

Simulation Patient Design (January, 2021)

Case of Maternal Trauma Presenting to the Emergency Department

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Introduction

Trauma complicates approximately 8% of all pregnancies, and is the leading non-obstetric cause of death among pregnant women.¹ Management of the pregnant trauma patient involves evaluation and resuscitation of two individuals, the mother and fetus, with the primary principle being prompt and sustained resuscitation of the mother to optimize outcomes for both.²

Traumatic injuries to pregnant women can be classed as *unintentional* (e.g. a fall, motor vehicle accident, poisoning) or *intentional* (e.g. assault/domestic violence, suicide, homicide). More than 90% of pregnancy-related trauma is minor, which usually does not involve the abdomen, rapid compression, deceleration or shearing forces, and usually the patient does not report pain, vaginal bleeding, loss of fluid, or decreased fetal movement.³ However, even minor trauma can result in fetal demise, therefore continuous monitoring for a viable fetus is recommended for at least 4 hours (and up to 24 hours if needed), and intermittent monitoring for a pre-viable fetus.⁴

The Advanced Trauma Life Support (ATLS) evaluation is divided into primary, secondary and tertiary surveys. The primary survey involves a quick assessment of vital organ function (i.e. ABCDE) involving airway, breathing, circulation, disability (e.g. Glasgow Coma Scale and pupillary response) and exposure.⁵ The secondary survey involves a head-to-toe examination and includes x-rays and a Focused Assessment with Sonography for Trauma (FAST) scan. The tertiary survey involves comprehensive general physical reexaminations and review of labs, investigations and imaging to detect missed injuries over the next 24 hours. The fetal survey is important but should not delay maternal resuscitation as maternal cardiovascular instability is the leading cause of fetal demise, so the obstetrician should perform a fetal survey only when disruption in maternal care will be avoided.⁶ Once stability has been achieved, focused x-rays/CT imaging may be indicated and/or surgery (as would be the case for a non-pregnant trauma patient).⁷ Abruption secondary to trauma is the leading cause of fetal demise.⁷ The Kleihauer-Betke test should be performed after trauma to determine fetal-maternal hemorrhage regardless of Rh status, and Rh negative women should receive a dose of RHo (D) immune globulin.⁸

Multidisciplinary discussions should occur and depending on the level of trauma sustained (and when safe to do so), consideration should be given to transfer to a tertiary care facility (e.g. level 1 trauma center) with obstetrical services.⁸

Key Points

1. Manual uterine displacement should be performed during resuscitation to improve venous return and optimize cardiac output
2. The pregnant airway is unique and requires advanced airway expertise - the combination of pregnancy and trauma causes an increased risk for aspiration

3. Unique aspects of advanced cardiac life support (ACLS) include aggressive volume resuscitation, early intubation, and performance of perimortem cesarean delivery, when indicated
4. Women of childbearing age should be routinely screened for domestic violence and assessed for depression and suicidal tendencies

Educational Rationale: To teach team skills in recognizing and managing maternal trauma

Target Audiences: Emergency Medicine physicians, Obstetricians, Anesthesiologists, Trauma teams, Emergency Department nursing and Labor and Delivery nursing

Learning Objectives: As per Accreditation Council for Graduate Medical Education (ACGME) Core Competencies

Upon completion of this simulation (including the debrief) learners will be able to:

- *Medical knowledge:* Recognize the difference between minor and major maternal trauma and understand fetal, maternal and obstetric consequences of major and minor trauma
- *Patient care:* Describe application of a trauma protocol in a pregnant trauma patient and describe minor and major injuries, mechanisms of injury and screen for domestic violence and mental health issues
- *Practice-based learning and improvement:* Evaluate the multidisciplinary team response, and escalation of level of care as needed in a pregnant trauma patient
- *Interpersonal and communication skills:* Demonstrate multidisciplinary team management, including closed-loop and SBAR communication, and coordinate effective and efficient care to resuscitate the mother and fetus
- *Professionalism:* Demonstrate respect and recognize the expertise of all team members
- *Systems-based practice:* Recognize and adapt to challenges that can exist in different units of the hospital system (e.g. Emergency Department, Labor and Delivery, Operating Room and Intensive Care Unit), understand systems issues, and recognize any barriers that exist to deliver coordinated care

Questions to Ask After the Scenario:

- Did each member of the team have a well-defined role and was a team leader identified?
- Did team members communicate effectively?
- Were management steps clearly outlined by the care team?
- Was the emergency response team appropriately activated and decision-making clear?
- Were there any barriers or system issues identified when caring for the patient?
- Would cognitive aids have been useful in this scenario, if so, why?

Assessment Instruments:

1. Learner Knowledge Assessment form (Appendix 1)
2. Simulation Activity Evaluation form (Appendix 2)

Equipment Needed and Set-up:

Airway equipment (difficult airway cart)

Cervical collar

Maternal monitoring equipment

Ultrasound/tocodynamometer

IV access equipment (e.g. rapid infusion catheter, central line, large-bore IV, arterial line setup)
 Rapid infusion equipment
 Crash cart

Simulation Scenario Set-up:

The case

Ms. Elle Dee, a 31-year-old multiparous patient (G3P2) at 37 weeks gestation arrived in the Emergency Department’s trauma bay via taxi. Emergency personnel lifted the patient onto a gurney and active bleeding was evident from staining on her skirt and on the floor of the taxi. The patient described being assaulted by her partner at home on her lower abdomen and she fell down in distress and called for a taxi. Past obstetric history includes two prior cesarean deliveries, and this pregnancy has been uneventful.

Simulation Pre-brief

- Read the scenario and instruct team members on their roles during the simulation
- Learners take their place
- Patient (mannequin/actor for voice of patient)
- OB and anesthesiologist respond to an OB Rapid Response alert to the Emergency Department and on arrival ATLS evaluation (end of the secondary survey) and resuscitation are in progress by the Emergency Department team

Maternal Trauma Scenario

Trigger	Patient condition	Action	Done	Time	Comments
End of secondary survey: ongoing resuscitation with 2 large-bore IVs in-situ infusing normal saline	Awake, confused and scared HR 122 bpm (thready pulse) BP 92/55 mm Hg Resp 24/min Sats 94% (on oxygen 10 L/min via non-rebreather facemask) Temp 36°C	1. Huddle and review case with ED team <ul style="list-style-type: none"> <input type="checkbox"/> Current situation <input type="checkbox"/> PMH/allergies/ NPO status etc. 2. Verify which labs have been sent <ul style="list-style-type: none"> <input type="checkbox"/> CBC, coag screen, fibrinogen, lactate, CMP, ABG, type and cross <input type="checkbox"/> Activate MTP 3. Check left uterine displacement 4. Review airway equipment in the ED			
Cardiovascular instability continues	Confused and shivering Evidence of bleeding from vagina (EBL 300	1. Review resuscitation fluid type <ul style="list-style-type: none"> <input type="checkbox"/> Start blood transfusion 			

	<p>mL)</p> <p>HR 128 bpm BP 84/62 mm Hg Resp 22/min Sats 96%</p> <p>pO₂ 98 mm Hg pCO₂ 32 mm Hg pH 7.32 HCO₃ 19 mEq/L</p> <p>Lactate 3 mmol/L</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Discuss blood product ratios <ol style="list-style-type: none"> 2. Place arterial line 3. Review imaging from secondary survey (CXR, pelvic x-ray) 4. Review lab results (if available) 5. OB team assess maternal status <ul style="list-style-type: none"> <input type="checkbox"/> Examine abdomen/pelvis <input type="checkbox"/> Perform FAST scan 6. OB team assess fetal status <ul style="list-style-type: none"> <input type="checkbox"/> FHR/toco <input type="checkbox"/> Perform ultrasound <input type="checkbox"/> Assess gestational age/AFI 			
<p>Cardiovascular stability improving</p> <p>Suspected abruption secondary to blunt abdominal trauma</p>	<p>HR 100/min BP 112/68 mm Hg Resp 18 /min Sats 96% (on oxygen) FHR 150/min</p> <p>Mental status improving – patient verbalizes injury</p>	<ol style="list-style-type: none"> 1. Multidisciplinary discussion <ul style="list-style-type: none"> <input type="checkbox"/> Discuss differential diagnoses <input type="checkbox"/> Need to go to the OR? <input type="checkbox"/> Discuss need for RHo (D) immune globulin 			
<p>Transport patient to OR for emergency cesarean delivery</p> <p>Bakri balloon placement not successful, decision made to proceed with hysterectomy</p>	<p>Hemorrhage secondary to uterine atony</p> <p>HR 136 bpm BP 80/45 mm Hg Resp – intubated Sats 99% Temp 36.5°C</p> <p>Hb 8.5 g/dL WCC 18.5 x 10⁹/L Plts 105 x 10⁹/L</p> <p>INR 1.4</p>	<ol style="list-style-type: none"> 1. Perform rapid sequence induction 2. Uterine atony <ul style="list-style-type: none"> <input type="checkbox"/> Administer oxytocin <input type="checkbox"/> Administer 2nd-line uterotonics (methylergonovine + carboprost) <input type="checkbox"/> Place Bakri balloon 3. Hemorrhage management <ul style="list-style-type: none"> <input type="checkbox"/> Repeat labs <input type="checkbox"/> Keep ahead with MTP <input type="checkbox"/> Review EBL/QBL 			

	Fib 135 mg/dL	<input type="checkbox"/> Consider fibrinogen concentrate administration <input type="checkbox"/> Consider early administration of tranexamic acid <input type="checkbox"/> Initiate active warming			
Disposition	HR 95 bpm BP 106/74 mm Hg Resp – intubated Sats 100% Temp 37°C	<ol style="list-style-type: none"> 1. Admit to ICU (intubated) 2. Report to family 3. Contact social services 			

Appendix 1

Obstetric Interdisciplinary Team Simulation

Name of simulation: Management of pregnant trauma patient

Date: _____

Anesthesiology

Obstetrician

ER physician

Support Personnel

Each item has two components. The “Before the simulation” column (left side) examines your perspective at the beginning of the simulation. The “End of Simulation” column (right side) is to evaluate your perspective at the completion of the simulation.

1. How would you rate your knowledge of the impact of trauma on pregnancy?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none				Knowledgeable			Little/none				Knowledgeable		

2. How would you rate your knowledge of primary, secondary and tertiary survey of pregnant trauma patients?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none				Knowledgeable			Little/none				Knowledgeable		

3. How would you rate your knowledge of the effect of maternal trauma on the fetus?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none				Knowledgeable			Little/none				Knowledgeable		

4. How would you rate your knowledge of the management of general anesthesia and airway management for a pregnant trauma patient?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none				Knowledgeable			Little/none				Knowledgeable		

5. How would you rate your knowledge of massive hemorrhage management?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none				Knowledgeable			Little/none				Knowledgeable		

Appendix 2

SIMULATION ACTIVITY EVALUATION FORM

DATE OF SIMULATION: _____

OCCUPATION: Consultant PG Yr 1 2 3 4 STUDENT NURSE MIDWIFE OTHER

SPECIALTY: _____ YEARS IN PRACTICE: _____

Please rate the following aspects of this training program using the scale listed below:

1 = poor 2 = suboptimal 3 = adequate 4 = good 5 = excellent

Use "N/A" if you did not experience or otherwise cannot rate an item

INTRODUCTORY MATERIALS

Orientation to the simulator	1	2	3	4	5	N/A
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PHYSICAL SPACE

Realism of the simulator space	1	2	3	4	5	N/A
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EQUIPMENT

Satisfaction with the mannequin	1	2	3	4	5	N/A
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SCENARIOS

Realism of the scenarios	1	2	3	4	5	N/A
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Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
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Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
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Overall quality of the debriefings	1	2	3	4	5	N/A
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DID YOU FIND THIS USEFUL?

To improve your clinical practice?	1	2	3	4	5	N/A
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To improve your teamwork skills?	1	2	3	4	5	N/A
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To improve your VERBAL communication?	1	2	3	4	5	N/A
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To improve your NONVERBAL communication?	1	2	3	4	5	N/A
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FACULTY

Quality of instructors	1	2	3	4	5	N/A
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Simulation as a teaching method	1	2	3	4	5	N/A
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COMMENTS

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