was administered. At 27 weeks, her MCA PSV was once again elevated to 1.8 MoM. Fetal echocardiogram revealed an increased RV cardiac dimension. Based on these findings, a decision was made to proceed with cordocentesis.

At 27 1/7 weeks, cordocentesis revealed a fetal hemoglobin of 5.2. Blood typing revealed the presence of the Fya antigen with a positive direct Coombs. The patient underwent a series of five uneventful intravascular transfusions, the last at 35 weeks. At 37 3/7 weeks, she underwent induction of labor with delivery of a 2891 g male infant with Apgars of 8 and 9. Initial neonatal hemoglobin was 16.6 and total bilirubin was 6.5 with a decline to 4.5 in 24 hours. Patient and infant were discharged on the second day of life.

Doppler measurement of the fetal MCA PSV has been adopted almost universally to evaluate for anemia. The MCA PSV is influenced primarily by fetal hemoglobin concentration. Previously, there have been conflicting reports on the effects of maternally administered corticosteroids on fetal hemodynamics. There are several possible mechanisms of a glucocorticoid-induced decrease in MCA PSV. Betamethasone partially crosses the placenta and binds to glucocorticoid receptors which are plentiful in the hippocampus, thus changing vascular tone. Another possible mechanism is that glucocorticoids induce synthesis and production of placental corticotropin releasing hormone, increasing nitric oxide expression and vasodilation, presumably affecting cerebral blood flow. In conclusion, our case describes a transient decline in the MCA PSV after maternal betamethasone that has not previously been described. If confirmed, MCA PSV should be interpreted cautiously, as anemic fetuses could be misdiagnosed when the Doppler MCA PSV normalizes after antenatal betamethasone.

Abstract #: S-20

Effect of Obesity on Epidural Ropivacaine Consumption During Labor

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Introduction:
Obese parturients have more complicated pregnancies and a higher risk of cesarean section(1), and difficult intubation. Early placement of epidural anesthesia is very important in the management of the obese parturient to avoid morbidity during a crash general anesthetic. However, the literature is controversial on the effect of obesity on epidural dosing. One study(n=32) suggested that obese parturients require less epidural local anesthetic(2). However, another study found no difference in the spread of epidural analgesia in obese parturients(3). We examined the effect of obesity on epidural ropivacaine consumption during labor.

Methods:
After IRB approval, a retrospective chart review was performed for the year 2008. Inclusion criteria was primigravid women aged >18 years who were admitted with a gestational age >36 weeks and who delivered vaginally. The obese group was body mass index (BMI) > 30 kg/m^2 and non-obese group was BMI < 30 kg/m^2. At our institution epidural analgesia is provided by a 0.2% ropivacaine infusion without narcotic and anesthesiologist administered boluses of either ropivacaine, bupivacaine, lidocaine, or chloroprocaine with or without fentanyl. Total epidural medications were calculated as ropivacaine area under the curve (AUC) as both infusion and bolus dosing. Epidural boluses were converted to ropivacaine equivalent dose in mg by minimal local anesthetic concentration equivalency(4). Unpaired t-test was performed to compare ropivacaine usage in the two groups, $p<0.05$ was considered statistically significant.

Results:
567 patients met the inclusion criteria; the obese group (n=143) and the non-obese group (n=424). The obese group consumed 22.45±7 mg/hr ropivacaine compared to 22.75±7.6 mg/hr ropivacaine in the control group, P=0.6. The duration of epidural infusion was 8.9±4.7 h and 8.03±4.5 h P=0.05, and duration labor 15.4±7.6 h and 13.7±6.8 P=0.01 for obese and non-obese groups. To further examine this effect, we used linear regression analysis of BMI vs. ropivacaine AUC, which was not correlated, r^2 =0.016.

Conclusion:
Obstetrical studies have shown obesity leads to complications of pregnancy including a slower labor (5), as well as an increase in cesarean rate, preeclampsia, and postpartum hemorrhage(6). While a previous study found reduced MLAC in obese parturients(2), we found obese and non-obese parturients had the same epidural requirements for labor analgesia. Our study is the first large study examining epidural local anesthetic requirements in primiparous obese parturients completing vaginal delivery. The correct dosing requirements for obese parturients is important to help manage their labor and especially if the need for cesarean arises.

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Abstract #: S-21

Electroconvulsive Therapy during Pregnancy

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Introduction: Major depressive disorder (MDD) is the most common mental illness during pregnancy. 20% of pregnant women report symptoms of depression and 9% suffer with an episode of major depression.1 MDD refractory to medical management and psychotherapy does occur and electroconvulsive therapy (ECT) remains perhaps the single most effective psychiatric intervention. Antenatal depression has been associated with higher rates of poor pregnancy outcomes including preeclampsia, preterm delivery, impaired fetoplacental function, decreased fetal growth, and neonatal complications.1

Case: We report the case of a 32 yo G2P1 presenting at 28 weeks for ECT due to MDD with increasing suicidal ideation. Her psychiatrist recommended a course of twice weekly ECT. We discussed the implications of the pregnant airway and agreed she should be intubated for each session. She was premedicated with famotidine, metoclopramide, and sodium citrate. Twenty minutes of fetal heart tone (FHT) monitoring was performed pre and post procedure. She was placed in left uterine tilt and pre-oxygenated prior to rapid sequence induction with methohexital and succinylcholine. Cricoid pressure was applied until tracheal intubation was confirmed with auscultation and end-tidal CO2. Utilizing mild hyperventilation, the ECT was performed and an adequate seizure was induced. Upon awakening and following commands, she was extubated. During the first ECT session, the patient had an episode of laryngospasm immediately after extubation, which resolved quickly with CPAP. To reduce secretions, glycopyrrolate was given for the subsequent procedures and laryngospasm did not recur. Acetaminophen, rather than ketorolac, was given for the discomfort associated with ECT. A total of 12 ECTs were performed from 28 to 34 weeks gestation. As she developed severe procedural anxiety, we began administering post-ECT midazolam. No FHR decelerations or premature contractions occurred during the process, despite them being the most common fetal and maternal adverse events in ECT.1

Discussion: ECT is considered a safe and effective treatment for pregnant patients with MDD. Airway management and fetal monitoring are key components for ECT during pregnancy. Providers must consider both increased aspiration risk and the challenges inherent to the pregnant airway. The psychiatry team should be aware of the unique risks to both mother and fetus when offering ECT. Deviating from our normal practice of mask ventilation for non-pregnant ECT necessitated much discussion with the psychiatry and nursing staff, along with additional equipment, monitoring and personnel to ensure maternal and fetal safety. Not only was the patient intubated twice a week, but preparations were in place to mobilize for a crash cesarean delivery in a non-obstetric pavilion. Our patient's depression greatly improved and was followed by an uncomplicated term delivery of a healthy baby.

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Abstract #: S-22

Emergency Cesarean Delivery in a Patient with Severe Pulmonary Arterial Hypertension (PAH): A Major Dilemma

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Background: Pulmonary arterial hypertension (PAH) in pregnancy is associated with a prohibitive maternal mortality of 30-56% and thus, pregnancy is strongly discouraged in these patients. Physiologic pregnancy changes compound the compromised hemodynamic state in PAH. Although new advances in medical management of PAH offer improved prognosis, maternal mortality remains high. We describe the anesthetic management of a patient with severe PAH for emergency cesarean delivery.

Case Report: A 25-year old (G3P1) female presented at 35 weeks gestation with progressive dyspnea at rest, and fetal tachycardia. Past medical history was significant for severe PAH (Echo: RVSP 96 mmHg, dilated PA, enlarged RV). Physical exam was notable for RR of 32 breaths/min, pan systolic murmur(TR), SpO2 of 91% on 10L O2. Her platelet count was 37,000/cmm, with active epoprostenol infusion. After consultation with a multi-disciplinary team, an emergent cesarean section with postoperative ICU care was planned. With a pre-induction arterial line and IABP 120/70, HR 120; cardiac index (CI) of 2.1 L/min/M2 (Edward FloTracTM) and epoprostenol infusion(1ng/kg/min), a rapid sequence induction with lidocaine, etomidate and succinylcholine was performed. After delivery of a viable male neonate with Apgar scores of 91 and 95 and initiation of oxytocin infusion, there was acute hypotension and marked drop in CI which responded to phenylephrine, ephedrine and slowing of oxytocin infusion. The hemodynamics were stabilized with loading dose of milrinone and patient was transferred sedated and intubated to the ICU, where her vital signs were stable and she was following commands. The first 16 hours in the ICU were uneventful except for vaginal bleeding which resolved with treatment. However, on POD 1, she had sudden desaturation and hypotension which prompted an increase in epoprostenol rate with addition of nitric oxide, dopamine and eventually norepinephrine. Despite aggressive therapy, the patient continued to deteriorate and finally succumbed on POD 3.

Conclusion: The majority of deaths among parturients with PAH occur in the peripartum period due to the exaggerated hemodynamic changes which may exacerbate pre-existing hypoxia, leading to further PA vasoconstriction, hypercarbia and acidosis with further increase in PAH and right-sided heart failure. This case demonstrates the challenging management in a patient with severe PAH that presented late in pregnancy with acute deterioration requiring an emergent cesarean section under general anesthesia, and subsequent demise in postoperative period. Although no one mode of delivery or type of anesthesia may be superior in these patients, the importance of early intensive monitoring and treatment during gestation with a multidisciplinary team and a controlled approach to delivery cannot be over emphasized.

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Abstract #: S-23

Endovascular Repair of a Descending Aortic Aneurysm in a Pregnant Patient and Subsequent Cesarean Delivery

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Case: A 37 year old G3P2002 presented with chest pain and back pain at 22 weeks gestation. MRI showed a 5.1 cm thoracic aortic pseudoaneurysm distal to the left subclavian artery, as well as dilation of the ascending aorta and main pulmonary artery.

The patient insisted on continuing her pregnancy and agreed to proceed with endovascular repair of the aneurysm. A multidisciplinary meeting to plan the repair included an obstetrician, cardiac anesthesiologist, and cardiothoracic and vascular surgeons.

In addition to standard ASA monitors, an arterial line and central line were placed. General anesthesia was induced with propofol and rocuronium. Blood pressure was controlled intraoperatively with nicardipine and labetalol. A total of 10,000 units of heparin were given for anticoagulation. Intravascular ultrasound (IVUS) was utilized to identify the origin of the left subclavian artery, as well as measure the aorta for endograft sizing. The endovascular stent was deployed just distal to left subclavian artery. IVUS, TEE, and spot fluoroscopy were utilized to confirm adequate deployment and apposition of the thoracic endograft. No contrast was used and total radiation exposure was 8mGy.

The patient was extubated, monitored postoperatively in the ICU, and had an uneventful hospital course. Postoperative fetal monitoring was normal. At 34 weeks gestation, she was scheduled for a primary cesarean delivery. A multidisciplinary meeting for her delivery management included her obstetrician, obstetric anesthesiologists, cardiac anesthesiologists, and a cardiothoracic surgeon. Low-dose combined spinal-epidural anesthesia was elected to avoid hemodynamic changes that could occur during general anesthesia for cesarean delivery (rapid sequence induction, intubation, emergence). Cesarean delivery and her postoperative course were uneventful.

Discussion: Presentation of descending aortic aneurysm is rare during pregnancy. Etiologies include hypertension, hypercholesterolemia, atherosclerosis, connective tissue abnormalities, trauma, and inflammatory and infectious disorders.1 Dissection during pregnancy occurs most often in the third trimester or early postpartum period due to maximal increases in cardiac output.2 Multidisciplinary management for aneurysm repair and for delivery is essential. Endovascular repair during pregnancy is challenging due to limitations on use of IV contrast, CT, X-rays and fluoroscopy. Utilization of intraoperative TEE and IVUS allowed avoidance of contrast and minimization of ionizing radiation. Epidural anesthesia has been used successfully for cesarean delivery to minimize hemodynamic changes that increase sheer stress during intubation and emergence.1,3

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Abstract #: S-24

Epidural analgesia and Impaired Breastfeeding

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Background: Epidural analgesia is an effective method for labor pain management and its use has increased rapidly in recent years in the US and countries throughout the world. However, the effect of epidural analgesia on breastfeeding initiation and maintenance has been controversial, with some studies reporting impaired breastfeeding after epidural use, while others have not.

Methods: 3,006 women aged 18 to 36 who were expecting their first child in Pennsylvania in 2009 to 2011 were interviewed after 34 weeks gestation to measure plans for breastfeeding, and 1 month after childbirth to measure breastfeeding initiation and maintenance.

Results: Overall, 2772 women (92.2%) reported prior to delivery that they planned to breastfeed. Among those who planned to breastfeed, 1,979 (71.4%) delivered vaginally and were included in these analyses. Those who had used no pain medication (n = 201) or narcotics only (n = 84) were more likely to report at 1 month postpartum that they were successfully breastfeeding (86.1% and 88.1% respectively), while those who had received epidural analgesia alone (n = 1,082), or in combination with other types of analgesia (n = 566), were less likely to be breastfeeding (76.7% and 70.3%, respectively), $p < .0001$. Controlling for confounders did not affect this association. Women who received an epidural were more likely to report that they did not have enough milk.

Conclusions: Receipt of epidural analgesia during labor decreases the likelihood that a woman who plans to breastfeed will be able to successfully maintain breastfeeding.

Abstract #: S-25

Evaluation of Epidural and Peripheral Nerve Catheter Heating during Magnetic Resonance Imaging

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Background: Many epidural and peripheral nerve catheters contain a polymer bound wire that could heat to unsafe levels when exposed to magnetic resonance imaging (MRI). As MRI is the gold standard for diagnosing epidural hematoma following placement of an epidural catheter, it is important to determine whether such catheters should be removed during MRI 1-3.

Methods: The six catheters we studied included three from Arrow International, Inc. (MultiPort Epidural with FlexTip Plus, Epidural with FlexTip Plus, and StimuCath Peripheral Nerve Catheter), two from B. Braun Medical Inc. (Contiplex Polyamide PNC, and Perifix FX Epidural), and one from Smiths Medical/Portex (Epifuse Nylon Epidural). Two of the six selected catheters, the Arrow International, Inc. StimuCath Peripheral Nerve Catheter and the B. Braun Medical Inc. Perifix FX Epidural, were found to be magnetic, attracted by the MRI magnetic field, and thus were excluded from radio frequency (RF) heat testing. Four catheters were placed in a standard human torso- sized phantom in clinical 1.5T and 3T MRI scanners in an epidural configuration, extending 5cm parallel to the main magnetic field. An MRI pulse sequence was applied with a maximum scanner allowed RF specific absorption rate (SAR) for 15 min 4. Temperature and SAR exposure were sampled during MRI using multiple fiberoptic temperature sensors at reference and catheter locations in the phantom.

Results: At 3T, exposure to the scanner's maximum RF exposure produced anomalous heating to 47°C in the two Arrow catheters (MultiPort Epidural with FlexTip Plus, Epidural with FlexTip Plus), with greatest heating occurring at the entry point for all devices. Temperature increases for the other catheters at 3T and all catheters at 1.5T were <1.5°C. When normalized to an applied average SAR exposure of 4W/kg, maximum temperature increases were 0.12.5°C at 1.5T, and 0.72.7°C at 3T for all catheters except the Arrow device at 3T whose maximum projected heating was 14°C.

Conclusions: Heating of <3°C during MRI for most catheters is not expected to be injurious. While heating was lower at 1.5T vs. 3T, performance variations between different manufacturer's devices underscore the need for safety testing prior to performing MRI.

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Abstract #: S-26

General Anesthesia and Endotracheal Intubation Experience from an Academic Labor & Delivery Service

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Introduction: General anesthesia (GA) is discouraged during cesarean delivery (CD) because the physiological changes of pregnancy are thought to result in a higher incidence of difficult intubation (DI) and aspiration, although this has been questioned in recent years.

Methods: The records for all GA used for cesarean section at an academic institution from September 2008-March 2012 were extracted. Information collected included age, BMI, ASA class (ASA), anesthetic start time, intubation attempts, Cormack-Lehane grade (CLG), esophageal intubation, airway equipment used, difficulty of mask ventilation, and indication for GA. Characteristics of the general anesthetic group were described, and factors potentially associated with difficult intubation were examined. DI was defined as any case requiring more than one attempt at placement of the endotracheal tube. T-tests and Fishers exact test were used to compare the groups (difficult versus not difficult intubation).

Results: 220 (3.5% of 6323 anesthetics) GA cases were performed predominantly for obstetrical emergencies (53%) and failed regional (RA) anesthesia (32%). Overall, 18 (8%) parturients were CLG 3 or 4, 14 (6%) required multiple attempts, 7 (3%) required special airway devices (Glidescope, bougie, etc.), and (3) 1% had esophageal intubations. Of the 14 cases of multiple intubation attempts, 3 required more than two attempts, but all patients were successfully intubated with a combination of Glidescope or bougie. Eleven of the 14 patients (78%) requiring multiple intubation attempts needed ventilation prior to another attempt. One patient required an oral airway (grade 2) to facilitate ventilation, while the remainder needed no airway device (grade 1). No reported cases of aspiration occurred although cricoid pressure was maintained in all cases. Age, BMI, ASA, day versus night cases, or classification as an emergency were not associated with an increased risk of DI.

Discussion: The incidence of DI (6-8%) in parturients may be higher then the quoted 5% in the general surgical population. However, there were no reported cases of aspiration despite 78% of DI patients requiring positive pressure ventilation. This may be secondary to the use of adequate cricoid pressure, low peak pressures, a low incidence of aspiration, or NPO guidelines in laboring parturients. Almost 90% of GA occurred in patients with preexisting RA (failed RA and emergency procedures) reinforcing that practitioners should not have a false sense of security with functioning RA. Our data are consistent with other reports that failed intubation is low in this population because of the accessibility of difficult airway equipment on L and D. Although predictive models of DI in parturients have been largely unsuccessful there is some evidence that increased BMI is associated with DI. Our data contradicts this finding and found that none of the factors analyzed were predictive.

Abstract #: S-27

How far is too far? Tales of the Tuohy

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Introduction: The obesity pandemic remains a significant public health concern in the United States, with Louisiana leading this trend (1). In the 1980s and 1990s the mean depth to the epidural space was demonstrated to be 4.2-4.9 centimeters (cm)(2). In 2007, Clinkscales et al demonstrated a mean depth of 5.3 cm in Michigan patients paralleling the explosion in the obesity pandemic (3). Anecdotally, we have noted greater average depth to the epidural space and a higher rate of patients with loss of resistance greater than 8 cm depth than previously reported (2-4). We sought to determine the rates of obesity in our obstetric population, as well as the depth to the epidural space and correlate these results with body mass index (BMI) at term gestation, and to quantify the number of parturients with >8cm depth.

Methods: After Institutional Review Board approval, a retrospective chart review was conducted for patients admitted to Ochsner Medical Center for delivery between November 1, 2012 and October 31, 2013. BMI (measured at the initial and final prenatal visits), anesthesia type, depth to the epidural space (in the sitting position), and delivery mode were recorded. Obesity rates, as well as depth to the epidural space in relation to BMI were measured. These end points were then stratified by delivery mode to determine if differences between groups could be demonstrated.

Results: Data from 608 parturients has been analyzed to date. Mean BMI at presentation and term gestation was 28.5 ± 7.8 kg/m2 and 32.4 ± 7.6 kg/m2, respectively. Antepartum rates of class I, II, and III obesity were 15%, 9%, and 10%. Mean depth to the epidural space was 6.2 cm ± 1.4 cm. BMI positively correlated with depth to the epidural space (Table 1). Ten percent of parturients had loss of resistance at greater than 8 cm depth.

Conclusion: The rise in obesity during pregnancy continues, with an increase in average depth to the epidural space by approximately 1 cm since the latest published data (2). The notion that the epidural space is rarely encountered at greater than 8cm no longer holds true, as 10% of our patient population exceeds this measure.

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BMI (kg/m^2)	n	Mean ± SD (cm)	Median	Range
≤29.9	260	4.81 ± 0.77	5	3.5-9
30-34.9	129	5.52 ± 1.05	6.5	4.5-9
35-39.9	106	6.36 ± 1.12	7	5-9
≥40	110	7.31 ± 1.25	8	4-10
Total	608	6.24 ± 1.44	6	3.5-10

Abstract #: S-28

How long does it take to do a spinal anaesthetic procedure: a pragmatic, observational study

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Background: Neural axial anaesthesia has become the anaesthetic of choice in obstetric anaesthetic practice but general anaesthesia remains the quickest technique to deliver the baby. With body mass index (BMI) of pregnant women increasing this can lead to dilemmas and conflict between anaesthetists and obstetricians in balancing the need for quick delivery due to urgency and the need for safety of the mother. Often this stems from the perceived delay caused by the spinal anaesthetic procedure when compared to a general anaesthetic technique. We carried out a pragmatic and prospective observational study to evaluate how long it takes to do the spinal anaesthetic procedure from the time the patient arrives in the operating theatre. Other outcomes evaluated were the variation within Caesarean section (C/S) urgency categories and increasing BMI, time to adequate block height and surgical time to deliver the baby. Study was approved by hospital audit department for ethical issues.

Methods: Following a small pilot 112 patients were studied. The following times were noted; arrival in theatre, spinal injection or tracheal intubation, knife to skin and delivery time. From these the following time durations were calculated; arrival to spinal injection or intubation (T1), spinal injection or intubation to KTS (T2), KTS to delivery (T3) and overall time (T4). Also noted was patients' BMI and urgency of operation for C/S.

Results: Median T1, T2, T3 and T4 for category 1 C/S spinal procedure were 9:30 min, 8:30 min, 4:00 min, and 22:30 min respectively. Median T1 for categories 2, 3, and 4 were 11:30 min, 14:30 min and 14:00 min respectively. Median T1 for BMI categories <20, 21-25, 26-30, 31-35, 36-40 and >40 were 12:30 min, 11:00 min, 14:00, 14:00 min, 10:00 min and 14:30 min respectively. There were 5 GAs with a median T1 of 6:00 min and 8 CSEs with median T1 of 15:30 min.

Conclusion: The spinal anaesthetic procedure is quick enough for a category 1 urgency C/S within our current standard target of delivering the baby within 30 mins from decision time were appropriate. General anaesthesia remains the quickest way to anaesthetise a mother but is associated with more morbidity and mortality. Communication with obstetric staff is very important in minimising other factors affecting decision delivery time and conferring urgency of delivery if we are to avoid unnecessary GAs.

Abstract #: S-29

Identifying and Analyzing Patient Volume Fluctuations on Labor and Delivery

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Summary: Accurate estimation of patient volume provides hospital leaders with the ability to appropriately match staff resources to patient needs. For this reason, it is important to be able to predict volume fluctuations as accurately as possible. In this study, we analyzed the fluctuation in patient volume as well as the potential causes for the day-to-day variation in the Labor and Delivery (L&D) Unit.

Background: When staffing remains fixed, patient volume fluctuations may cause inefficiencies in staff utilization. Several studies have shown an association between staff overutilization and decreased nursing staff retention rates.[1] A correlation between increased near-miss events and overworked medical personnel has been reported by several organizations.[2]

Methods: Registrars utilized an electronic scheduling system (ESS) to schedule cesarean sections (CS) and inductions. Providers utilized a separate electronic medical record (EMR) to document care of patients. We obtained institutional data from both the ESS and EMR for the period May 2012 to May 2013 and separated total deliveries into non-CS, CS from the Triage Unit, CS from labor rooms, and scheduled CS. Scheduled inductions were also analyzed.

Results: We found a significant daily variation in patient volume on L&D, as exemplified by April 2013 (Figure 1). Data for the period May 2012 to May 2013, analyzed by day of week using ANOVA, showed a statistically significant peak in average total number of deliveries Wednesday and Thursday (17.3), compared with the average number on Monday, Tuesday, and Friday (16.1) and on Saturday and Sunday (13.5), $p<.05$. This included scheduled CS, scheduled inductions, and all unscheduled deliveries. The proportion of scheduled deliveries was 30%.

Conclusion: Our data suggest that predictable patterns in patient volume fluctuations on L&D may present us with opportunities to actively manage patient flow and reduce these fluctuations by redirecting selected patients to low volume days. In conjunction with a dynamic nursing staffing model, this could help us better match patient volume to staff resources.

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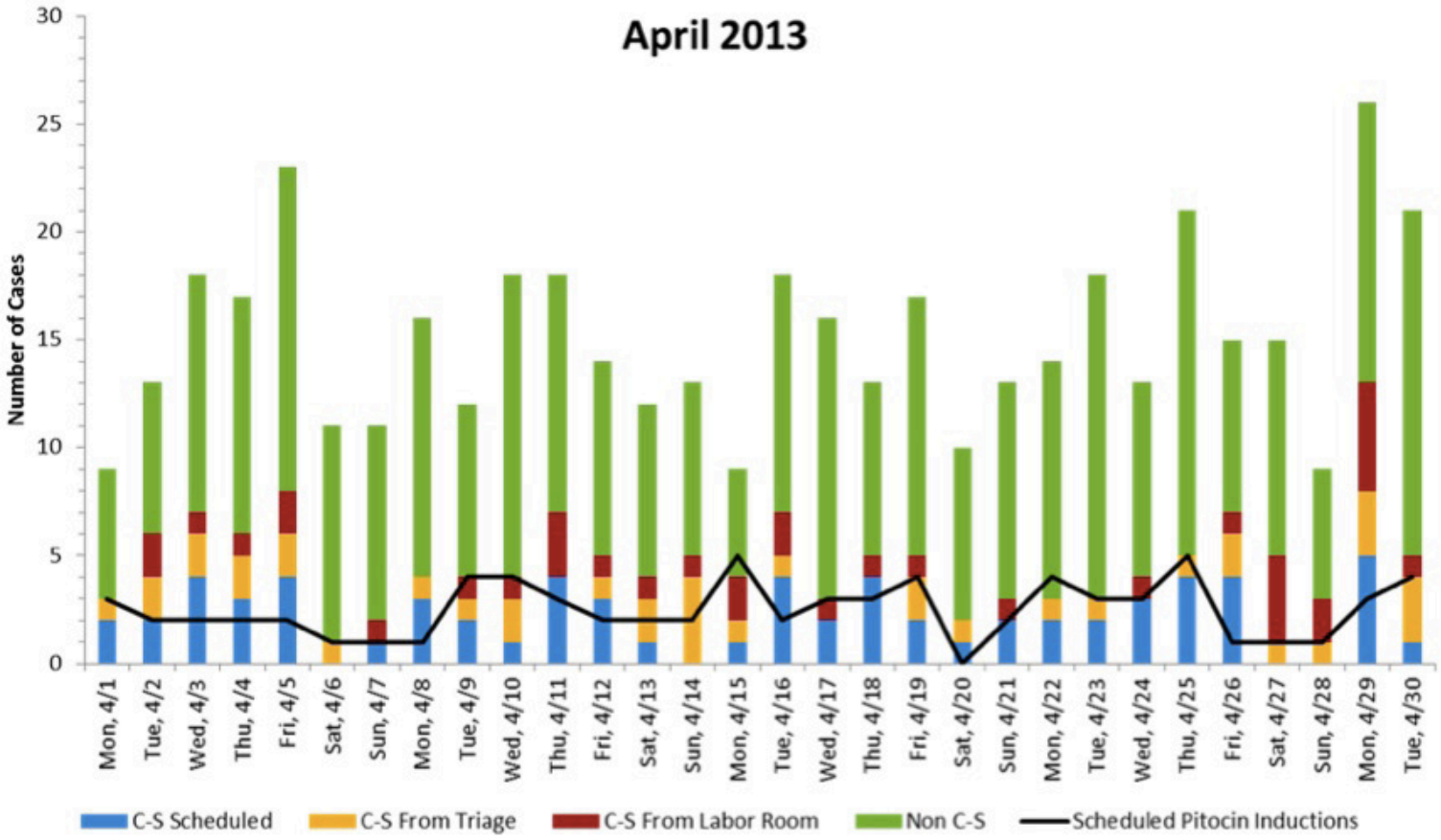
Figure 1

L&D Total Volume Variation



Abstract #: S-30

Intrathecal bupivacaine dose for cesarean delivery is not reduced in obese compared to non-obese parturients

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Background: The optimal dose of local anesthetic for obese parturients undergoing spinal anesthesia for cesarean delivery (CD) is controversial due to concerns about exaggerated block spread with doses used in non-obese patients. Previous MRI studies have shown that obese patients have reduced lumbar cerebrospinal fluid volume, and that there is an inverse correlation between this reduced volume and the cephalad spread of neuraxial blockade (1,2). Other studies, however, examining the ED95 and ED50 of hyperbaric bupivacaine for CD in obese and non-obese patients do not seem to support concerns of high cephalad spread (3,4). The purpose of this study was to investigate the hypothesis that standard doses of hyperbaric bupivacaine for CD do not cause an increased risk of high spinal block in the obese parturient.

Methods: After IRB approval, we searched the perioperative database for women who underwent CD under spinal or combined spinal epidural anesthesia from 2003-2012. We included patients who received our standard doses of local anesthetic (1.4-1.6mL of 0.75% hyperbaric bupivacaine) with fentanyl 15mcg and morphine 0.1-0.2mg. Obesity was defined as BMI ≥ 30. Exaggerated cephalad block (high spinal) after initial spinal dose was the primary outcome. High spinal was defined as need to convert to general anesthesia within the first 20 minutes after initial block due to weakness, altered mentation or respiratory distress or recorded block height ≥ T1. Chi-square test was used to compare high spinal rate between obese and non-obese parturients. We also performed a multivariable regression analysis with high block as the outcome and age, height, weight, obesity, ethnicity, gestational age and hyperbaric bupivacaine dose as predictors.

Results: 4724 patients (1828 non-obese and 2896 obese) fulfilled the inclusion criteria and were included in the analysis. Except for higher weight and BMI in the obese group, there were no clinically significant differences between the groups in age, height, ethnicity, gestational age or dose of hyperbaric bupivacaine used. Overall, there were 28 high spinal blocks (0.6%) with no significant difference between obese and non-obese parturients (0.7% versus 0.4%, p=0.2). In two obese and one non-obese patient, general anesthesia was induced due to a high block. In the multivariable model, obesity was not a significant predictor of high block [adjusted odds ratio (95% confidence interval) = 1.1 (0.4-3.0)] nor was any of the other predictors.

Conclusions: At standard spinal doses of hyperbaric bupivacaine for CD, there is no significant difference between obese and non-obese patients in the risk of developing high spinal block. These findings confirm earlier ED95 and ED50 studies and suggest that spinal dose reductions are not required in this population.

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Abstract #: S-31

It happened again: How safe is neostigmine and glycopyrrolate during nonobstetric surgery?

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"It happened again: How safe is neostigmine and glycopyrrolate during nonobstetric surgery?"

Introduction: There is limited and controversial data concerning the use of neuromuscular blockade reversal agents in parturients undergoing non obstetric surgery.1 Due to their large quaternary ammonium structure, neostigmine and glycopyrrolate are thought to have limited placental transfer.2 However, Clark and Brown, et al. previously reported a case of mild, transient fetal bradycardia after neostigmine and glycopyrrolate administration in a parturient under general anesthesia. The authors attributed this bradycardia to neostigmine placental transfer and the inability of glycopyrrolate to cross the placenta relative to neostigmine. On a repeat surgery in the same patient a few days later, the authors used neostigmine and atropine without complication.2 Due to the lack of conclusive evidence of harm, many providers still use the combination of neostigmine and glycopyrrolate for reveral of neuromuscular blockade in parturients undergoing nonobstetric surgery.

Case: We present a case of a G4P2 parturient at 27+6 weeks gestational age undergoing general anesthesia for placement of bilateral nephrostomy tubes for nephrolithiasis. Prior to induction of anesthesia, fetal heart rate was reassuring and within normal limits. Induction, intubation and maintenance of general anesthesia were uncomplicated with continued reassuring fetal heart tones throughout the case. At conclusion of procedure, neuromuscular blockade was reversed with neostigmine and glycopyrrolate, which was followed by immediate prolonged and persistent fetal bradycardia. The patient had not received any other medications and was hemodynamically stable at the time of fetal deceleration. Intrauterine resuscitation was performed with left uterine displacement, 100% oxygen and intravenous fluids. Although no uterine contractions were noted, the fetal bradycardia persisted necessitating emergent cesarean delivery.

Discussion: This case highlights that the combination of neostigmine and glycopyrrolate for the reversal of neuromuscular blockade during nonobstetric surgeries may present unrecognized risk to the fetus. Providers should be aware of this potential for harm and may choose to administer these agents incrementally with special attention to fetal status. Although unproven, this case supports the recommendation for consideration of a prior injection of an anticholingeric agent followed by a slow titration of an anticholinesterase inhibitor 3

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Abstract #: S-32

Laboring Patient with Hereditary Angioedema and Recent Lumbar Surgery

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We present a case of a patient with Hereditary Angioedema in labor with h/o previous C-Section and recent lumbar spine surgery requesting VBAC.

32 years female,G2P1, at 42 weeks with a history significant for HAE, G6PD deficiency, anxiety and prior C-Section presented in early labor for desired VBAC. Patient was diagnosed with HAE type 1 at age of 12 with symptoms of bowel angioedema. She had a strong family history of HAE type 1(her two sisters are affected and one of them required multiple intubations during her pregnancy). For the last 20 years, the patient had flare ups 1-2 times a year, mainly abdominal pain from bowel angioedema. She was hospitalized 3 times for laryngeal edema, was never intubated and treated with IV C1 concentrate. Patient underwent back surgery for lumbar disc problems. Patient claimed that the neurosurgeon forbade regional/neuraxial anesthesia in the future.

Upon consultation with Anesthesia at 37 weeks, MRI of lumbar spine were requested. Neurosurgical record was not available. MRI of lumbar spine revealed mild degenerative disc disease at L4-L5 level w/o spinal or foraminal stenosis, and 12 mm benign hemangioma(incidental) at left posterior L3 vertebral body. Patient agreed for neuraxial anesthesia, once the risks versus benefits were explained to her.

On admission, the patient was hysterically crying in pain and very anxious. A CSE was successfully placed at L5-S1 level uneventfully. IV fluids were minimized to KVO and patient was allowed to have clear liquids. First stage of labor lasted 5 hours and overall was uneventful. There was a short period of flat tracing of the baby's heart rate and a decision was made to proceed with C-Section. In the interim, patient became fully dilated and she delivered a healthy girl. C1 esterase inhibitor 500 units was given IV prophylactically as per the recommendation from the immunologist. Postpartum period was uneventful.

Discussion:
Acute therapy for HAE includes C1 esterase inhibitor (human), kallikrein inhibitors, and bradykinin inhibitors. The patient in this case had C1 esterase inhibitor, which is dosed at 20 units/kg. Prophylactic regimens include 17-alpha-alkylated androgens such as danazol, oxandrolone and stanozolol, all of which are thought to increase endogenous C1 esterase inhibitor levels in the serum via hepatic synthesis.

Based on our case experience, we advocate for:

1. Early multidisciplinary team involvement(Pharmacy, OB, Anesthesia, Blood Bank, Allergy-Immunology)
2. Have C1 Esterase inhibitor readily available and in-service on it's administration.
3. Early placement of epidural anesthesia to provide effective analgesia.
4. Restrictive fluid management to minimize interstitial edema
5. Early airway management if symptoms of swelling evident. Stand by jet ventilation and tracheostomy kit available.

Abstract #: S-33

Labour epidural in a mother with Hansen's disease

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Hansen's disease or leprosy is a rare chronic systemic infection causing severe peripheral neuropathy. This systemic disease poses a challenge to the anaesthetists, not only because of the effects it has on the multiorgan systems, but also the lack of awareness of the effects it has on the parturient. There is a lack of hard data relevant to current practice in the western world especially in obstetric patients (1)

We present a 26-year-old primip originating from Sri Lanka who was admitted to labour ward at a 39 weeks gestation. She requested epidural for labour analgesia. She had been diagnosed with tuberculoid leprosy 3 years previously treated with multi-bacillary drug therapy (MDT). On presentation in labour she had multiple hypopigmented patches, severe peripheral neuropathy resulting in peripheral paraesthesia and a claw hand deformity. Vital sign were stable. Her blood results include a haemoglobin of 15.5g/dL, white cell count of 7.6 x 10 9/ L, platelets of 154 x10 9 and normal clotting screen. An epidural was performed using a full septic technique, a single insertion and otherwise uneventful. A slow top up dose in sitting position using 10ml of 0.1% bupivicaine + 2mcg/ml fentanyl was given. The test dose revealed no adverse signs after five minutes so a further 5 mls of local anaesthetic mix were given. She required one further top up 30 minutes later for adequate analgesia. On neurological examination approximately 1 hour following the second top up, she had complete sensory block to cold and touch between S1 to T4 bilaterally and bromage score of IV. She continued needing epidural top up intermittently in labour until spontaneous vaginal delivery 8 hours later. Following labour her sensory and motor function returned to normal after 3 hours. However she had urinary retention that required catheterization for 2 days.

The physiological immunosuppression of pregnancy can result in relapse even following MDT (1). Neuraxial block should be used cautiously due to the possibility of autonomic neuropathy, and urinary retention is a frequent problem. Neurological deficit can also follow after regional anaesthesia. We suspect our patient was demonstrating sensitivity of the C fibres which could be either due to the disease itself or its' treatment. Awareness of the consequences of diseases once thought eradicated in the first world is important as a result of our shrinking world, and the obstetric anaesthetist must remain vigilant to this.

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Abstract #: S-34

Management of a Parturent with Recent Stroke

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A 27-year-old G2P1 at 36+6 weeks' gestation with a past medical history of 2 DVTs, prothrombin gene mutation on therapeutic enoxaparin, and a BMI of 47 kg/m2 presented with possible preterm labor and worsening neurologic deficits over the past 24 hours. A CT scan revealed acute left intra-parenchymal bleeding near the central sulcus. Discussion ensued between the obstetric, neurosurgical, and anesthesiology teams to determine which mode of delivery would balance the risk of re-bleeding with the overall risk from a cesarean delivery (CD). The patient was therapeutic on enoxaparin and regional anesthesia was contraindicated. General anesthesia presented concerns with aspiration, potential for a difficult airway with an elevated BMI, and risk of increasing ICP with direct laryngoscopy and succinylcholine. Further dilemma included the location of delivery, labor and delivery provided proximity to the obstetricians and pediatric teams while the main operating rooms were close to the neurosurgical operating rooms should intervention be required.

The patient was ruled out for preterm labor and was transferred to the NICU for tight blood pressure control and monitoring. The patient had a negative angiogram and magnetic resonance venogram with no etiology identified. The neurosurgical team stopped enoxaparin due to the acute bleed. There was concern for her risk for recurrent DVTs while not anti-coagulated and an IVC filter was placed. The patient remained stable during hospitalization and repeat imaging showed no progression of the bleed. On day 4, she was deemed stable to leave NICU, and was transferred to the obstetric service. The patient had a prior vaginal delivery and an assisted vaginal delivery was the desired mode of delivery. Imaging and physical exam were not concerning for increased ICP and an epidural technique was determined to be appropriate to provide analgesia to allow a forceps assisted vaginal delivery (FAVD). On day 6, she went into spontaneous labor. An early epidural was uneventfully placed and she underwent a FAVD in the operating suite. Post-delivery CT scan showed no progression of bleed.

Literature remains insufficient regarding management of a parturient in labor with an acute intracranial bleed. The incidence is rare and approximately 6-34/100,000, with 40% of those occurring around the time of delivery.^1 A literature review of 18 patients with an unsecured hemorrhage found no difference in outcome between CD and assisted vaginal delivery.^2 While there is a paucity of literature guiding anesthetic management of a parturient with a recent intracranial bleed, a multidisciplinary approach is paramount in deciding management to ensure optimal patient outcome.

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Abstract #: S-35

Management of carnitine palmitoyltransferase (CPT) II deficiency during labor: a case series

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Introduction: CPT II deficiency is characterized by an enzyme defect preventing long chain fatty acid use for energy. The myopathic form presents with weakness, myalgias, and fatigue during periods of increased metabolic demand with possible progression to rhabdomyolysis, renal failure, cardiac arrhythmias, and coma. We present a case series of two parturients with CPT II deficiency both of whom had transient myalgias after vaginal delivery and mild elevations of CPK levels irrespective of assisted or unassisted second stage.

Case Reports: A 20 y/o G2P0 diagnosed with CPT II deficiency at age 16 and a history of exercise-induced myalgias presented in spontaneous labor at 40 wks. A D10 infusion was started and an early epidural was placed to minimize labor stress. She pushed for 30 minutes and delivered via low forceps vaginal delivery. She complained of abdominal cramping post-delivery. Her baseline CPK was 48 U/L, peaked to 531 U/L post-delivery and decreased to 347 U/L at 24 hours post-partum. Her urine was negative for myoglobin.

A 28 y/o G1P0 was initially diagnosed with CPT II deficiency at age 2 but became aware of the diagnosis one year ago after an episode of hypothermia led to prolonged weakness and myalgias. She presented in spontaneous labor at 39.2 wks. A D10 infusion was started and an early epidural was placed. The patient labored down and after 35 minutes of pushing had an unassisted vaginal delivery. After delivery, she complained of right arm cramping. Her baseline CPK was 51 U/L, peaked to 268 U/L post-delivery and decreased to 162 U/L at 24 hours post-partum.

Discussion: CPT II deficiency can present unique challenges during labor due to the possibility of precipitating severe symptoms of this disease. The peripartum management of these patients focuses on maintaining glucose substrates and avoiding metabolic stress.1 These patients should receive an early labor epidural to minimize labor stress. To avoid lactic acidosis from hypoglycemia, D10 should be infused and glucose levels checked regularly. While previous literature supports checking CK levels at baseline and 24 hrs post-partum2, we also recommend checking CK levels soon after delivery. Both of our patients had CK levels peak within hours of delivery, indicating that this time period could confer the greatest risk for rhabdomyolysis. Although previous studies demonstrate lower overall CK values post-cesarean delivery3, this clinically insignificant difference in CK does not warrant elective surgery in these patients.

Although these patients have developed rhabdomyolysis and renal failure under general anesthesia, there is no evidence they are MH-susceptible. If propofol is used, the dose and duration should be minimized since mitochondrial disease predisposes patients to propofol infusion syndrome.4

Sources
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2. Can J Anesth. 2006;53:482-486.
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4. Anesth Analg. 2009;109:1049-53.

Abstract #: S-36

Massive Hemorrhage and Pulmonary Embolus in a Parturient with Placenta Accreta

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Purpose: We present the anesthetic management of a patient with placenta accreta who experienced a pulmonary embolus (PE) during a massive postpartum hemorrhage, and subsequently required an intraaortic balloon pump (IABP).

Clinical features: A 36-yr G5P2 was scheduled for cesarean delivery and possible hysterectomy at 34 weeks due to a known placenta previa and suspected focal placenta accreta. Her BMI was 29 and she had a reassuring airway. Anesthesia was provided with a CSE technique and an infant with a known prenatal diagnosis of truncus arteriosus was safely delivered. The placenta separated easily, however the lower uterine segment myometrium appeared attenuated with only a serosal layer remaining and a hysterectomy was planned. There was significant bleeding from her left ovarian vein, and the anesthetic was converted to general. During volume resuscitation, her end-tidal CO2 suddenly declined and pulseless electrical activity requiring cardiopulmonary resuscitation ensued. After return to spontaneous circulation, a PE was observed with intraoperative transesophageal echocardiography (TEE); a large clot was seen moving out of the right ventricle into the pulmonary circulation. She was started on an epinephrine infusion to maintain blood pressure and inhaled nitric oxide for right ventricular enlargement seen on TTE. The patient continued to bleed from the surgical site and a liver laceration sustained during the chest compressions, and a 10.5 L estimated blood loss was recorded. She received 48u PRBC, 40u FFP, 13u platelets, 8u cryoprecipitate, 8L crystalloid, 7g factor VII, 2g human fibrinogen intraoperatively. She received further PRBC, FFP and platelets in ICU for ongoing bleeding from her sacral venous plexus. She was taken back to the operating room for abdominal washout and re-packing. Her PaO2 continued to remain in the low 40s. An IABP placed due to severe cardiac dysfunction resulted in dramatic improvements of her hemodynamics and oxygenation. The IABP was removed post-operative day 3 after she stabilized hemodynamically, she was extubated on day 7, and started on therapeutic anticoagulation. She was discharged from hospital on day 35, without significant morbidity or neurological injury.

Conclusion: This case presents a therapeutic dilemma of PE in the setting of massive postpartum hemorrhage during a surgical procedure. Prolonged bed rest (4 weeks) prior to the surgery may have contributed to her PE, however prophylactic or therapeutic anticoagulant use in a setting of potential and actual catastrophic hemorrhage is problematic. The IABP for this case was likely a lifesaving intervention, that improved her oxygenation and contributed to preservation of neurological function.1 Early recognition of decompensation and interventional measures are key after a catastrophic event during abnormal placentation cesarean delivery.2

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1. Int J Obstet Anesth. 2008; 262-6
2. Clin Cardiol. 1985:599-602

Abstract #: S-37

Misoprostol-induced anaphylaxis during labor: A dire dilemma in patient management

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Introduction: Anaphylaxis poses significant risk for the parturient, particularly due to opposing considerations for mother and baby. Although peripartum anaphylaxis is sparsely reported, misoprostol has never been an implicated agent, and is of significant concern for the obstetric anesthesiologist.

Case Report: A 21 y/o G1P0 female presented at 41 1/7 weeks for post-dates IOL. PMH was negative and she had no allergies. She was 5'2", 65kg, with a Mallampati class II airway.

After initial triage, our patient was given misoprostol 50 mcg buccally. Twenty minutes later, she had a severe cutaneous reaction that spread from her trunk to her back and all four extremities. Diphenhydramine 25mg IV was administered, with no improvement. She began to complain of peri-oral tingling and shortness of breath and was noted to have swelling of both lips, and faint bilateral wheezing. Diphenhydramine 25mg IV was again administered, a bolus of IV fluids started, and supplemental oxygen by face mask was initiated. Vital signs and fetal monitoring initially remained stable, then her BP began to fall. Epinephrine 1:1000 0.3mg IM, and hydrocortisone 100mg IV were administered. Subsequently, her heart rate increased to 160-170 bpm, the uterus became hypertonic, and persistent fetal decelerations were noted.

A stat caesarean section(C/S) under GA was initiated. Our patient was emergently taken to the OR and GA was induced with etomidate 40mg IV and succinylcholine 100mg IV. Upon DL, airway swelling was noted, but tracheal intubation was successful with a 6.5 ETT. Incision was made and the baby delivered within two minutes of induction with APGARS of 7 and 9. The patient remained intubated post operatively for ongoing facial and suspected continuing airway edema. She was successfully extubated on POD #1, and discharged home with her baby three days later.

Discussion: We report a novel case of anaphylaxis secondary to induction of labor with misoprostol. Reports have found antibiotics and latex as common allergens, but Misoprostol has never before been implicated. It has, in fact, been shown to have a protective role in other allergic reactions.(1,2) Prompt recognition of anaphylaxis in the parturient is vital, as serious neurological sequeleae and death can occur in up to half of neonates.(3) Although previously held beliefs that epinephrine decreases uteroplacental blood flow have delayed administration, new practice guidelines advocate its use as a first line drug.(3,4) Epinephrine, titrated to severity and response, along with early C/S, have been shown beneficial to both mother and neonate.(3)

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4. Simons FER, Schatz M. J Allergy Clin Immunol 2012; 130 (7): 597-606.

Abstract #: S-38

Modified electrical cardiometry predicts velocity time integral, stroke volume and cardiac output when compared to transthoracic echocardiography in pregnant patients

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Electrical cardiometry (EC) is a simple, non-invasive and continuous monitor that measures cardiac output (CO) via impedance cardiography. In our previous studies, EC showed useful CO trends within individual pregnant patients, but did not give accurate absolute values when compared to transthoracic echocardiography (TTE). Since heart rate is easily measured, stroke volume (SV) is the variable requiring validation.

A certified cardiac sonographer, blinded to simultaneous EC data acquisition, performed TTE on 26 non-laboring patients positioned left side down and weighing 100 kg or less. SV by TTE (SV_TTE) equals the product of velocity time integral (VTI_TTE) and left ventricular outflow tract (LVOT) area. SV by EC (SV_EC) equals the product of square root of ICON (SQRT_ICON), left ventricular ejection time (LVET), and a patient constant. Unmodified, SV_EC had a 48.2 percentage error when compared to SV_TTE by the Bland-Altman technique.

Our new model (EC_A) predicts VTI (a measurement normally obtained by echocardiography) from EC data alone. Our key innovation is that Vmean_EC_A = SQRT_ICON/(22.7 - 0.16 x Weight), where Vmean_EC_A is the EC_A-derived prediction of mean systolic blood flow velocity in the LVOT. Vmean_EC_A multiplied by LVET gives VTI_EC_A, which we call a "virtual VTI."

Obtaining a "virtual VTI" from EC alone is appealing since measuring VTI by TTE is difficult and time consuming, especially for repeated measurements. With our new approach, continuous VTI_EC_As are easily trended. When absolute SV is required, a one-time measurement of LVOT diameter using hand-held TTE could be obtained (although LVOT diameter was obtained by formal TTE in this study). LVOT area multiplied by VTI_EC_A gives SV_EC_A.

Applying EC_A to data from 4 laboring patients, Vmean_EC_A, LVET, VTI_EC_A and SV_EC_A agree with Vmean_TTE, Envelope Time, VTI_TTE and SV_TTE with percentage errors of 22.2, 15.4, 19.9 and 23.3%, respectively. Mean biases are -0.03m/sec, -0.2msec, -1.1cm and -4.0mL, respectively. Corresponding values for 6 new, non-laboring patients were 24.5, 8.8, 24.0 and 25.5%, with mean biases of -0.05m/sec, -5.0msec, -1.8cm and -7.2mL (Figure1).

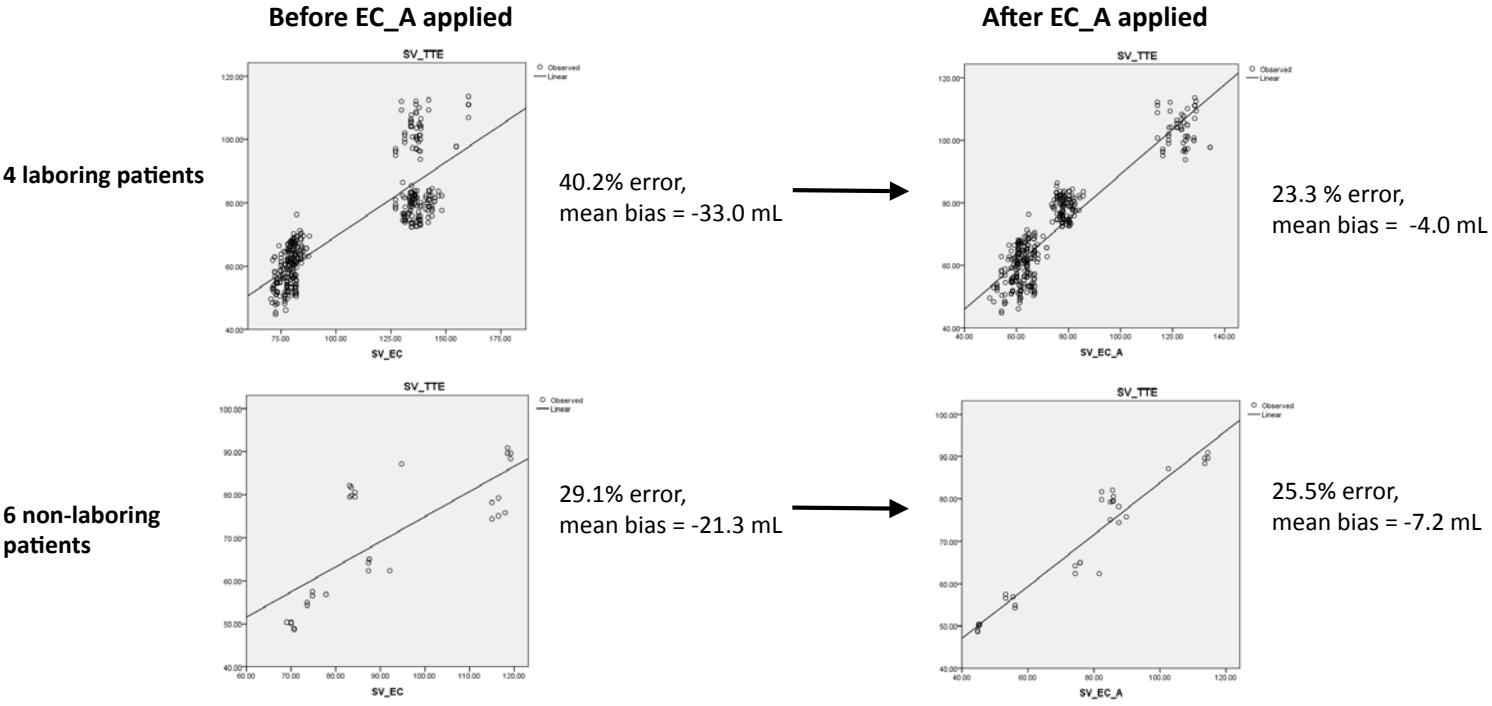
Our new model not only allows for increased absolute accuracy in SV measurement, but also makes the equation for SV by EC mirror that for SV by TTE:

SV_TTE = (Vmean_TTE) x (Envelope Time) x (LVOT area), and
SV_EC_A = (Vmean_EC_A) x (LVET) x (LVOT area).

Further testing of our model is required.

FIGURE 1

A weight-based modification of electrical cardiometry (EC_A) improves the accuracy of stroke volume (SV) measurements in pregnant patients, using transthoracic echocardiography as the reference standard. We developed EC_A with data from 26 non-laboring patients and then tested it on data from additional patients as below. Statistics to right are from Bland Altman analysis of scatterplot data.



Abstract #: S-39

Neurological Outcomes in Women with Multiple Sclerosis undergoing Pain Relief in Childbirth: A Cross Sectional Study of Patients Delivering at Mount Sinai Hospital from 2000 to 2013.

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Introduction: The effect of neuraxial anesthesia on the post-partum relapse rate in women with Multiple Sclerosis(MS)remains controversial,given the paucity of literature on this topic (1). Anesthesiologist are divided on the use of neuraxial analgesia for MS patients(2) because of the possibility of exacerbating preexisting disease. We aimed to identify the correlation between the use of labor analgesia/anesthesia and neurological outcomes in parturients with MS.

Methods: This was a cross sectional study. Eligible women were those who had MS and had delivered at the Mount Sinai Hospital from 2000-2013. Subjects were identified from the Medical Records and Special Pregnancy Program databases. Eligible women were contacted by phone and informed about the study, and those agreeing to participate were asked to sign an informed consent which was mailed. The steps in the study were as follows: 1) a chart review to look at obstetric and anesthesia data; 2) a mailed structured questionnaire inquiring about their MS and relapse(s) in the year preceding a given pregnancy, during pregnancy, and during the first 2 years postpartum; and 3) a follow-up telephone call to determine the degree of disability, if any, using the Expanded Disability Status Scale(3).

Results: 94 women were identified for a total number of 112 pregnancies. 8 women declined, 27 could not be reached. 59 (62.8 %) women consented for a total of 75 pregnancies. Mean age was 34.1 ± 6.4 years. The number of times each patient was able to conceive ranged from 1 -7 (mean 2). Average gestational age was 38 ± 2.6 weeks. The most common mode of delivery was spontaneous vaginal delivery (37.1%) followed by elective CS (27.4%), emergency CS (25.8%) and assisted vaginal delivery (9.7%). Epidural analgesia (67.7%) was the most common choice of analgesia for delivery. The other choices were spinal (19.4%), combined spinal/epidural (3.2%), general anesthesia (3.2%), patient controlled intravenous analgesia (1.6%) and no analgesia (4.8%).

Discussion: Preliminary analysis suggests a trend in increased CS rate (53%) and use of general anesthesia(3.2%) in this cohort as compared to historical controls at our hospital(34% and <1% respectively). Data on neurological outcomes are being finalized and will be presented at the annual meeting.

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Abstract #: S-40

New-Onset Atrial Fibrillation Complicating Labor in a Healthy Parturient

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Case: An otherwise healthy, 23-year-old G1P0 presented at 38 weeks gestational age complaining of ruptured membranes and palpitations beginning 3 hours prior to admission. She was contracting regularly. Blood pressures were 120s/70s, but the radial pulse was fast and irregularly irregular. SpO2 was 98% on room air, and temperature 36.7˚ C. She denied angina, dyspnea, or pre-syncopal symptoms. Twelve-lead ECG showed atrial fibrillation with HR 180-200 bpm, and no evidence of Wolf-Parkinson-White Syndrome. Esmolol had no effect. The patient was found to be in labor and 4 cm dilated. She requested analgesia. As FHT was reassuring, the decision was made to provide epidural analgesia.

A lumbar epidural catheter was placed and, after a negative test dose, 10 mL of bupivacaine 0.125% was given in divided doses over ten minutes, with good analgesic effect. Maternal cardiac rhythm and rate did not change, but the automated BP machine failed to provide values, and the FHT exhibited decelerations with contractions. The patient continued to deny other symptoms. Her cervix was found to be 10 cm dilated with the fetal head at +2 station. As the FHT continued to return to baseline between contractions, the decision was made to proceed with forceps-assisted vaginal delivery. IV esmolol, metoprolol, and phenylephrine were given prior to and during pushing, with no effect on maternal or fetal HR. Maternal BP was 85/50 and maternal HR during second stage was 180s-210s; the patient continued to deny symptoms. Delivery of a live infant, Apgars 8 and 9, occurred just under two hours after admission. After delivery, the ventricular rate decreased to 110s-150s after administration of diltiazem, and the BP increased to 110s/60s. Chest CT was negative for PE; an aberrant pulmonary vein was seen arising from the LA. Echo showed normal biventricular size and function and biatrial enlargement consistent with pregnancy. CBC, CMP, and TSH were all normal. The patient continued on diltiazem; digoxin and metoprolol were added per cardiology. She spontaneously converted to sinus rhythm 11 hours after delivery.

Discussion: Although pregnancy may predispose to cardiac dysrhythmias(1), lone atrial fibrillation in otherwise healthy parturients is very rare; most cases are explained by abnormal cardiac anatomy, drugs, electrolyte derangements, or PE(2). Treatment consists of rate control and, if necessary, anticoagulation and/or cardioversion. In this case, the rapid progress of labor and lack of response to β-blocking agents complicated treatment. This appears to be the first report of lone atrial fibrillation concurrent with onset of labor; however, it is possible that this patient was predisposed to atrial arrhythmias due to her aberrant pulmonary vein.

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Abstract #: S-41

NLRP3 inflammasome activation contributes to the neurotoxicity of sevoflurane anesthesia in neonatal mice

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NLRP3 inflammasome activation contributes to the neurotoxicity of sevoflurane anesthesia in neonatal mice
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The authors have no potential conflicts of interest to disclose.

Background: Inhaled sevoflurane causes cell death in the developing rodent brain and neurocognitive dysfunction. However, the mechanisms by which sevoflurane leads to cognitive dysfunction remain unclear. Herein, the authors investigated whether NOD-like receptor pyrin domain containing 3 (NLRP3) inflammasome activation contributes to the neurotoxicity of sevoflurane anesthesia in neonatal mice.

Methods: Six-day-old C57BL/6 and NLRP3 knockout (KO) mice were exposed to 3% sevoflurane 2 h daily for 3 days. The mice were killed at the end of the anesthesia, and the brain tissues were harvested and then subjected to Western blot, immunocytochemistry, enzyme-linked immunosorbent assay, and real-time polymerase chain reaction. In another set of experiment, cognitive functions were tested by fear conditioning test and social behavior was tested by social recognition and interaction tests at postnatal day 60, respectively.

Results: In wide type neonatal mice, sevoflurane anesthesia induced cognitive impairment later in adulthood as evidenced by decreased freezing response in both contextual and cued fear conditioning. Furthermore, neonatal exposure to sevoflurane significantly increased the number of apoptotic cells and enhanced neuroinflammation in the brain immediately after anesthesia. However, NLRP3 deficient mice were protected from both learning deficits and neuroinflammation when exposure to sevoflurane anesthesia.

Conclusions: Our results provide additional evidence that NLRP3 inflammasome activation is a key mechanism critically involved in the neurotoxicity of sevoflurane anesthesia in neonatal mice.

Abstract #: S-42

OB operating rooms are closing for renovations. What do we do?

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Introduction:
When renovations require an L&D suite to close the ORs, the transportation of parturients to the main OR for emergency cesarean presents a challenge. The L&D ORs at our hospital were scheduled to temporarily close, requiring a plan to allow construction while maximizing safety. Healthcare Failure Mode and Effect Analysis (HFMEA) 1, a method allowing for hazardous failures to be identified so that solutions can be developed, was utilized. A risk assessment was undertaken to identify and prioritize risks associated with transportation of high-risk parturients from L&D to the main OR (a distance of approximately two city blocks).

Aims:
1. To conduct an HFMEA and determine if risks could be identified and reduced
2. To assess the results of the HFMEA
3. To evaluate the success of proposed interventions to reduce patient risk

Methods:
Components of the HFMEA included observations during all time frames (including nights & weekends). Results were discussed and validated by a multi-disciplinary team including anesthesiologists, obstetricians, nurses, neonatologists, and hospital administrators. The HFMEA team explored potential risks and suggested interventions that could be put in place during the transition. Alternative strategies were discussed and consensus reached regarding which processes would be implemented.

Results:
I. The following issues were identified by HFMEA and corresponding solutions advocated by the multi-disciplinary team:
1. Time to transportation to OR could be excessive.
a. Practice runs to reduce time.
b. Reserved elevators
c. Three main OR operating rooms ready at all times for OB cases
d. Additional staffing requirements for coverage in two locations simultaneously.

2. Identification of communication issues between main OR and L&D
a. Joint simulated drills
b. Improved phone/walkie-talkie system
c. Protocols for transport of postoperative patients back to L&D recovery

3. Plans for delivery of patients too unstable to be transported to the main OR
a. Policies to determine who should not be transported to the main OR
b. Transformation of an L&D room to a nemergency OR on the L&D floor.

II. Utilization of Emergency OR on L&D
OR renovations began on October 1, 2013. With 1250 deliveries since then, the emergency OR has thus far been used 19 times (12 deliveries for fetal bradycardia, 5 for placental abruption, 1 maternal hemorrhage, and 1 uterine rupture)

Discussion:
We proactively assessed risks and incorporated solutions using a modified HFMEA process. This allowed recommendations to be made, trialed, and implemented prior to actual closure of the L&D ORs. With our renovations almost complete, we have shown the following:
1. HFMEA was successfully used to identify risks and implement solutions
2. L&D ORs were temporarily closed while maintaining safety
3. Labor room conversion to a makeshift OR can reduce risk and potentially be life-saving.

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Abstract #: S-43

Optimal dosing of spinal anesthesia for cesarean delivery using intrathecal catheters

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Introduction:
Placement of intrathecal catheters (ITC) after accidental dural puncture is practiced by many anesthesiologists.[1] Currently, there is no literature defining the optimal dose of bupivacaine for cesarean delivery using an ITC. Previous studies evaluating local anesthetic dosing for anesthesia given through a spinal needle suggest that low dose spinal bupivacaine provides effective surgical anesthesia with a lower incidence of spinal side effects.[2, 3] Optimal dosing of spinal anesthesia via an ITC has not been reported. We place approximately 25 ITC per year to provide anesthesia for high-risk parturients and have collected data on the dosing of these ITCs for cesarean deliveries.

Aim:
Our aim was to determine if low doses of bupivacaine administered through ITC provides effective surgical anesthesia for cesarean delivery while decreasing the incidence of side effects compared to higher doses of bupivacaine.

Methods:
As a pilot study, we collected data on all ITC dosed for cesarean delivery:
1. Dose of 0.75% hyperbaric bupivacaine required to obtain an initial T4-T6 level:
a. Low dose group: 0.8 ml (6 mg) or less
b. High dose group: greater than 0.8 ml (6 mg)
2. Need to re-dose the catheter within one hour of initial dose (inadequate duration)
3. Need to re-dose the catheter within 15 minutes of initial dose (inadequate initial block)
4. Frequency of spinal anesthesia side effects:
a. Incidence of hypotension from initial spinal dose
b. Administration of vasopressors
c. Incidence of nausea and/or vomiting

Results:
Data from 28 patients with intraoperative ITC were collected. Fourteen patients were in the low dose group and 14 patients in the high dose group.
1. All 28 patients achieved a T4 +/-1 anesthetic level.
2. 57% of the low dose group vs 36% of the high dose group needed supplemental dosing within one hour .
3. Intraoperative pain occurring less than 15 minutes after the initial spinal dose occurred in 2 patients, both in the low dose group.
4. Side effects- there were no statistically significant differences between the low and high dose groups.

Discussion:
The results of this pilot study suggest that low dose spinal bupivacaine (0.8ml or less), can achieve effective surgical anesthesia. However, the low dose group experienced more intraoperative discomfort, needed more top-ups, and had no reduction of hypotension or nausea and vomiting. These data suggest that higher ITC doses may be beneficial, especially given that re-dosing of the ITC near the end of the surgery may prolong PACU stays. Based on this pilot, we plan to perform a prospective, randomized dose response study to determine the optimal dosing of an ITC for cesarean delivery.

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Abstract #: S-44

Osteogenesis Imperfecta and Regional Anesthesia in a Parturient

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Introduction: Osteogenesis Imperfecta (OI) or "brittle bone disease" involves osteopenia with primary defects in the protein matrix of connective tissue and bone (1,2) and varies in severity. Clinical presentations include excessive bone fragility, fractures, short stature, scoliosis, triangular face (small jaw, large vault), bruising, and increased laxity of skin, ligaments and heart valves (1,2). There are eight subgroups; type 1 is the mildest and type 2 the most severe. The optimal mode of delivery is controversial as labor and vaginal delivery could lead to pelvic (mom) and fetal fractures, although cesarean section (C/S) does not result in fracture reduction (1). Anesthetic management has included general, epidural and spinal anesthesia (3). Particular concerns include patient fragility, vertebral column abnormalities (short stature, kyphoscoliosis leading to respiratory compromise), bleeding (platelet adhesion abnormalities), and airway abnormalities, (1,3) all of which make GA and particularly RA challenging (1,3).

Case: An 18 y/o primigravida with a history of type I OI presented at 37+ weeks in labor for an elective C/S despite counseling that vaginal delivery would not increase her fracture risk. She had declined fetal testing. Our patient had a history of surgeries for multiple fractures and repair of a globe rupture. She weighed 126 lbs and was 4'8" tall. Physical exam revealed a mallampati class III airway with no limited neck motion. Examination of her spine demonstrated small interspaces and mild kyphoscoliosis. Due to short stature and history of no prior vertebral fractures, we chose a CSE (plt 140,000/μL, no easy bruising) using 11.5 mg of hyperbaric bupivacaine, 10 mcg of fentanyl and 100 mcg of hydromorophone as the anesthetic. Our patient delivered a viable healthy baby (no signs of OI) weighing 5 lbs, 7 oz. with Apgars of 9 & 9.

Discussion: The advantages of spinal anesthesia are its rapid onset, reliability and minimal transplacental drug passage (1,3). However, in patients with OI, maternal short stature and kyphoscoliosis can make spinal anesthesia difficult. The amount of drug to use without causing a total spinal in a patient with a possibly difficult airway is a concern. The distribution of local anesthetic may be unpredictable depending upon the degree of scoliosis. Placement of an epidural can be problematic as well. If vertebral abnormalities do not prevent its placement, a CSE can incorporate the benefits of spinal (dense solid block) and epidural anesthesia (extended duration), while minimizing the risk of hypotension and high/total spinal by using a decreased spinal dose. With proper preoperative assessment and preparation of a parturient with OI, CSE may be a viable anesthetic option for elective C/S.

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Abstract #:S-45

Pain Management after Cesarean Delivery in a Patient Dependent on Buprenorphine (Subutex)

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The American College of Obstetrics and Gynecology (ACOG) committee recently released their opinion regarding opioid abuse, dependence, and addiction in pregnancy and recommended buprenorphine as an alternative to methadone to decrease risks associated with the use of illicit opioid dependency during pregnancy(1). Buprenorphine (Subutex™) is a partial μ-opioid agonist and at high doses a weak κ-antagonist that is taken as a sublingual tablet. Managing labor and post-cesarean pain in women taking buprenorphine is challenging, because of its long duration of action and its association with patients having a history of opioid abuse and addiction.

We report the case of a 28-yo G6P1 at 36 weeks gestation transferred to our institution for cervical shortening, vaginal bleeding and pelvic pressure. The patient had a history of 4 years of buprenorphine 8mg TID and alprazolam 1mg BID use in the setting of anxiety disorder, opiate and benzodiazepine dependence, several 2nd trimester losses, and a cesarean delivery at 40 weeks for 2nd stage arrest. Providers diagnosed intrauterine fetal demise, for which the patient strongly desired a repeat cesarean delivery.

She had weaned off alprazolam a month prior to admission, and planned to restart the medication after delivery. She was continued on her home dose of buprenorphine 8mg TID and lorazepam 1-2mg PRN anxiety. The patient requested a general anesthetic, which was induced with IV lidocaine, propofol, succinylcholine, midazolam 2mg, and fentanyl (total 2250mcg). A ketamine infusion was started intraoperatively at 8mg/h and continued postoperatively for 24h. Ketorolac 30mg IV was administered at the end of the case.

Postoperative pain regimen included a fentanyl IV PCA (50mcg bolus q6min, no 4 hour maximum), acetaminophen 1g PO q6h, and ibuprofen 600mg PO q6h. PCA use of fentanyl was 4500mcg during the 1st 24h and 2600mcg during the following 24h. On POD2 the PCA was discontinued and buprenorphine was restarted. She received 3-6 mg IV lorazepam per day. Prior to surgery, the patient's VAS pain score was 5/10, and ranged from 6-8/10 during the 1st 24h, 6-7/10 during the following 24h, and 2-5/10 after 48h. The patient met goals for symptom relief and was satisfied with her pain control.

Multimodal analgesia including neuraxial analgesia and regional techniques such as a TAP block would have been optimal(2). Ideally, patients are rotated off buprenorphine to a pure μ-opioid agonist before surgery to facilitate perioperative pain management. However, the nature of labor and delivery doesn't always allow time to do so. This case emphasizes the challenges obstetric anesthesiologists face when managing such obstetric cases.

1. ACOG Committee Opinion No. 524: Opioid abuse, dependence, and addiction in pregnancy. Obstet Gynecol 2012 May; 119(5):1070-6.
2. SOAP 2013 Summer Newsletter. Education Committee: Post Cesarean Pain Management in the Buprenorphine (Subutex) Dependent Patient

Abstract #: S-46

Pain upon local anesthesia infiltration before spinal anesthesia is associated with acute post-cesarean pain

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Introduction: Prediction of acute post-cesarean pain is an important clinical question. To date, most studies have mostly used experimental models to assess pain (1,2) or preoperative questionnaires (3) to categorize women into different risk groups for post-operative pain. Pain upon IV placement was not found to predict labor pain intensity (4). The goal of this study was to evaluate whether pain upon injection of local anesthesia (ILA) before spinal anesthesia predicts acute post-cesarean pain.

Methods: 103 women scheduled for an elective cesarean delivery were enrolled to receive a standardized ILA (lidocaine 1% 3-5ml via 25G needle) before spinal anesthesia (bupivacaine 12mg, fentanyl 20mcg, morphine 100mcg). The anesthesiologist performing the procedure used a standardized script to inform that ILA was about to occur ('I am giving you now the numbing dose, please rate your pain on a scale between 0-100'). Outcome measures included: demographics, ILA pain (verbal numeric pain scale; 0-100), average and peak pain (at rest, with movement and uterine cramping at 24 & 48h). Statistical analysis included t-test for equality of means ($p<0.05$).

Results: Women were categorized into one of 3 groups based on ILA pain score [mild (0-30), moderate (31-69) or severe (70-100)] with no difference in demographic data (Table). Acute post-cesarean pain at 24h was significantly different based on ILA pain scores (Table), but not at 48h (data not shown).

Conclusion: This is the 1st study evaluating a clinical test to predict post-cesarean pain. Our main findings were that up to 12% of women experience severe pain upon local anesthesia infiltration, which was associated with significantly increased pain (at rest, upon mobilisation and uterine cramping) during the first 24h. Further studies are needed to evaluate whether these women may benefit from higher spinal morphine dosing to improve post-operative pain.

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2. Eur J Pain 2013;17:111-23
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Table. Post-cesarean pain outcomes during the first 24h according to pain during injection of local anesthesia (ILA)

	Mild ILA (n=47)	Moderate ILA (n=44)	Severe ILA (n=12)
Age (years)	34.2±4.4	32.7±3.9	34.7±4.4
Weight (kg)	76.5 ± 17.1	83.4±14.1	75.5±7.7
Nulliparous women (%)	27%	23%	17%
Peak pain at rest	8 ±16	17 ± 21	33 ± 25*
Peak pain with movement	30 ± 26	39 ± 25	57 ± 32*
Peak uterine cramping	24 ± 25	26 ± 31	47 ± 39 **
Average pain at rest	4 ± 9	7 ± 15	21±17 *
Average pain with movement	14 ± 20	21 ± 24	37 ± 27 *
Average uterine cramping	9 ± 17	12 ± 22	18 ± 23

Data presented as mean ± standard deviation
Mean pain scores recorded on a verbal scale from 0-100 (0=no pain, 100=worst pain imaginable)
Comparison was performed between the severe ILA group and the 2 other groups (T-test)
* $p<0.01$
** $p<0.05$

Abstract #: S-47

Patient Position and Hypotension After Spinal Placement For Cesarean Delivery

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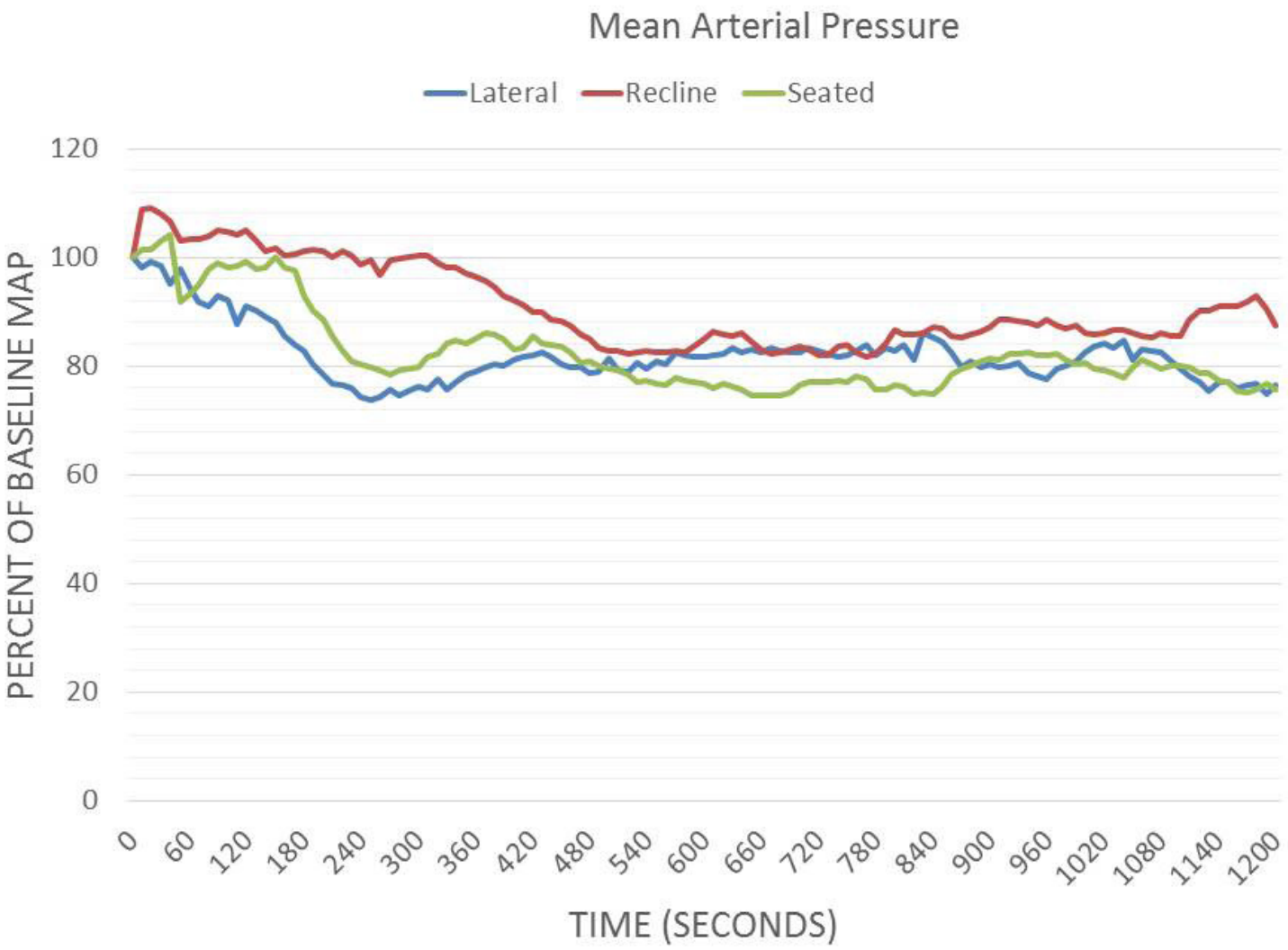
Background: Spinal anesthesia is associated with a high incidence of hypotension. One hypothesis for hypotension prevention is whether patient positioning during placement affects the severity and onset of the drop in blood pressure. A previous study supported the lateral position as more hemodynamically stable (Obasuyi), however this conflicts with our clinical observations. We hypothesized that seated positioning would lead to slower onset and rise of spinal level and therefore less hypotension than the lateral position. In addition, we hypothesized that patients who had seated spinals and then were slowly reclined over 5 minutes would have even greater hemodynamic stability due to a slower rise in the spinal level.

Methods: After IRB approval and written informed consent, patients undergoing elective cesarean delivery under spinal anesthesia were enrolled in a randomized controlled trial. They were allocated to receive their spinal in one of three positions: Lateral (L), Seated (S) or seated followed by a five-minute Recline from 30-degrees (R). Blood pressure was observed with a continuous, non-invasive CNAP monitor for twenty minutes and IV fluids and vasopressors were dosed based on a protocol. Secondary outcomes included the maximum height of the spinal blockade and the duration of the motor and sensory blockade.

Results: 45 of 105 patients were enrolled. Eight patients were excluded from the study for failed spinal, inability to place in assigned position, or monitor failure. We found a significant difference in lowest SBP and MAP ($P<0.05$ for both) (see figure 1 for trend) with the (L) group significantly lower than (R). No difference was found in HR, nausea or vomiting. The amount of fluid used was found to be significant among groups ($p=0.03$), with the (R) group receiving the least fluid (625cc(R) vs 1000cc(S) vs 875(L)). There was no difference in pressor boluses ($p=0.16$), but the lateral group had a trend towards higher use. There was no difference in the height of spinal level achieved at 15 minutes.

Conclusion: We found that positioning patients laterally for spinal placement led to greater hemodynamic instability when compared with using a gradual recline for the first five minutes following seated placement. In addition, the lateral position was associated with increased IV fluid and vasopressor usage. Despite this difference in hemodynamic stability, the maximum height of the spinal achieved was equivalent between the three groups.


Mean Arterial Pressure
Lateral
Recline
Seated
PERCENT OF BASELINE MAP
120
100
80
60
40
20
0
0
60
120
180
240
300
360
420
480
540
600
660
720
780
840
900
960
1020
1080
1140
1200
TIME (SECONDS)

Abstract #: S-48

Perioperative management for cesarean delivery of a woman with super-morbid obesity and severe preeclampsia

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Purpose: We present the anesthetic and perioperative management of a woman with super-morbid obesity and preeclampsia presenting for cesarean delivery (CD).

Clinical features: A 30-year old primiparous patient with super-morbid obesity (weight 228 kg; BMI 86 kg.m−2), chronic hypertension with superimposed severe preeclampsia and type II diabetes mellitus presented for CD at 35+4 weeks due to worsening preeclampsia. An arterial line and 2 peripheral venous catheters were placed preoperatively with ultrasound guidance. A combined-spinal epidural was performed with pre-procedure ultrasound examination to estimate midline and depth of epidural space. Loss-of-resistance was identified at 10 cm, a depth consistent with ultrasound estimation. Intrathecal fentanyl 15 mcg, morphine 75 mcg and hyperbaric bupivacaine 4 mg was administered, and the epidural catheter secured at 15 cm. General anesthesia (GA) was induced with propofol, remifentanil and succinylcholine after 10 min of pre-oxygenation in a head-up, ramped position with 100% O2 and continuous positive airway pressure (CPAP) 5 cmH20. After an uneventful rapid sequence intubation with videolaryngoscopy, anesthesia was maintained with sevoflurane, nitrous oxide and remifentanil. During forceful retraction of the pannus to facilitate surgical access, airway pressures markedly increased; this was associated with a rapid decrease in Sp02. Endobronchial intubation was excluded and the changes resolved immediately with muscle relaxation and pressure controlled ventilation with 100% O2. CD of a 2030 g neonate was accomplished with vacuum extraction with an estimated blood loss of 700 ml. The patient was extubated in the operating room without any respiratory or hemodynamic events. She received overnight monitoring in the recovery room for adequacy of oxygenation (continuous pulse oximetry), ventilation (respiratory rate) and hemodynamics (arterial blood pressure monitoring). Epidural analgesia was maintained with bupivacaine 0.125% for 24 h, at which time the catheter was discontinued to allow thromboprophylaxis to be restarted. CPAP was administered due to the high risk of obstructive sleep apnea. The patient and her baby had an uneventful recovery.

Conclusion: Obese parturients are at increased risk for anesthesia-related maternal mortality[1]. Although avoidance of GA is often advised in obese parturients[2], general anesthesia and mechanical ventilation proved essential in our case. Spontaneous respiration with pannus retraction and CD under neuraxial anesthesia would not have been tolerated. Neuraxial opioids and local anesthetic minimized systemic opioids, reducing the risk of postoperative respiratory failure. This case suggests that combined regional and general anesthesia may be an optimal approach in super-morbidly obese patients undergoing CD. Ultrasound was invaluable in attaining neuraxial and vascular access.

References:
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2. Anaesthesia. 2006;61(1)

Abstract #: S-49

Perioperative Management of Peripartum Hysterectomy at Duke University Hospital: A Retrospective Review

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Introduction: Peripartum hysterectomy is associated with significant morbidity and mortality. Nationwide the incidence of parturients undergoing hysterectomy has been steadily increasing, but the perioperative management of these patients has not been well described. The purpose of this retrospective study was to identify the perioperative management of patients undergoing peripartum hysterectomy at Duke University Hospital in order to develop an effective protocol for management of these patients at our institution.

Methods: We identified patients admitted to the Duke Birthing Center at Duke University Hospital between January 1, 2003 and September 26, 2012 who had a peripartum hysterectomy from the electronic anesthesia database. Patient characteristics, indication for hysterectomy, anesthesia technique, estimated blood loss, blood product utilization, need for invasive monitoring, interventional radiology procedures and frequency of post operative ventilation and ICU admission were analyzed. Data were summarized as median (IQR) or n (%).

Results: We have identified 43 patients to date. 77% (33/43) of patients who underwent peripartum hysterectomy were multiparous women and 51% (22/43) had a history of prior cesarean section. Abnormal placentation and uterine atony accounted for 67% (29/42) of patients. The anesthetic technique fell into 3 major categories: 28% (12/43) were performed under neuraxial anesthesia only, 14% (6/43) were performed under general anesthesia (GA) and 58% (25/43) were converted from a regional anesthetic for vaginal or cesarean delivery to a GA for hysterectomy. 86% (37/43) of patients had an arterial line and 40% (17/43) had central venous access established intraoperatively. The median estimated blood loss was 3500 ml (2750, 5000 ml). 97% (42/43) of patients required transfusion of blood products intraoperatively. The median intraoperative PRBC transfusion was 5 units (3,12 units) and the median intraoperative FFP transfusion was 2 units (2,9 units). Platelets were administered to 40% (17/43) while 35% (15/43) received cryoprecipitate intraoperatively. 12% (5/43) of patients received factor VII and 9% (4/43) of patients required a vascular interventional radiology procedure in addition to a hysterectomy to control bleeding. At the conclusion of the operative procedures 50% (21/42) of patients required postoperative ventilation and 57% (24/42) were admitted to the ICU. There was one intraoperative death from uncontrolled bleeding.

Summary: Our findings highlight the significant transfusion requirements for peripartum hysterectomy patients and the variability in perioperative anesthetic technique. These differences in anesthesia technique are likely based on the urgency of the hysterectomy and anticipated blood loss. Based on the significant resources required, successful management of these patients requires a carefully coordinated multidisciplinary approach which we have implemented at our institution.

Abstract #: S-50

Pneumocephalus in a Parturient With Methylenetetrahydrofolate Reductase Deficiency After a Lumbar Epidural Block

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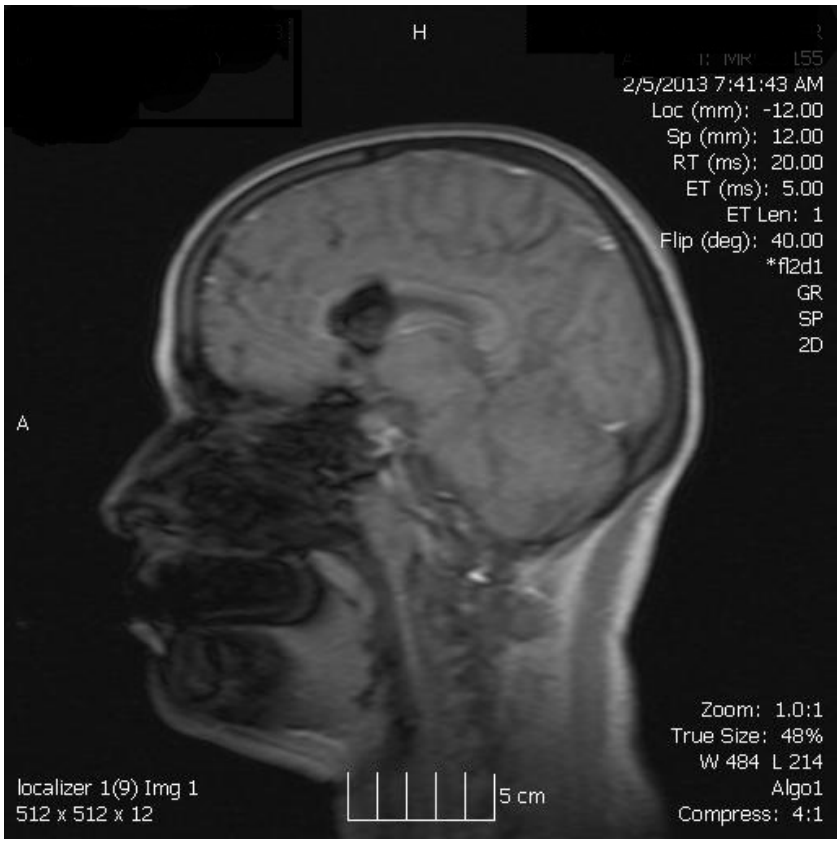
A 34 year old parturient with past medical history of methylenetetrahydrofolate reductase deficiency and gestational hypertension developed sudden onset of lethargy and difficulty swallowing half an hour after epidural catheter placement. The epidural was placed at the L4-L5 interspace using the loss of resistance to air technique with 3ml of air inserted. No cerebrospinal fluid was noted to have leaked back during placement of the epidural. Test dose 3ml of 1.5% Lidocaine with Epinephrine was given and was negative for dense motor block or tachycardia.

When summoned to the patient's room 25 minutes after epidural placement, patient was lethargic and having difficulty swallowing but was answering questions appropriately, moving all extremities, and vital signs were stable. In light of the patient's history of methylenetetrahydrofolate reductase deficiency, for which she had been taking Enoxaparin subcutaneously daily up until 3 days prior, cerebrovascular accident was high on the differential list. Patient's symptoms remained constant for 20 minutes, at which point a stroke code was called. Five minutes later as the stroke team arrived, patient's symptoms suddenly resolved and she was at her baseline. A decision was made to obtain an emergency MRI of the brain as part of the work-up. The MRI was read as diffuse intraventricular and subarachnoid pneumocephalus, likely secondary to recent epidural placement. The patient remained stable and at baseline for the remainder of her labor, and delivered via cesarean section under spinal analgesia 7 hours later.



Pneumocephalus is a rare consequence of inadvertent dural puncture, resulting from the injection of air into the subarachnoid or subdural space and subsequent cranial migration. Signs and symptoms can include headache, focal neurological deficits, lethargy, vomiting, nausea, seizures, cranial nerve palsies, and even cardiovascular instability, depending on the distribution of air. As seen on the attached MRI, there is a large air pocket in the anterior intraventricular space, which confirms the diagnosis.

Our patient did not have any worsening or recurrence of symptoms. She was discharged 3 days after presentation and had a repeat MRI performed 2 weeks later at an outside office which demonstrated resolution of the penumocephalus. The patient experienced no long term complications and was able to resume her normal activities of daily living.

Abstract #: S-51

Presence of a Post-partum labor epidural in a Patient with severe ARDS on ECMO with systemic anti-coagulation

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The patient was a 30-year-old G4P2113, who initially presented to an outside hospital in January for a STAT cesarean section performed under epidural anesthesia for acute placental abruption at 24 weeks gestation.

Immediately postpartum, the patient was noted to be having persistent fever spikes at less than 24 hours after delivery. Blood and urine cultures, as well as viral studies for influenza were obtained, and the patient was placed on Piperacillin-Tazobactam and Gentamicin. Of note, the patient complained of a 2-3 day history of cough, sore throat, and runny nose prior to her C-section.

On post-op day 1, the patient developed acute shortness of breath and chest pain, followed by severe hypoxia despite maximum non-invasive oxygen support. The patient was immediately intubated and transferred to the ICU. Initial chest X-rays showed complete opacification of the lungs. An echocardiogram performed at that time was read as normal. At this time, the patient's Rapid Flu came back positive for Influenza A and the etiology of the patient's rapid decompensation was felt to be pulmonary capillary leak secondary to infection with Flu or possible superinfection. The patient was switched to Levofloxacin, Vancomycin, Imipenem-Cilastatin, and Oseltamivir.

The patient remained hypoxemic despite maximum conventional mechanical ventilatory support. The patient was then transferred to Texas Heart Institute for ECMO.

On admission, the patient was found to have severe ARDS, was hypotensive and tachycardic, and was manifesting signs of shock. The patient was placed on 4 pressors and was emergently placed on VV ECMO via Right IJ cannulation with a 23F Avalon ECMO catheter, and anticoagulated via a Heparin drip.

Due to the severe, emergent nature of the patient's condition, and the patient's crashing onto ECMO, it was only after the patient was fully anticoagulated and on ECMO before it was realized that the patient had been transferred with the labor epidural still in place. Given that the patient was septic, any additional lines would only serve as a potential nidus for infection, and therefore required removal. This required discontinuation of the patient's Heparin drip. However, given the vital need for the patient to be on ECMO, which needed continued systemic anticoagulation in order to function, stopping the patient's Heparin drip risked clotting the ECMO circuit and potentially causing a fatal thromboembolic event.

Care was coordinated between the ICU and Anesthesia teams with the goal of minimizing the amount of time the patient would be off systemic anticoagulation in order to balance discontinuing the epidural without risking bleeding and epidural hematoma formation versus the need of the ECMO circuit to remain anticoagulated. The patient's Heparin drip was discontinued, and serial PTTs were taken every hour until the patient's PTT dropped below 40. The patient's epidural was then removed and the Heparin drip was then restarted 2 hours later.

Abstract #: S-52

Preterm gestation is associated with an increased failure rate of spinal anesthesia for cesarean delivery

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Background: Pregnancy is associated with an increased spread of spinal anesthesia. While studies have examined the relative spread of spinal block for surgical anesthesia in pregnant versus non-pregnant women, there is limited data reviewing adequate spinal dosing for preterm (gestational age <37 weeks) versus term parturients. The purpose of this study was to investigate the hypothesis that preterm gestation is associated with an increased incidence of failed spinal anesthetics for cesarean delivery (CD) compared to term gestation.

Methods: After IRB approval, we searched the perioperative database for women who underwent CD under spinal or combined spinal epidural anesthesia from 2003-2012. We included patients who received our standard doses of local anesthetic (≥10.5mg of 0.75% hyperbaric bupivacaine with fentanyl 15mcg and morphine 0.1-0.2mg) and were 152-183cm tall. Inadequate surgical anesthesia (failure) after initial spinal dose was the primary outcome. Failure was defined as need to repeat the spinal technique to obtain adequate block height; convert to general anesthesia secondary to pain; supplement intravenously with at least two of the following: fentanyl (>100 mcg), ketamine, midazolam or propofol; use nitrous oxide; or augment the initial block with epidural lidocaine within 30 minutes if the combined spinal epidural technique was used. Chi-square test was used to compare failure rate between preterm and term parturients. We also performed a multivariable regression analysis with failure as the outcome and age, height, weight, ethnicity, gestational age and hyperbaric bupivacaine dose as predictors.

Results: 5041 patients (3404 term and 1637 preterm) fulfilled the inclusion criteria and were included in the analysis. There were no clinically significant differences between the groups in patient demographics or dose of hyperbaric bupivacaine used. The most common dose administered was 12mg (62%). Overall, there were 150 failed spinal anesthetics (3.2%). The incidence of failure was significantly higher in preterm compared to term patients (4.5% vs. 2.2%, $p<0.0001$). Failure rate was 6.8% for those ≤30 weeks and 3.6% for those >30 weeks and <37 weeks gestation. In the multivariable model, gestational age was a significant predictor of failure [adjusted odds ratio (95% confidence interval) = 0.91 (0.88, 0.94), $p<0.0001$] while none of the other predictors was statistically significant.

Conclusions: At standard spinal doses of hyperbaric bupivacaine, there is a higher likelihood of inadequate surgical anesthesia in parturients undergoing CD at preterm gestational ages. Early preterm parturients (gestational age <30 weeks) have the highest risk. These findings suggest that an increased spinal dose may be necessary to reliably ensure adequate anesthesia in this population or, preferably, a combined spinal epidural technique allowing epidural augmentation of inadequate spinal blocks would be recommended.

Abstract #: S-53

Quality improvement project: adapting an electronic medical record system to improve quality measures reporting in obstetric anesthesia

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Background: Quality measures for regional anesthesia in obstetrics include unintended dural puncture and failed block(1). Previous large scale studies have estimated adverse events of neuraxial anesthesia in obstetrics(2,3). These include minor complications such as dural puncture, venous puncture, paresthesias, and epidural failure/catheter replacement. Local practice data must be complete and accurate so that a practice can compare their rates of adverse events to national norms. We initiated a quality improvement (QI) project that compared our current medical record system with an automated electronic medical record (EMR) system to evaluate several regional anesthesia quality measures.

Methods: Medical records(paper and EMR) were reviewed for completeness for the following six measures over a ten day period in patients who had a lumbar epidural placed: unintended dural puncture, presence of blood in the epidural catheter, paresthesia reported during block placement, epidural failure requiring replacement/use of a second anesthetic, presence of documented sensory levels during the anesthetic, and patient satisfaction. Our study intervention placed separate questions into the EMR corresponding to each of the six quality measures. The EMR program was also changed to mandate completion of all six questions before the case could be closed in the EMR. Ten days of records were reviewed after the intervention.

Results: Records for 79 patients were reviewed; 36 patients pre-intervention and 43 patients post-intervention. Pre-intervention, gaps in documentation for the quality measures were significant, with missing or unknown responses as follows: paresthesias 14%, blood in catheter 8%, dural puncture 11%, epidural replacement 97%, bilateral sensory levels 31%, and patient satisfaction 64%. The rate decreased to zero for all six quality measures once the mandatory EMR system was instituted. Rates of adverse outcomes could not be compared because of the large amount of missing data pre-intervention.

Discussion: The QI intervention eliminated documentation deficiencies. Adapting the EMR has allowed us to track quality measures related to neuraxial anesthesia. As a result of this study, we now have real-time notification of each patient not satisfied with her epidural and investigate each failure prior to patient discharge. Limitations include using some quality markers that may, or may not be, important for optimal patient care.

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Abstract #: S-54

Racial and Ethnic disparities in Mode of Anesthesia for Cesarean Delivery

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Background: Racial/ethnic disparities have been identified in the anticipated and actual use of neuraxial labor analgesia.(1) These disparities may exist in other key aspects of obstetric anesthesia. We sought to determine if racial/ethnic disparities exist in mode of anesthesia for cesarean delivery (CD).

Methods: Women undergoing cesarean delivery (CD) were identified among a U.S. cesarean registry from a previous MFMU study.(2) Race/ethnicity was categorized as: Caucasian, African-American, Hispanic, Non-Hispanic Others (NHOs). Mode of anesthesia was classified as neuraxial anesthesia (spinal, epidural or combined spinal-epidural anesthesia) or general anesthesia (GA). To account for obstetric/non-obstetric co-variates that may have influenced mode of anesthesia, multiple logistic regression analyses was performed using 4 sequential models:(Model 1) race and ethnicity only; (Model 2) Model 1 covariates + maternal sociodemographic factors;(Model 3) Model 2 covariates + obstetric factors; (Model 4) Model 3 covariates + emergency indications for CD.

Results: The study cohort comprised 50,972 women who underwent CD. Rates of GA among racial/ethnic groups were: 5.2% for Caucasians, 11.3% for African Americans, 5.8% for Hispanics and 6.6% for NHOs. After adjustment for obstetric and non-obstetric covariates, African Americans had the highest odds of receiving GA vs. Caucasians (aOR = 1.7; 95% CI: 1.6 – 1.9). The odds of receiving general anesthesia were also higher among Hispanics (aOR = 1.1; 95% CI: 1.0 – 1.3) and NHOs (aOR = 1.2; 95% CI: 1.0 – 1.5) compared to Caucasians respectively.

Conclusion: Our results suggest that racial/ethnic disparities exist in mode of anesthesia for CD, with African-Americans being at highest risk of GA compared to Caucasians.

References: (1) Curr Anesthesiology Reports 2013:3;292-299. (2) N Engl J Med 2008;359:895-905.

Table. Associations between Race/Ethnicity and Mode of Anesthesia for Cesarean Delivery

	Model 1[a]		Model 2[b]		Model 3[c]		Model 4[d]	
	OR (95% CI)	***P* value**	**OR (95% CI)**	***P* value**	**OR (95% CI)**	***P* value**	**OR (95% CI)**	***P* value**
Caucasian	Reference		Reference		Reference		Reference	
African-American	2.3 (2.2-2.5)	<0.001	1.9 (1.7-2.0)	<0.001	1.9 (1.8-2.1)	<0.001	1.7 (1.6-1.9)	<0.001
Hispanic	1.1 (1.0-1.2)	0.02	0.8 (0.7-0.9)	<0.001	1.1 (1.0-1.2)	0.14	1.1 (1.0-1.3)	0.02
Other	1.3 (1.1-1.5)	0.003	1.1 (0.9-1.3)	0.3	1.2 (1.0-1.4)	0.03	1.2 (1.0-1.5)	0.03
Log likelihood	-12,837		-12,628		-13,085		-10,952	
LRT			419.1		1,792.3		1,559	
AIC	25,583.3		25,280.1		23,507.8		23,507.8	

AIC = Akaike Information Criteria; LRT = Likelihood ratio test

CI = Confidence Intervals; OR = Odds Ratio

[a] Model 1: only race/ethnicity.

[b] Model 2: adjusted for maternal age, insurance class, body mass index at the time of delivery

[c] Model 3: adjusted for maternal age, insurance class, body mass index at time of delivery, chronic hypertension, gestational age at delivery, singleton/multiple pregnancy, number of prior cesarean deliveries, pregnancy-associated hypertensive disease, labor or attempted induction.

[d] Model 4: adjusted for maternal age, insurance class, body mass index at time of delivery, chronic hypertension, gestational age at delivery, singleton/multiple pregnancy, number of prior cesarean deliveries, pregnancy-associated hypertensive disease, labor or attempted induction, and emergency indication for cesarean delivery.

Abstract #: S-55

Randomized Controlled Trial of the Efficacy of Topical AmetopTM Gel in Reducing Pain of Local Anesthetic Infiltration prior to Elective Cesarean Delivery under Neuraxial Anesthesia

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Introduction: Up to 22% of patients experience needle phobia.(1) The fear of needle injection pain may interfere with anesthetic care. Previous studies analyzing the benefit of skin topical anesthesia prior to neuraxial block (NB) have found mixed results.(2,3,4) The efficacy of AmetopTM (tetracaine 4% gel) in reducing pain prior to skin local anesthetic infiltration before NB in pregnant women has not been studied. AmetopTM has a significantly faster onset of more profound anesthesia compared to EMLA®.(5) We hypothesized that AmetopTM, compared to placebo, when applied for a minimum of 20 minutes would reduce the pain of local anesthetic infiltration in parturients undergoing elective cesarean delivery (CD) under NB.

Methods: CONSORT guidelines were followed. 78 parturients were randomized to either placebo or Ametop groups. Standardized protocol for 1% lidocaine infiltration was utilized. Primary outcome was the Numeric Pain Score (NPS) (0-10) at 30 seconds after local infiltration. Groups were compared using the Welch's t-test, an adaptation of the Student's t-test, which corrects for the possibility of unequal variances between groups.

Results: Six patients were excluded for protocol violation leaving 36 in each group. There was a statistically significant difference in the mean NPS between the placebo and Ametop groups: (3.51, SD = 2.22, 95%CI = 0.75) and (2.36, SD = 1.80, 95%CI = 0.61), respectively (P = 0.019). Mean application time of study cream: Placebo = 41.6, Ametop = 40 minutes.

Discussion: Numeric pain score in Ametop group compared to placebo was 33% lower. While the clinical significance of this is uncertain, topical AmetopTM gel application before local anesthetic infiltration in elective CD prior to NB may be a useful adjunct in needle phobic parturients. There were no significant adverse events.

References

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3. Ralston SJ et al. Anaesthesia 1993.
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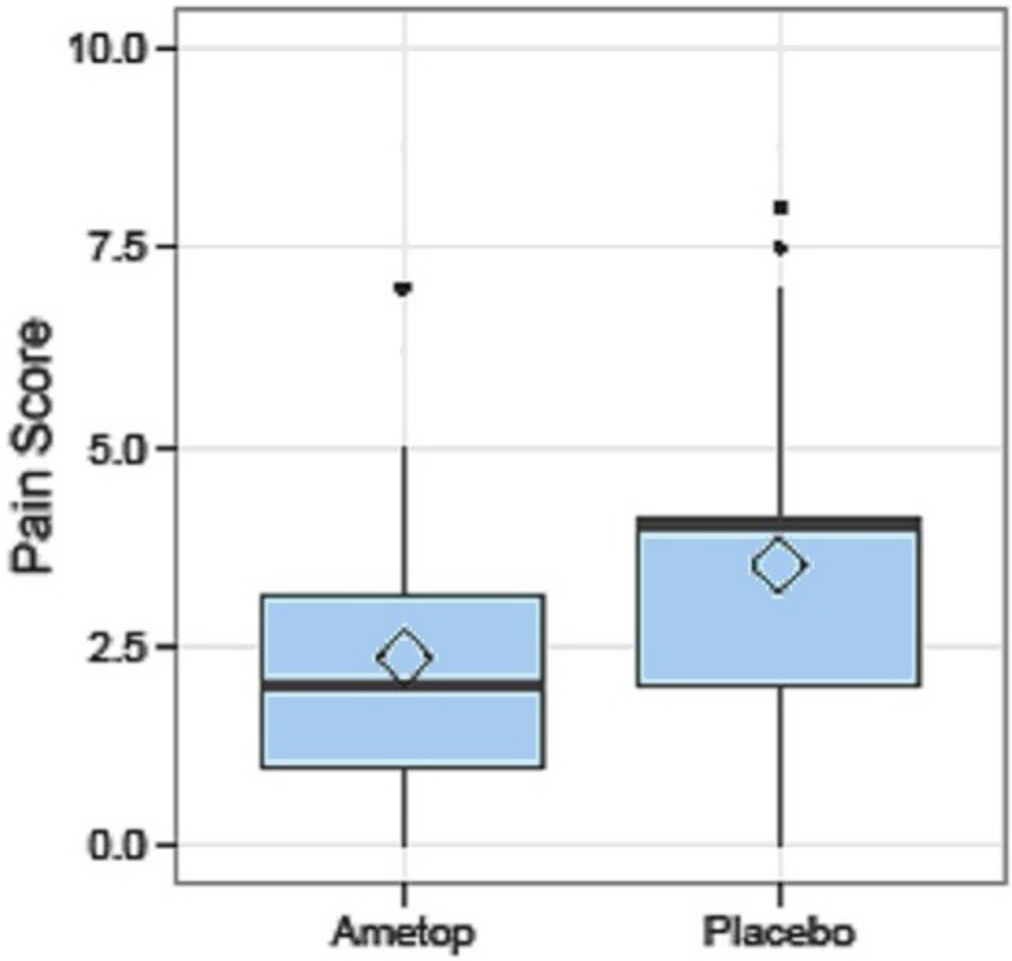

Thick horizontal line = the median.
Diamond = the mean
Boxes show the interquartlie range
Whiskers extend to 1.5 times the interquartile range
The points indicate outliers beyond 1.5 times the interquartile range.

Abstract #: S-56

Scheduled cesarean deliveries at ≥39 weeks compared to ≥37 weeks does not significantly impact obstetric and anesthetic workflow

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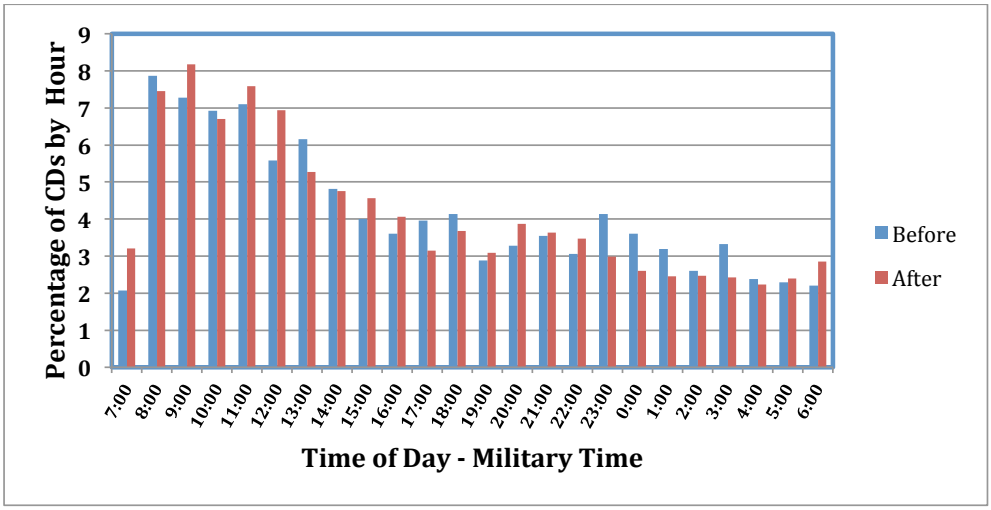
Introduction: Delivery of infants before 39 weeks gestation increases the risk of adverse neonatal outcomes, including increased mechanical ventilation, newborn sepsis, hypoglycemia and admission to NICU. [1] Current guidelines now recommend a minimum gestational age of 39 weeks for elective cesarean deliveries (CD). However, scheduling CDs at ≥39 weeks gestation (compared to ≥37 weeks) may increase unscheduled and after-hours CDs, requiring delivery prior to their scheduled CD. [2] The aim of this study was to determine the impact of waiting until 39 weeks gestation on the timing of CDs.

Figure 1: Percentage of cesarean deliveries by each hour in the day



Methods: After IRB approval, we conducted a retrospective, single center study of all women who underwent a CD between January 2010 and September 2013. On April 1, 2011, an institutional policy was implemented to eliminate non-medically indicated deliveries before 39 weeks gestation. The timing of CDs before (01/01/2010 to 03/30/2011) and after (06/01/2011 to 09/30/2013) the policy change was determined; April and May 2011 were omitted to account for an adjustment period. Data were extracted from an institutional database. Extracted data included date and time of admission and type of delivery. Shifts were divided into daytime shifts (7am-5pm) and nighttime shifts (5pm-7am) in accordance with our institution's current anesthesia shift times.

Results: On average 4214 deliveries per year occurred at our hospital during the study period. The overall CD rate changed slightly between the two study periods (41.5% vs. 39.4%; before vs. after the policy change; P=0.012). Figure 1 shows the average percentage of CDs that occurred each hour before and after the policy change. There was a very slight increase in the percentage of CDs performed in the daytime shifts (55.4% before and 58.7% after the change; P = 0.014). There was also a small increase in the CD percentage occurring during the weekend shifts (17.6% vs. 21.6% before vs. after the change, P=0.002).

Discussion: Our analysis suggests that scheduling CDs at ≥39 weeks compared to ≥37 weeks does not impact the temporal pattern of CDs. The most significant change was an increase in CDs during the weekend shifts. This change amounted to one more CD during the weekend shift on average, which does not impact the workflow enough to warrant a change in staffing patterns.

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1. Tita ATN, et al. N Engl J Med 2009;360:111-20
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Abstract # :S-57

Severe Hemodynamic Instability from Aortocaval Compression in a Parturient with Marfan Syndrome

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Introduction: Marfan Syndrome (MFS) in pregnancy is associated with potential challenges for the anesthesiologist including aortic root dilatation, scoliosis and lumbosacral dural ectasia.1 We report a case of severe hemodynamic instability from aortocaval compression after combined spinal-epidural anesthesia (CSE) in a parturient with ascending and descending aortic grafting due to MFS.

Case: A 35 year old G2P1 at 36w6d presenting for cesarean delivery with MFS, hypertension and severe scoliosis. She is status post graft repair of the entire descending aorta and right iliac artery due to Type B dissection followed by valve-sparing root replacement of the ascending aorta. Recent echocardiogram revealed stable grafts and an ejection fraction of 45% with a 4.6 cm native aortic root. Following arterial line and large bore intravenous placement, a CSE technique was performed using 3.5 mg of hyperbaric bupivacaine with fentanyl and morphine in the sitting position with BP 173/80 and HR 72. The epidural was dosed incrementally with 2% lidocaine with epinephrine with the patient in left uterine displacement (LUD) position. Bilateral anesthetic level could not be achieved while SBP fell into the 90's with normal HR. With reseating for epidural placement SBP increased dramatically to 180-190. Following epidural replacement and LUD positioning, severe hypotension (40's/20's,) bradycardia (30's) and obtundation occurred despite steep LUD and vasopressors. With prompt placement in full left lateral decubitus (LLD) position, hemodynamics and mental status resolved completely. Following induction of general anesthesia, cesarean delivery of a healthy infant was performed in LLD position. Immediately postoperatively, hypertension was treated with esmolol drip.

Discussion: Supine Hypotension Syndrome occurs in 15% of women at term.2 Caval and aortic compression typically occur at < 15% and 35% tilt respectively. Manual uterine displacement or full LLD position will prevent compression.3 In this case, we suspect the graft in conjunction with differences in vascular wall tone contributed to severe compression.

References:
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3. Anesthesia Intensive Care 2008; 36: 775-777. (Paech)

Abstract #: S-58

Snoring frequency increases during pregnancy and is associated with hypertension and cesarean delivery for labor dystocia

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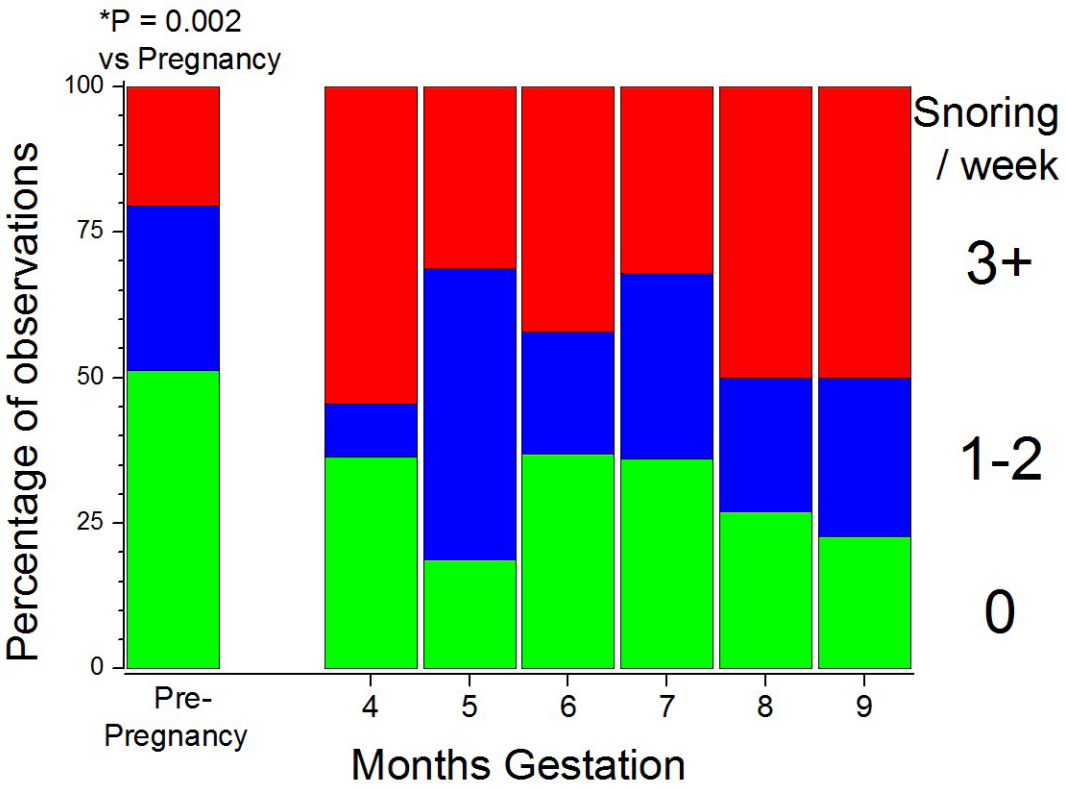
Snoring and sleep position have been previously shown to change during pregnancy and these changes are associated in some studies with gestational diabetes and hypertension, pre-eclampsia, premature birth, and intrauterine growth restriction. Most of these studies have studied only high risk populations and been cross-sectional in nature, typically assessing snoring and sleep position in the 3rd trimester. To assess changes over time, we recruited 79 women (23 ± 7 weeks gestation) from a general prenatal clinic and contacted them monthly regarding snoring and sleep position. As of the writing of this abstract, 55 of these women had delivered. Snoring was more common during pregnancy than prior to pregnancy (P=0.002) as was sleeping on the side compared to the stomach (P<0.001). However, snoring frequency and sleep position during pregnancy did not vary over time within individuals or across observations. The highest snoring frequency category (> 3 times per week, present in 44% of the women) was present in all 7 women with gestational hypertension. Snoring remained a significant predictor of gestational hypertension after adjusting for the effect of obesity. Snoring was associated with cesarean delivery for arrested descent or failure to progress, but not with other labor characteristics. Snoring was not associated with gestational diabetes, small- or large-for gestation birth weight, or NICU admission. These results agree with previous research that snoring, as a surrogate for high risk of obstructive sleep apnea, is common during pregnancy and associated with gestational hypertension. Changes in snoring occur early in pregnancy and are stable in most women, implying the need for early assessment for presence of obstructive sleep apnea and potential treatment.



Abstract #: S-59

Spinal anesthesia for emergency Cesarean delivery in a parturient with malaria falciparum

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Introduction: In the United Kingdom (UK) there are approximately 1500 cases of imported malaria a year. Despite malaria being a common disease world-wide, this is the first report of neuraxial anesthesia for cesarean delivery (CD) in a parturient with confirmed severe falciparum malaria.

Case report: A 35 year old Nigerian parturient (G3P2) with no medical history presented at 35 weeks gestation with fever, rigors, vomiting and headache. She had recently arrived in the UK from Nigeria. On admission a blood film was performed confirming falciparum malaria, with a parasitaemia of 3.8%, a level consistent with severe infection. Intravenous quinine therapy was started and she began spontaneous labor 48 hours later. Following labor onset, continuous cardiotocography displayed 2 late deep decelerations and a decision was made for emergency CD (category 2) in view of potential fetal compromise. She was hemodynamically stable and lab investigations revealed a platelet count of 119 x 10 /L, INR 1.1 and APTT 30.8 s. Spinal anesthesia at the L4/5 interspace was performed with intrathecal injection of 12 mg of hyperbaric bupivacaine and 400 micrograms of diamorphine using a 25 G Whitacre spinal needle. Surgery was uneventful with no cardiovascular instability and a healthy neonate (3850 g) was delivered. On day 1 post CD repeat blood film microscopy showed a malaria parasitaemia of <0.01%. Mother and baby were discharged home on day 3 following CD with no further complications reported at 1 month.

Discussion: An estimated 25% of women in sub-saharan Africa have malaria during pregnancy.(1) UK treatment guidelines issued by the Royal College of Obstetricians and Gynaecologists do not provide recommendations regarding anesthetic technique for CD in such patients. Spinal anesthesia has previously been used without complication in a parturient with babesiosis, a disease also characterised by intraerythrocytic parasites.(2) Spinal anesthesia in this patient was chosen after exclusion of coagulopathy and discussion with an infectious diseases expert. Although spinal anesthesia poses a theoretical risk of the needle introducing erythrocytes containing malaria parasites into the cerebrospinal fluid (CSF) and precipitating cerebral malaria, it was felt that the risk of parasite transfer into the CSF was low and unlikely to cause complications since cerebral malaria results from sequestration of malaria parasites in brain capillaries rather than being a meningeal process. We feel that spinal anesthesia is not contraindicated in parturients with malaria provided a clear risk-benefit analysis has been made. Further work is required to elucidate the safety of neuraxial anesthesia in this setting.

References:
1. Desai M et al. Lancet Infectious Diseases 2007; 7: 93–104.
2. Sultan P et al. Anaesthesia 2012; 67:180-3.

Abstract #: S-60

The effect of low-molecular weight heparin on thromboelastography in prengnancy - an in vitro study

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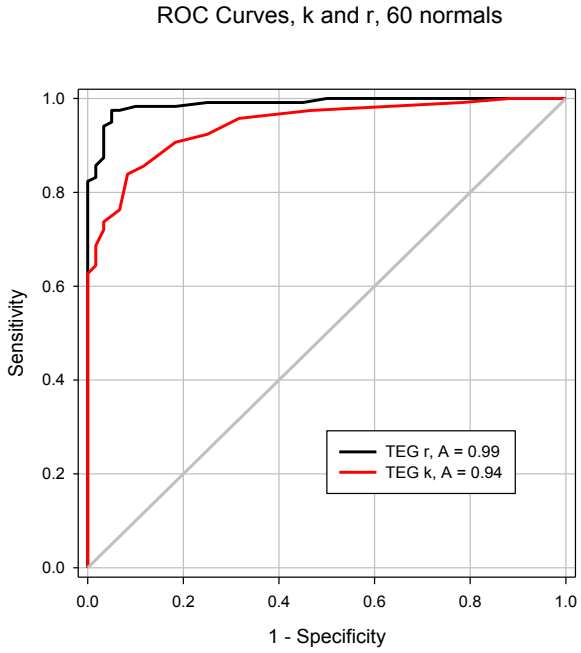
Background: Low molecular weight heparin (LMWH) is often used for prophylaxis or treatment of venous thromboembolism. Anti-Xa assays are used as a surrogate for LMWH activity, but there is a lack of consistency between LMWH dose, anti-Xa activity and anticoagulant effect(1). Due to the physiologic changes of pregnancy, standard weight-based dosing may underestimate the LMWH doses required for anticoagulation(2). Thromboelastography (TEG) is a point-of-care monitor of whole blood coagulation. The aim of this study was to determine if serial doses of LMWH added in vitro to whole blood samples from term, pregnant women changed TEG parameters in a dose-dependent manner.

Methods: ASA I or II parturients presenting for elective caesarean delivery were recruited. Blood was collected before delivery and serial dilutions of dalteparin in normal saline were added to yield final concentrations of 0 (control), 0.05, 0.25, 0.5, 0.75 and 1.0 U/ml anti-Xa activity. TEG tracings were obtained for all six samples using the standard kaolin protocol, and measured parameters included r time, k time, alpha angle and maximum amplitude (MA). Group medians underwent pair-wise multiple comparisons with Dunn testing. Receiver operating characteristic (ROC) curves were created for each TEG parameter and cut-off values for each parameter that best identified anti-coagulated samples (highest negative predictive value (NPV)) were also determined.

Results: 30 parturients were recruited. Samples containing ≤0.05 U/mL anti-Xa activity were considered "normal", while ≥ 0.25U/mL were "anticoagulated". TEG r time showed a dose-dependent response to increasing LMWH concentrations. There was a statistically significant difference in median TEG r time, k time, alpha angle and MA between normal and samples ≥ 0.5U/ml ($p<0.05$). r and k time ROC curves yielded an AUC of 0.99 and 0.94, respectively (Fig1).

Figure 1:



Conclusions: This pilot study demonstrates that TEG is able to detect the presence of LMWH in maternal whole blood. TEG r time is the most sensitive and specific parameter for detection of LMWH and an r time cut-off of 6.1 min yields the best combined sensitivity and specificity. At this value, the NPV for detecting anticoagulated samples was 95%. This finding supports a need for further study to differentiate if TEG can be used to determine real-time coagulation status, particularly for safety of neuraxial techniques.

References: 1. J Trauma. 2009;66:1509-17. 2. Obstet Gynecol. 2008;112:884-9

Abstract #: S-61

The Influence of an International Teaching Program on the Use of Regional Anesthesia for Cesarean Section in a Serbian Obstetric Hospital Over a Two Year Period

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Introduction: Regional anesthesia (RA) is infrequently used for cesarean section (CS) in Serbia, Factors may include poor parturient knowledge about RA benefits, perceived safety of general anesthesia and poor availability of anesthesiologists skilled in RA1. In 2003-2004, the Department of Anesthesia at Clinical Center Vojvodina (CCV) began a patient education program regarding RA use for CS. The use of RA rose from 6% in 2004 to 24% in 2009; however, in 2011, only 260 of 1860 CS (14%) had RA. Kybele is a dedicated to improving childbirth safety worldwide through educational programs. A four man team sponsored by Kybele visited CCV in 2012 and the percentage of CS with RA rose to 29.5% during the 2 months afterward. Neuroaxial analgesia (NA) for labor was emphasized. This study updates the ongoing joint efforts of Kybele and CCV physicians to increase RA use in CCV following a return visit in 2013.

Method: A team of two OB anesthesiologist, re-visited CCV in September 2013 to provide training in RA and NA. We prospectively compared the use of RA for CS one week before the visit (R1), the week during (R2), and at one (R3) and two (R4) weeks and two months (R5) following the visit. The use of NA for labor was also recorded. We compared the results to those from 2011/2012. Chi square testing was used for comparisons between groups.

Results: For both yearly visits significant increases in the use of RA for CS occurred during the Kybele visit and during some time intervals following visits in 2012/2013 (Table 1). Year over year increases were modest, but statistically significant. NA increased from 161 out of 4312 vaginal deliveries in 2012 to 253 out of 4330 vaginal deliveries in calendar year 2013 (57% increase).

Conclusion: The collaborative program between CCV and Kybele increased the use of RA for CS during the period of visitation and for some time intervals shortly afterward. Long term increases in use of RA for CS and NA are modest compared to the 84% increase reported by Kopic1. This probably reflects the additional cost that is associated with RA procedures, limited availability of anesthesiologist, and lack of PE on the benefits of RA and NA. The local team has prepared a brochure about RA for CS and NA for labor to supplement patient education. A future Kybele team visit will see if additional training of local anesthesiologist, and use of patient education efforts will increase RA and NA utilization.

Reference:1.Kopic IJOA 2009;18:4.

Interval	2012	2013
R1	15.9%	21.5%
R2	32.5%*	42.3%^
R3	22.2%	39.3%
R4	24.4%	16.1%
R5	29.5%+	18.8%
Yearly Percentage C/S under RA		
1/2011 – 12/2011		14.0%
1/2012 – 12/2012		16.1%+
1/2013 - 12/2013		18.4%*

Table 1: Percentage of cesarean deliveries performed under Regional Anesthesia (RA)

R1 = week before Kybele visit
R2 = week during Kybele visit
R3 = week after Kybele visit
R4 = 2 weeks after Kybele visit
R5 = 2 months after Kybele visit
*P = 0.05 for comparison between R2 and R1; + P = 0.03 for comparison between interval R5 and R1; ^P = 0.04 for comparison between R2 and R1 ; *P < 0.001 for comparison between 2013 and 2011 using Chi square testing; + P = 0.03 for comparison 2012 and 2011; Chi Square used for comparison testing

Abstract #: S-62

Transfer of Anesthesia Care: Optimal Characteristics of a Paper vs. Electronic Hand-off Tool on the Labor and Delivery Unit

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Introduction: Communication failures are consistently cited as the leading root cause of sentinel events. The care of an obstetric patient may be transferred among several anesthesia care teams. Information may be lost or miscommunicated during these hand-offs. The purpose of this qualitative study was to explore optimal obstetric anesthesia hand-off characteristics and to compare the perceptions of effectiveness of a paper compared with an electronic hand-off template using face-to-face interviews with anesthesia team members.

Methods: At our institution approximately 25 patients are handed off twice daily to an incoming anesthesia team. Historically, a paper template was used to organize hand-off information. In November 2012, a web-based spreadsheet template was trialed for three months.

An interview guide was developed to explore optimal hand-off characteristics, to compare the paper and electronic hand-off templates, and probe for possible improvements in the electronic template. Face-to-face interviews were conducted with resident, fellow, and attending anesthesiologists until thematic saturation was reached. Interviews were transcribed verbatim. Codes were developed using content analysis with an inductive approach, and were altered through consensus to ensure validity. Inter-rater reliability between two coders was 93%.

Results: Ten residents, 4 obstetric anesthesia fellows, and 9 attending anesthesiologists were interviewed. Information desired during hand-offs included an accurate medical and obstetric history, anesthesia-specific findings (e.g. Mallampati class) and information that would cause a deviation from the usual plan of care. Poor quality hand-offs left out pertinent information, spent too much time on irrelevant information and did not highlight critical information.

Comparing the paper and electronic hand-off systems, providers felt that the electronic template was not as easily accessible, was not as efficient, and was not as customizable as a paper system. However, the electronic template improved legibility and reduced the number of data omissions. While 66% of providers preferred the paper template, many stated that they would prefer an electronic one if it could auto-populate data from the electronic medical record and if it were accessible from a mobile device.

Conclusion: Our interviews delineate important characteristics of an obstetric anesthesia hand-off and suggest that an electronic template could improve the completeness and legibility of patient hand-offs, thereby improving patient safety. However, many improvements to the tool are necessary before it is widely accepted. Future work should directly compare the effectiveness of these two sign-out methods.

Funding: Robert Wood Johnson Foundation award 69779

Abstract #: S-63

Two Cases of Fulminant Respiratory Failure Requiring Combined Cesarean Delivery and VV ECMO Placement

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Introduction: H1N1 influenza is notable for its propensity to cause severe illness in young, healthy patients. Pregnant women are at increased risk and represent a disproportionate number of deaths. In January 2014, we treated two pregnant patients with H1N1 influenza who required Cesarean delivery (CD) immediately followed by VV ECMO with excellent short-term results.

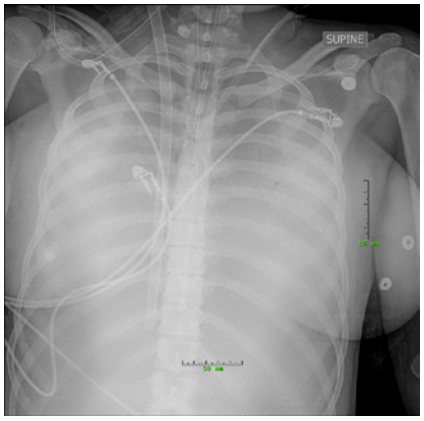

Figure 1: Initial chest x ray for Patient 1.

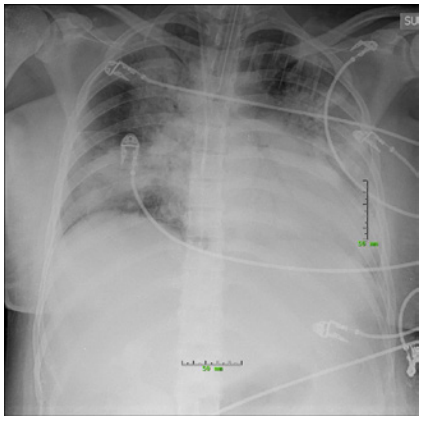

Figure 2: Initial chest x ray for Patient 2.

Case Presentation: Case 1: 27 year old at 26 weeks with severe, refractory hypoxia was transferred from an outside hospital intubated and sedated. SpO2 was 83% on 100% FiO2. Fetal heart tones were absent variability with decelerations. She was taken to the OR emergently, intravenous anesthesia was provided, and a left internal jugular central venous catheter, radial arterial line, and TEE probe were placed. A guidewire for a bicaval, dual lumen ECMO cannula was placed via the right internal jugular vein so that cannulation could be quickly completed if decompensation occurred. CD was performed. Oxytocin infusion and methylergonovine IM were administered. Heparin 3,000 units was given, cannula placed, and VV ECMO initiated. Heparin infusion began six hours post delivery, and no bleeding complications occurred.

Case 2: 24 year old at 37 weeks with severe, refractory hypoxia was transferred intubated and sedated. SpO2 was 83% on 100% FiO2. Fetal heart tones were reassuring. Intraoperative management paralleled the first case. Oxytocin infusion and misoprostol PR were administered after CD. Heparin 5,000 units was given, cannula placed, and VV ECMO initiated. Heparin infusion began six hours post delivery. The patient passed two large clots vaginally on postop day 1, but no other bleeding complications occurred.

Discussion: Bleeding complications are common and increase with duration of ECMO therapy. Hemodynamic instability requiring vasoactive agents is common. Therefore, we felt that the best chance for good maternal and fetal outcome was prompt CD followed by initiation of ECMO. With meticulous surgical hemostasis, aggressive resuscitation and prompt administration of uterotonics, CD followed by initiation of VV ECMO was safely performed. Collaboration between cardiothoracic surgery, obstetrics, intensive care, and anesthesiology teams was essential for success.

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Abstract #: S-64

Use of Nitrous Oxide/Oxygen Mixer in a Thrombocytopenic Parturient

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Administration of N2O/O2 mixture for labor analgesia is a practice in many European countries, but seldom used in the United States. In this case report, we discuss successful administration of nitrous oxide in a thrombocytopenic parturient who would otherwise be a poor candidate for neuraxial analgesia. The patient is a 36 year old Gravida 2 Para 1 at 39 1/7 weeks gestational age confirmed by ultrasound and presence of fetal heart tones, who presented for scheduled induction of labor. She had a past medical history significant for systemic lupus erythematosus with associated thrombocytopenia, advanced maternal age, and asthma. In her first pregnancy, there was concern for preeclampsia with HELLP and the patient was diagnosed with SLE. She had previously had a SVD to VMI complicated by shoulder dystoscia and postpartum hemorrhage requiring manual extraction of the placenta. The patient was subsequently placed on hydroxychloroquine. The patient's platelet count had been showing a declining trend during her pregnancy from 125,000/mmol during her first trimester to the time of presentation, which was 53,000/mmol. While platelets were being prepared for transfusion, patient started feeling increasingly uncomfortable with contractions and the decision was made to offer the patient SEDARA Gas Mixer System. SEDARA offers a 50/50 mixture of oxygen and nitrous oxide delivered under patient control via negative inspiratory pressures. Patient received 45 minutes of administration of N2O/O2 and delivered with minimal discomfort and no other medications. During the administration of N2O, patient's blood pressures ranged from 105-145/45-80 with heart rates ranging from 72-110. Delivery of infant was without complication, APGAR scores were 8 at one minute and 9 at five minutes. Vital signs of the infant upon delivery were heart rate 160, temperature 37.1, respiratory rate 48, blood pressure 70/39 and pulse oximetry 98% on room air. Post-delivery, the patient had a second degree perineal tear which was repaired while the patient continued to use Sedara, and 15 mL of lidocaine 1% administered by the surgeon at the site of the injury. Patient had no postoperative complications and the infant was watched in neonatal ICU because of maternal thrombocytopenia. With the increasing availability of nitrous oxide mixing systems in the US, non-neuraxial options for analgesic relief during labor should be considered.

	Heart Rate	Respiratory Rate	Blood Pressure	Pulse Oximetry	APGAR
Patient	72-110	16	105-140/45-80	100%	N/A
Infant	160	48	70/39	97%	8/9

Abstract #: S-65

Using quality improvement in practice; introducing labour ward handover

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Introduction: In Good Medical Practice, the General Medical Council identified the importance of sharing relevant information at the point of handover when going off duty (1). When handover is unstructured, information can be missed leading to an increased risk of critical incidents (2). The use of a structure can increase the quality of obstetric anaesthetic handovers and thus enhance patient safety (3). Our labour ward handover was unstructured and independent of the multidisciplinary team (MDT) handover which potentially led to important patient information being missed. We used Quality Improvement in Practice (QIP) methodology to identify ways to introduce a structured handover.

Methods: The PDSA (Plan, Do, Study, Act) cycle was used to help structure the change. A driver diagram systematically looked at all aspects of the project. In phase 1 the form was designed, it included all patients that may need anaesthetic input (ante-, peri-, post-natal). The timing of the handover was studied using process mapping. This identified that anaesthetic handover occurred before the MDT handover and duplication of tasks was occurring. We acted on this by incorporating our anaesthetic handover into the MDT meeting. Phase 2 of PDSA saw implementation of our joint handover with the new structured sheet. The initial measurement of change was the number of completed handover forms and this was shown visually using a run chart.

Results: Monitoring revealed that 44/62 (71%) forms were completed through December. There were only 4/31 days (12%) in which no forms were completed and these fell at weekends and on Christmas Day. Overall, the target of forms being filled in at both handovers occurred on 17/31 days (56%).

Discussion: There was initial resistance to the structured handover sheet. It was felt that there would be duplication in the handovers. This was identified in phase 1 and after discussion with senior team members was solved by joining the MDT handover. This was welcomed. Our target was 90% of forms completed so we will continue the project to achieve this. Run charts are a good way to show variation in progress over time visually and will be put on posters for all clinicians to see. Further education is needed to improve the quality of information included about patients at handover. This QIP project identified when the form was less likely to be completed and will focus on these periods, which have been suggested as times of increased patient risk.

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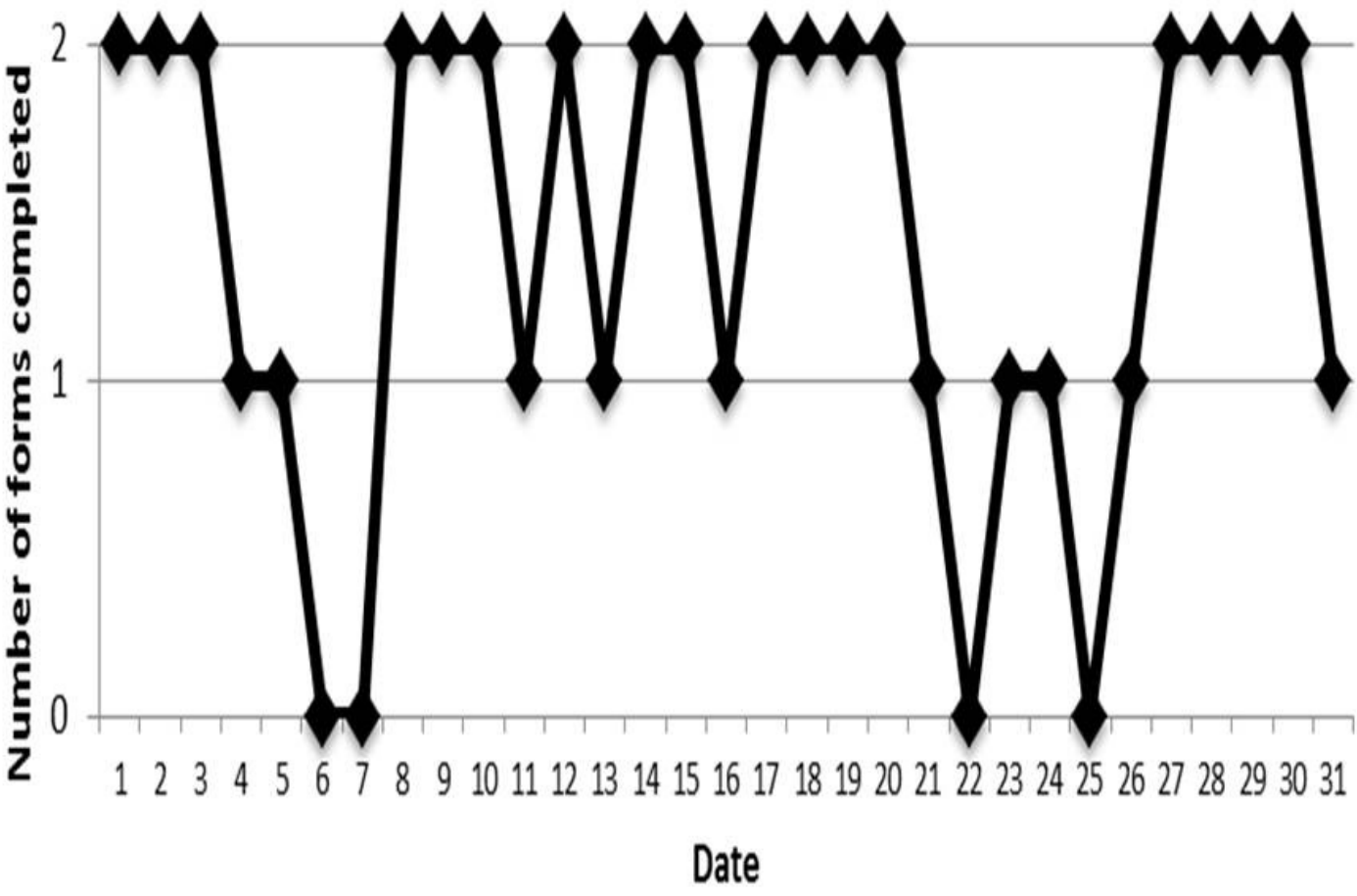

Run chart of number of forms completed in December 2013

Abstract #: S-66

Uterine and umbilical artery pulsatilty index following phenylephrine infusion versus bolus in cesarean section

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Introduction: Phenylephrine (PE) is commonly used for spinal-induced hypotension in women undergoing cesarean delivery (CD). PE has been shown to decrease maternal heart rate (HR) and cardiac output (CO). Previous studies suggest that maternal CO correlates with the uterine artery pulsatility index (PI), and poor fetal outcomes have been associated with increased PI. Phenylephrine infusions induce a more profound decrease in maternal HR and CO compared with intermittent phenylephrine boluses. The aim of this pilot study was to compare maternal hemodynamics and PI in patients receiving PE as boluses for the treatment of hypotension versus prophylactic infusions.

Methods: In this prospective, observational study, ASA 1-2 women undergoing CD under spinal anesthesia were alternately assigned to either a PE bolus (n=6) or infusion (n=5). Baseline CO, non-invasive blood pressure (NIBP), uterine and umbilical artery PIs were recorded in the preoperative holding area. CO was measured continuously using bioimpedance cardiography. Following a standardized spinal anesthetic with 12 mg bupivacaine, 15 mcg fentanyl, and 150 mcg morphine, patients were positioned in left uterine displacement. NIBP was measured every minute for 10 minutes and then every 2.5 minutes. Uterine and umbilical artery PIs were measured 5 and 10 min after spinal. In the infusion group, PE was initiated at 50 mcg/min and adjusted according to a predefined algorithm to maintain SBP within 20% of baseline. In the bolus group, hypotension defined as a drop of SBP of at least 20 % from baseline was treated with 100 mcg PE boluses. Maternal hemodynamics were compared using within- and between-group analyses. We also compared changes in umbilical and uterine artery PI between groups.

Results: Results are summarized in the table. There were no significant differences between groups in baseline measures. More PE was used in the infusion group (p =0.0004). There were no differences between groups in PI changes or maternal hemodynamic parameters after spinal, save for lower HR in the infusion group.

Discussion: Our pilot study finds no significant differences in maternal hemodynamics or uteroplacental perfusion in women receiving PE as bolus or infusion other than a decrease in HR. A sample size of 32 per group and 62 per group would have 80% power to detect a difference of the size we observed in umbilical artery and uterine artery PI respectively.

Statistics comparing Phenyephrine Methods on Change in Hemodynamics

	Method of PE Administration								
	Boluses				Infusion				
	Mean	SD	Median	Paired p#	Mean	SD	Median	Paired p#	Between-groups p*
Dose of PE (mcg)	266.7	454.6	0	n/a	2971.8	1105.6	2444	n/a	0.0004
PreOp Baseline CO (L)	6.61	0.43	6.8	n/a	7.07	0.87	6.54	n/a	0.2752
OR Baseline CO (L)	7.58	2.21	7.49	n/a	7.19	1.55	6.92	n/a	0.7447
Spinal 15 min CO (L)	5.88	1.79	5.09	n/a	5.59	1.33	5.05	n/a	0.7842
PreOp Baseline SV (mL)	87.3	16.4	84.2	n/a	80.7	7.8	77.7	n/a	0.4377
PreOp Baseline HR (bpm)	77.3	14.5	82.6	n/a	88.4	10.9	84.2	n/a	0.1913
PreOp Baseline SVR (dyn·s/cm5)	1070.4	110.1	1031.9	n/a	970.1	148.6	1034.6	n/a	0.2301
PreOp Baseline SBP (mmHg)	119.3	10.4	119.5	n/a	116.6	5.8	117	n/a	0.6157
Spinal 15 min SV (mL)	73.2	14.5	72.1	n/a	77.1	12.2	72.7	n/a	0.6386
Spinal 15 min HR (bpm)	79.4	12.9	79.8	n/a	72.1	5.8	70.4	n/a	0.2736
Spinal 15 min SVR (dyn·s/cm5)	1121	263.1	1111.4	n/a	1208.7	327	1250.5	n/a	0.6332
Spinal 15 min SBP (mmHg)	117.5	18.2	113.5	n/a	120.2	10.5	116	n/a	0.7765
CHANGES:									
Baseline to post-spinal CO	-0.73	1.48	-1.42	0.3125	-1.48	1.28	-1.31	0.1250	0.9273
Baseline to post-spinal SV	-14.1	20	-8.9	0.2188	-3.6	5.8	-4.9	0.1875	0.5228
Baseline to post-spinal HR	2.1	10.8	2.7	0.6505	-16.4	12.7	-13.7	0.0449	0.0282
Baseline to post-spinal SVR	50.6	198.4	42.8	0.5594	238.6	247.7	215.9	0.0976	0.1949
Baseline to post-spinal SAP	-1.8	11.3	-6	0.4375	3.6	10.5	-1	1.0000	0.1591
Umb Art PI change, base-1st OR	-0.043	0.676	0.18	1.0000	0.28	0.183	0.32	0.1250	0.6481
Umb Art PI change, base-2nd OR	0.143	0.888	0.145	0.7088	0.588	0.444	0.44	0.0772	0.3873
Ute Art PI change, base-1st OR	0.035	0.228	0.07	0.7225	0.134	0.401	0.14	0.4966	0.6184
Ute Art PI change, base-2nd OR	0.397	0.556	0.29	0.1408	0.158	0.378	0.31	0.4656	0.4769

*P-Value from t-test or Rank Sum test comparing PE Method groups

Pair P = Within groups paired test for significant change Baseline to Post-Spinal, using paired t-test or Sign Rank test

Abstract #: S-67

Utility of Thromboelastography in Post-Partum Hemorrhage

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A 40-year old G3P0 woman was brought to the operating room for emergency hysterectomy under general anesthesia. The patient had an uneventful cesarean section (C/S) 30 minutes earlier under epidural anesthesia for failure to progress. Extensive vaginal bleeding was noted in the PACU after the C/S, for which she received five units of packed red blood cells (PRBCs) and one unit of fresh frozen plasma (FFP). The patient's history was significant for hereditary antithrombin deficiency type 1 (ATD1); one who has a quantitative deficit of antithrombin, and received enoxaparin, an antithrombin amplifying drug, 48 hours before her admission. Individuals with ATD1 need sufficient anticoagulation and DVT prophylaxis with blood thinners. This is especially true in pregnancy when patients are at higher risk for thromboembolic events. Consequently, with anticoagulation comes the possibility of intra-operative bleeding.

During the exploration, lower uterine segment bleeding was noted; subsequently, the obstetrician proceeded with a hysterectomy. An additional three units of PRBCs, one unit of platelets, and two units of FFP were given. With the ongoing bleeding, a blood sample was sent for thromboelastography that showed poor clot firmness due to factor deficiency, hypofibrinogemia, and fibrinolysis. While cryoprecipitate was ordered and thawed, aminocaproic acid was infused and an additional one unit of FFP was given. Repeat thromboelastography results post-FFP and aminocaproic acid (5 grams infused) showed improved clot formation. No further blood products were given. She had a full recovery.

Postpartum hemorrhage is a major cause of maternal morbidity and mortality. A goal-directed transfusion is shown to improve the outcome and minimize the risk of unnecessary blood product transfusion. Thromboelastography is a point of care tool, which could be helpful in achieving these goals when it is used, along with continuous clinical evaluation.

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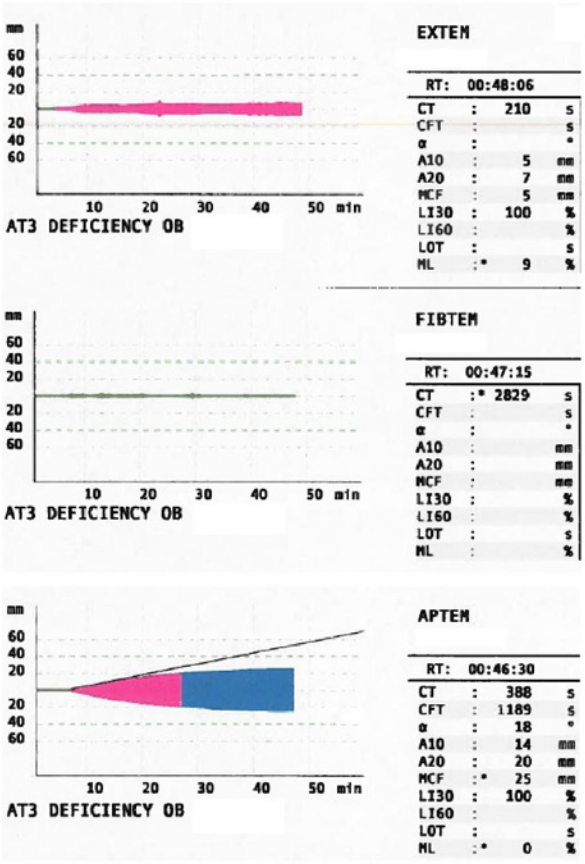
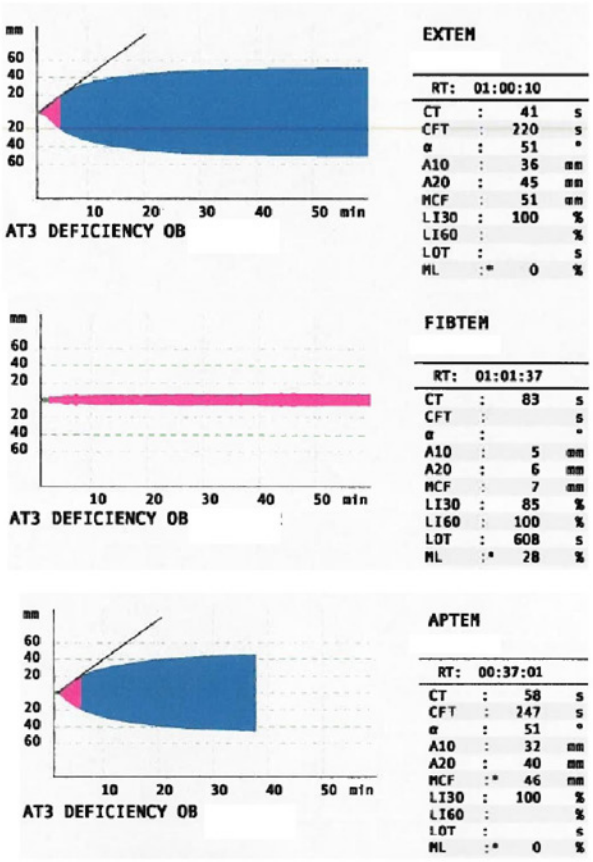


Before Aminocaproic Acid Infusion



After Aminocaproic Acid infusion + Fresh Frozen Plasma

Abstract #: S-68

Validation Studies for the Labor Pain Questionnaire: Comparison with the SF-1 and POM

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Introduction: The Short form 1 (SF-1 MPQ) version of the Long form McGill Pain Questionnaire (L-MPQ) and the Pain-O-meter(POM) are multidimensional tools that have been used for pain measurement during childbirth. Descriptors on both tools may be traced to the L-MPQ. Despite its use in obstetrics, the L-MPQ was not intended for pain measurement during childbirth and contains pain descriptors derived largely from the experiences of men. A health specific instrument, developed specifically for measurement of childbirth pain is likely to provide a more valid reflection of women's pain during childbirth. We report findings from validation studies which compared performance of two newly derived versions of a 22-item Labor Pain Questionnaire (LPQ) with the SF-1 MPQ and the POM using the parturient responses in the LPQ derivation sample.

Methods: With REB approval, underlying dimensions of women's childbirth pain experiences were compared between two versions of the LPQ (derived using Principal Components Analysis, Exploratory factor analysis followed by Varimax rotation or PAF with Promax rotation), SF-1MPQ and the POM using responses from 433 parturients in the database from which the LPQ was derived and the same statistical techniques. The interpretability of solutions as well as the internal consistency reliability associated with each scale and subscale was also examined and compared with LPQ versions.

Results: Five theoretically and clinically meaningful dimensions of the childbirth pain experience were found using the LPQ. These were: The Enormity of the Pain, Fear and Anxiety, Uterine Contraction Pain, Vaginal "Birthing Pain", and Back pain /Long Haul. Internal consistency reliabilities for both versions of the LPQ were also good or better for all subscales (0715 to 0.864) and the entire 22 item tool (0.894, 0.895) In contrast, items found on the SF-1 MPQ suggested that 4 dimensions underpin the experience of childbirth pain and the first (and most important) Factor for the LPQ, The Enormity of the Pain, was entirely omitted. Residual variance in the solution also suggested that another underlying factor remained unextracted in the data. Internal consistency reliability for the Birthing/delivery subscale equivalent for the SF-1 was also inadequate (Cronbach's alpha 0.686). Assessment of the underlying factor structure of the POM suggested that women's experiences of childbirth pain consisted of 6 dimensions. While the 26 questions found on this tool predictably increased internal consistency reliability (Cronbach's alpha 0.902), one dimension (Fear and Anxiety) was entirely missing and two others were not easily interpreted. The sixth dimension was difficult to interpret and possessed very low (0.361) internal consistency reliability.

Discussion: Findings from comparison of both versions of the LPQ with the SF-1 MPQ and the POM suggests that LPQ performance is superior to the other 2 tools.

Abstract #:S-69

Variations in baseline blood pressure readings correlate with reactive hypertension following prophylactic phenylephrine infusions=

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Background: Obtaining accurate baseline blood pressures is paramount to the management of spinal anesthesia (SA) induced hypotension and in research of vasopressor use for cesarean delivery. While some studies obtain baseline blood pressure in the preoperative holding (POH) area or the ward, others assess baseline pressure after patient transfer to the operating room (OR). We hypothesized that baseline blood pressure readings in the OR prior to placement of the neuraxial block would be higher than readings obtained in POH in women undergoing cesarean delivery under SA. We also explored if any difference between POH and OR blood pressures would predict hypotension or reactive hypertension following SA and initiation of phenylephrine (PE) infusion.

Methods: We performed a post hoc analysis of data previously collected for an IRB approved study. Three independent blood pressure readings were obtained two minutes apart with standard non-invasive blood pressure in POH and one measurement was obtained in the OR prior to initiation of standardized SA. After block placement PE was started at 50 mcg/min and titrated to maintain systolic blood pressure (SBP) within 20% of baseline. The mean of the three preoperative SBP readings and the highest preoperative SBP were compared to the first blood pressure reading obtained in the OR. Groups were compared with 2-sample t-tests or Rank Sum tests, and changes were tested with paired t-tests or Signed Rank tests, as appropriate. Association of SBP change with hypotension and reactive hypertension was tested with logistic regression analysis accounting for baseline SBP, and testing for an interaction of baseline SBP with change in SBP.

Results: 293 cases were included. The first blood pressure obtained in the OR was significantly higher than both the mean and the highest POH blood pressures ($P<0.0001$). The mean (SD) increase was 15.6 mmHg (13.5), 95% CL = 14.1 – 17.2. There was a significant positive correlation between SBP change and occurrence of reactive hypertension (but not hypotension) following initiation of PE infusion (unadjusted OR= 1.36 for increased risk of reactive hypertension per 10mmHg increase in SBP ($p=0.001$, 95% CL = 1.14– 1.64). This effect remained significant ($p=0.0035$) and consistent (OR=1.33 per 10mmHg change) when preoperative SBP was added to the model with no significant interaction of SBP change and preoperative SBP.

Discussion: Our data show that baseline blood pressure readings in the OR are significantly elevated compared to those obtained in POH. However since this is a secondary analysis, only one blood pressure obtained in the OR before neuraxial placement was available for the analysis. Further studies should examine if those results are reproducible with several readings obtained in the OR. This has implications for standard practice and studies involving vasopressor administration. The relationship between blood pressure change and reactive hypertension deserves further studies.