

## The EM Educator Series

The EM Educator Series: Trauma with Two Patients on Board

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### Cases:

#1:

A 24-year-old female at 28 gestation is brought in by EMS after an MVC. She was restrained, but her side of the vehicle was hit head-on by a large truck. She is tachycardia and complaining of generalized abdominal pain.

#2:

A 19-year-old female at 30 weeks gestation comes in after being found on the side of the road. She suffered several stab wounds to her abdomen. She loses pulses just as she is placed on the trauma bay bed.

### Questions for Learners:

- 1) What should you consider in organizing the team? What are your priorities?
- 2) How do you manage the airway? What should you consider for the pregnant airway?
- 3) How is your assessment of Breathing different? If you need to place a chest tube, is there anything you need to consider?
- 4) What should you think about regarding Circulation?
- 5) When is a resuscitative hysterotomy recommended, and how is it performed?
- 6) Does your imaging change in pregnant trauma patients? What should you consider for FAST and CT?
- 7) What are signs of intimate partner violence, and what are your next steps if this is suspected?

**Note: Mastering neonatal resuscitation is a must; having an extra set of hands there, such as another EM physician or pediatrician, can be a big help!**

## Suggested Resources:

- ✓ Articles:
  - [emDOCs.net – Resuscitation of the Pregnant Trauma Patient – Pearls and Pitfalls](#)
  - [emDOCs.net – Trauma Management of the 3rd-Trimester Pregnant Patient: Pearls & Pitfalls](#)
  - [LITFL – Trauma and Pregnancy](#)
  - [LITFL – Trauma and Pregnancy Redux](#)
  - [Taming the SRU – AirCare Series: Resuscitative Hysterotomy](#)
  - [CORE EM – Peri-Mortem C-Section](#)
  - [Radiopaedia – Trauma in pregnancy](#)
  - [EMCNA – Trauma in pregnancy](#)
- ✓ Podcasts:
  - [CORE EM – Episode 34.0 – Trauma in Pregnancy](#)
  - [EM Cases – BCE 65 Intimate Partner Violence – A Silent Epidemic](#)

## Answers for Learners:

### 1) What should you consider in organizing the team? What are your priorities?

While it is important to remember that there are two patients, the survival of the fetus is dependent on optimal management of the mother. It is important to recall that the best fetal resuscitation is good maternal resuscitation. Doing the simple things well, such as optimizing maternal hemodynamics and oxygenation, will ensure the best fetal outcomes. Preparing ahead of time with simulated resuscitations or mental rehearsal will improve your chance of successfully managing this stressful situation.

Managing the resuscitation of a critically ill pregnant trauma patient is a novel, high-stress clinical scenario. You must be prepared for not only the medical challenges of the resuscitation but also the interpersonal dynamics of leading a team that includes multiple consultants with diverse interests. Both simulation and mental rehearsal are excellent ways to prepare, anticipate challenges, and formulate algorithms you can easily access when the situation does occur.

### 2) How do you manage the airway? What should you consider for the pregnant airway?

Expect a difficult airway, optimize pre-oxygenation and positioning, and expect significant edema and mucosal friability.

- The anesthesia literature estimates the rate of failed intubation during emergency cesarean section from 1 in 250 to 1 in 750. This is significantly higher than in the general anesthesia population. Much of this data comes from older studies conducted prior to the age of video laryngoscopy and other modern airway adjuncts, so it may be in a modern cohort that this rate would be lower. This assumption is supported by a 2009 study which reported 0 failed and 23 difficult intubations in 3,430 cases of obstetric general anesthesia. However a more recent survey-based study from Britain estimated a rate of failed intubation of 1 in 224.
- The same factors that predict a difficult airway in the non-pregnant population (Mallampati score, body habitus, short neck, and large incisors) are also predictive of a difficult airway in pregnancy. However there are other changes in pregnancy that can increase the difficulty of intubation. These include airway edema associated with the progesterone-mediated increase in total-body water as well as increased mucosal friability and as a result a higher likelihood of bleeding during manipulation.
- The risk of aspiration is also increased due to decrease in lower esophageal sphincter tone and increased intra-abdominal pressure from the gravid uterus. In order to decrease the risk of aspiration, positive pressure ventilation should be avoided if possible. If bagging is required lower volumes and slower inhalation times are recommended. Some authors recommend routine use of cricoid pressure during intubation of pregnant patients (controversial).
- Oxygen consumption increases throughout pregnancy by 30-60%, however there is a decrease in total lung volume due to upward displacement of the diaphragm. Minute ventilation is increased, primarily through an increase in tidal volume (rather than an increase in RR). As a result patients may desaturate much more quickly when hypopnea or apnea are present. Estimation of minute ventilation based solely on respiratory rate will underestimate ventilatory

needs due to increased tidal volume. Close attention should be paid to maximizing pre-oxygenation and de-nitrogenation.

### **3) How is your assessment of Breathing different? If you need to place a chest tube, is there anything you need to consider?**

In late pregnancy, consider placing a chest tube higher than you would in a non-pregnant patient.

- In advancing pregnancy there may be cephalad displacement of the diaphragm up to 4 cm. Caution should be taken to avoid inadvertent trans-hepatic or trans-splenic thoracostomy tube placement. Some authors suggest insertion of a chest tube in the 3rd or 4th intercostal space instead of the 5th.

### **4) What should you think about regarding Circulation?**

The patient should be positioned to reduce compression of the great vessels by the gravid uterus.

- The weight of the gravid uterus falls posteriorly in the supine patient, and may compress the IVC and aorta causing reduced venous return and resultant hypotension. It is commonly reported that placing the patient in 15 – 30 degrees of left lateral tilt may improve cardiac output by 30-50%, but it is unclear where this data comes from.<sup>ix</sup>, In one study of manual leftward displacement versus lateral tilt in patients undergoing cesarean section, leftward displacement was associated with less hypotension and decreased pressor requirements. The AHA guidelines on cardiac arrest give supine positioning and manual leftward uterine displacement during CPR a IIa recommendation, and left lateral tilt IIb.

Attempt to obtain supra-diaphragmatic intravenous or intraosseous access for volume resuscitation and medication administration.

- The gravid uterus causes compression of the IVC and may reduce venous return from the lower extremities, limiting the utility of volume or resuscitation or medication administration by infra-diaphragmatic access.

### **5) When is a resuscitative hysterotomy recommended, and how is it performed?**

Perimortem cesarean section should be performed by emergency providers in cases of maternal cardiac arrest and a pregnancy sufficiently advanced to cause aortocaval compression. Ideally this would be initiated within 4 minutes of arrest; however even after substantial delay may be beneficial to both mother and fetus.

- AHA guidelines recommend prompt perimortem C-section to alleviate aortocaval compression and allow extra-uterine fetal resuscitation. Prior guidelines have recommended waiting 4-5 minutes after arrest before beginning perimortem cesarean section to determine if medical therapy will be effective in achieving ROSC. The 2010 AHA guidelines do not recommend a mandatory trial of medical therapy prior to initiating cesarean section, and suggest that in some cases including clearly non-survivable maternal injury, it may be beneficial to the fetus to begin the procedure as soon as maternal arrest occurs.

- Even in the case of a nonviable fetus, perimortem cesarean section may improve maternal hemodynamics by alleviating aortocaval compression. The 2010 AHA guidelines suggest that it should be considered for pregnancies thought to be 20 weeks or greater, which can be estimated by finding the uterine fundus at or above the level of the umbilicus.
- For viable fetuses, outcomes are best when delivery occurs within 5 minutes of maternal arrest, however there have been fetal survivors delivered after delay as great as 30 minutes.
- In a large structured review of case reports of perimortem cesarean section 29 of 38 cases produced a fetal survivor. Maternal condition improved in 12 of the 18 cases in which it was recorded. However the primary cause of arrest in this series was medical, with only 8 of 38 arrests due to trauma.
- Lack of a complete surgical tray should not prevent initiation of perimortem cesarean section. Knife and scissors are the only instruments needed. Due to the low cardiac output associated with maternal arrest, minimal bleeding should be expected unless ROSC occurs. Consideration should be given to concomitant thoracotomy if indicated.

#### **6) Does your imaging change in pregnant trauma patients? What should you consider for FAST and CT?**

CT imaging should be performed as clinically indicated; diagnostic studies, including CT of the abdomen and pelvis, will not expose the fetus to an unsafe amount of radiation. Contrast agents should be used if indicated.

- According to the American College of Radiology, doses of less than 50 mGy are not associated with increased rates of fetal anomaly or loss. The typical dose of radiation to which a fetus would be exposed during the initial trauma evaluation should be less than this. For example a CT of the head, C-spine, chest, abdomen, and pelvis exposes the fetus to 25.2 mGy. Nevertheless, exposure to ionizing radiation is not without consequence. A fetal dose of 50 mGy increases the risk of childhood cancer from 1:2000 to 1:1000, and increases the lifelong risk of cancer by 2%.
- Iodinated contrast material should be used in the setting of trauma. It is a pregnancy category B drug; the benefit in diagnostic imaging of the trauma patient likely outweighs the risks.

The FAST is less sensitive for free fluid in the pregnant patient than in non-pregnant patients. Sensitivity decreases with increasing gestational age, likely due to altered fluid flow within the abdomen.

- Three retrospective case studies examined the sensitivity and specificity of abdominal ultrasound in detecting intra-abdominal injury in pregnant trauma patients. The largest from UC Davis enrolled 328 pregnant trauma patients including 23 who had intra-abdominal injuries. Sensitivity of FAST was 61% (95% CI 39 – 80) and specificity 94.4% (95% CI 91 – 97) in this group. This was lower than in non-pregnant female patients of child-bearing age in whom sensitivity of FAST was 71.2% (95% CI 64 – 77) and specificity 97.4% (95% CI 97 – 98). FAST was most sensitive in the 1st trimester and least in the 3rd. The authors theorize this may be due in part to compression of the paracolic gutters and altered intra-abdominal fluid flow in late pregnancy. The other two case series reported higher sensitivities, but were both much smaller. By comparison, a recent unstructured review of studies of the FAST exam in non-pregnant patients, reported sensitivities from 64% – 98%.

## 7) What are signs of intimate partner violence, and what are your next steps if this is suspected?

### Universal Screening for Intimate Partner Violence

#### Start with a normalizing statement

“Because violence is so common in many women’s lives and because there’s help available for women being abused, I now ask every patient about domestic violence.”

While there are multiple screening tools for intimate partner violence in the literature and there is no evidence that one is better than the other, *The Partner Violence Screen* has been shown to have 94% specificity for intimate partner violence.

#### The Partner Violence Screen

1. Have you been hit, kicked, slapped, punched or otherwise hurt by someone in the past year?
2. Do you feel safe in your current relationship?
3. Is there a partner from a previous relationship who is making you feel unsafe now?

This could be done at triage or in the ED by a nurse and if the patient screens positive, a useful thing to do is to then place a small colored paper on top of the chart that should alert the ED physician. The ED doc can also administer the screen.

Both the CDC and the American College of Obstetrics and Gynecology recommend *universal screening* for intimate partner violence. So if your ED doesn’t already have a screening protocol, you might want to consider speaking with your administration team and get a protocol up and running.

### Management of Intimate Partner Violence in the ED

You may find it uncomfortable to know exactly what to say and do once you have discovered intimate partner violence in the ED. There are 3 recommended steps:

1. Validate and empower the victim
2. Assess safety
3. Set up a plan

#### Validating and empowering the victim

“What you are experiencing is called abuse, and it is not your fault.”

“It takes courage to talk about your abuse with me.”

“I want you to know that you are not alone. There are many others going through this and I’m here to listen and to help.”

#### Assess safety

“Do you feel safe going home?”

If there are children, ask about the safety of the children.

#### Set up a plan

First you need to ensure that any information that is given to the patient must be done with discretion so that the perpetrator doesn’t find out because violence is very likely to escalate if the perpetrator finds out the victim is planning on leaving. Ask your patient about where they could go in case of an emergency, offer them information on women’s shelters and encourage them to speak to your ED social worker, or call a helpline for assaulted women.

It’s easy for ED docs to see ourselves as resuscitators and experts at managing true emergencies. But we’re fortunate to be in a unique position where we have the opportunity to change a person’s life or even

save a life with just a couple of quick questions. We need to start thinking beyond just the razzle and dazzle of emergency medicine and start to think more holistically about our patients. The ED is often the only chance a patient gets the opportunity to seek help before it's too late. **We need to think outwardly, beyond the walls of our EDs.**