Post-Mortem C-Section: A How-to-Guide to Section or Not to Section: The Peri-Mortem C-Section in the ED

Peri-mortem Cesarean section in the ED is one of the most heroic procedures in the EM scope of practice. Peri-mortem C-section is exceedingly rare, and the decision to embark on this procedure must literally be made within seconds to minutes. The speaker will discuss the controversy surrounding this procedure from both the emergency medicine and surgical perspectives. Indications and contraindications will be discussed. The procedural approach to peri-mortem section, as well as post-procedure complications also will be covered.

- Discuss the controversies of peri-mortem C-section from both ED and trauma surgery points of view.
- List the indications and contraindications.
- Learn how to perform rapid gestational dating by ultrasound.
- Discuss how to perform a peri-mortem C-section.

TH-229
9/30/2010
3:00 PM - 3:50 PM
Mandalay Bay Convention Center

(+)No significant financial relationships to disclose

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Perimortem Cesarean Section: Why, When, and How

Disclosures-None!

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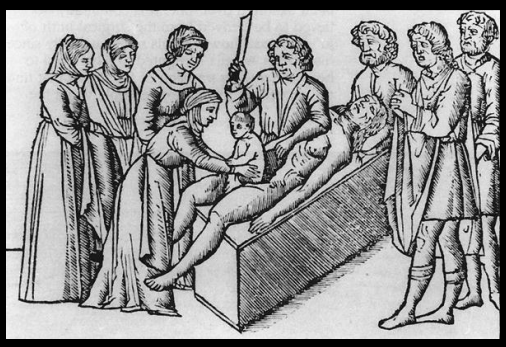
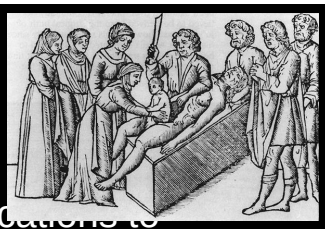
To section or not to section...

- You will know **why** to perform a PMCS
- You will know **when** to perform a PMCS
- You will know **how** to perform a PMCS



Goals



- **WHY:** Discuss the indications to perform a perimortem cesarean section, and why this is an important skill for EP's to have.
- **WHEN:** Describe the timeline that should be followed if this procedure is to be successful.
- **HOW**: Explain **for the non-surgeon** how to perform a perimortem cesarean section.

Cesarean Section Through the Ages

Modern History

Chronicle / Mark Costantini

OAKLAND / Bittersweet family moment / Baby delivered as mother was dying gets to leave hospital

October 04, 2005|By Henry K. Lee, Chronicle Staff Writer

Daphne Cruz left the hospital Monday, less than three weeks after doctors pulled her from her dying mother's womb after a freak accident in Oakland.
Daphne was born by emergency cesarean section on Sept. 15, the day her mother, Adriana Cruz, 32, died after being crushed against a wall by her sport utility vehicle in the city's Fruitvale district.
Although doctors at Highland Hospital in Oakland had to perform CPR on the full-term baby after her birth, she didn't suffer any trauma, authorities said as they marveled how a new life emerged from a mother's tragic death.

Perimortem C-section demands quick trip to OR

OB/GYN News, April 15, 2006 by Betsy Bates

- "A cesarean section by you in the emergency room 2 minutes after a patient is brought in by ambulance is no better than a C-section by the side of the road by EMTs [emergency medical technicians]," said Dr. Quirk, professor and chairman of obstetrics, gynecology, and reproductive medicine at the State University of New York at Stony Brook.

The Debate

- Never in the ED. Non-experts performing a procedure they cannot repair.
  - *No time to get to the OR.*
- Lack of consent from patient and family.
  - *This is an emergent procedure like any other life-saving intervention.*
- Fear of litigation.
  - *To date, there are no judgements against physicians performing PMCS*

Why

- To save the life of the mother.
- To save the life of the baby.

To Save the Life of the Baby: PMSC for Fetal Salvage

Emergent delivery may yield a fetus of viable gestational age in the setting of fatal maternal injury or disease.

To Save the Life of the Mother: PMSC for Resuscitation

- By reducing the hemodynamic burden of the uterus, the hemodynamic status of the mother can be improved in cardiopulmonary arrest.

Physiology

More Volume Under Less Pressure

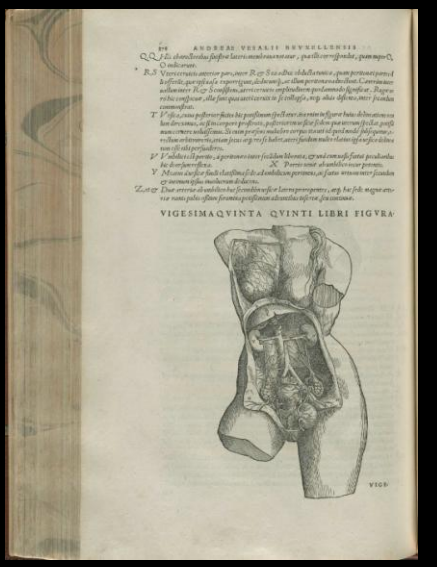
- Blood pressure: decreases 10-15 mm Hg
- Heart rate: increases 10-15 bpm
- SVR: decreases by 10-15%
- Cardiac output: increases by 30-50%
- Blood volume: increases by 30-50%
- Hematocrit: decreases to 32-34%

Physiologic Pitfalls in Pregnancy: D-O-A-P

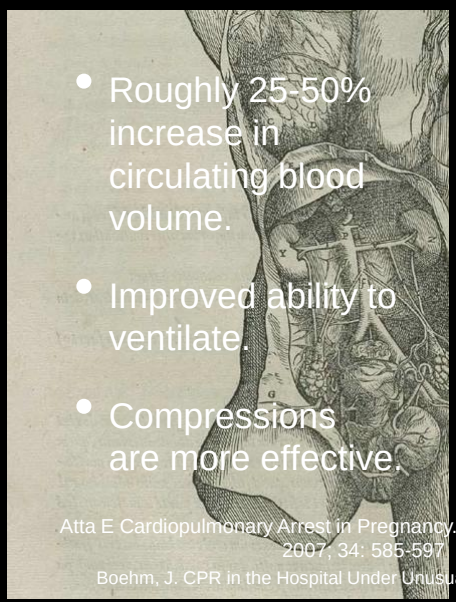
- ***D****ilutional anemia*: blood volume increases 30% causing lower O2 carrying capacity
- ***O****xygen consumption*: demand is high and reserve is low causing rapid onset of hypoxia
- ***A****ortocaval compression*: uterus can impede 30% of cardiac output
- ***P****rogesterone effects*: aspiration risk and mucosal edema

Aortocaval Compression

- IVC may be completely obstructed in the supine position.
- Uterus receives 30% of cardiac output.
- Compression occurs at 20 weeks.
- CPR only produces about 10% normal CO



Emptying the Uterus



- Roughly 25-50% increase in circulating blood volume.
- Improved ability to ventilate.
- Compressions are more effective.

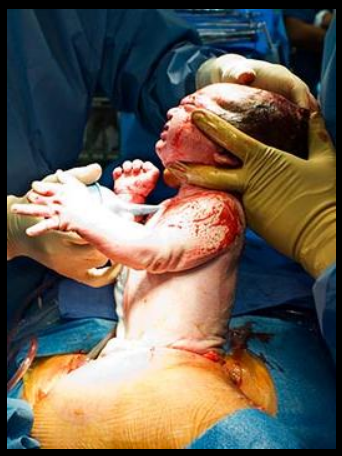
Atta E Cardiopulmonary Arrest in Pregnancy. *Ob and Gyn Clin of NA* 2007; 34: 585-597

Boehm, J. CPR in the Hospital Under Unusual Circumstances; AHA 200

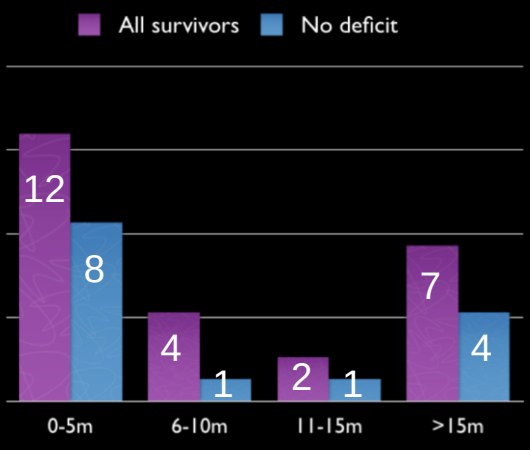
Perimortem cesarean delivery: Were our assumptions correct?

Katz et al. Am J Ob and Gyn 2005: 192

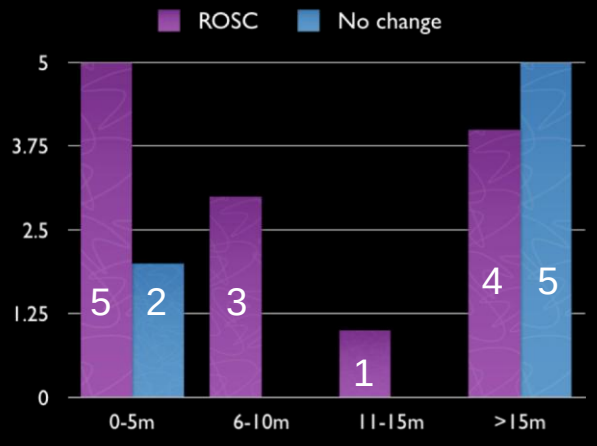
- 38 cases of PMSC during CPR identified 1985-2004.
- 34 surviving infants.
- 13/20 mothers with reversible causes of arrest survived to discharge.
- No “maternal deterioration”with PMCS.



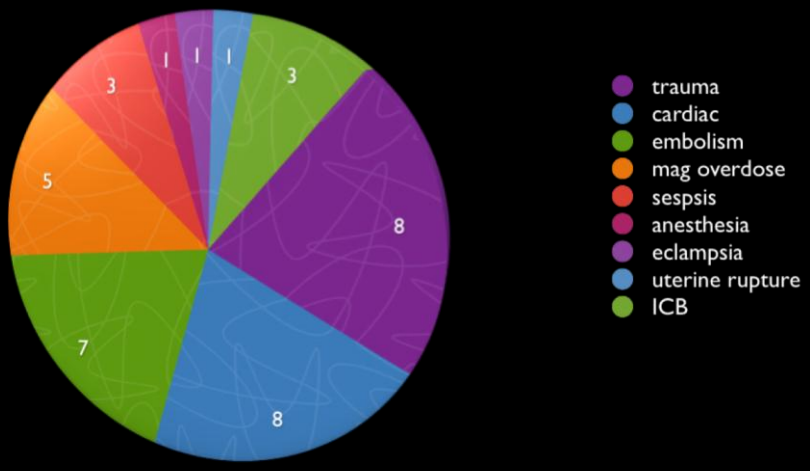
The Surviving Babies



The Surviving Mothers

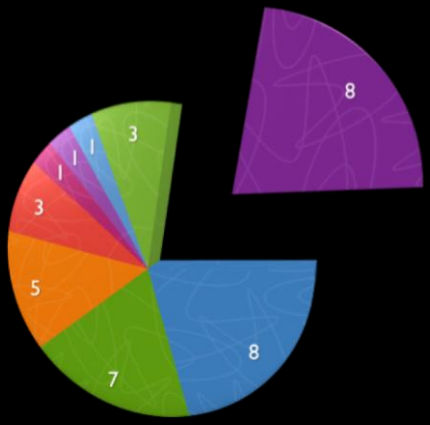


Causes of Maternal Arrest



Trauma Patients

- "Numerous reports of postmortem sections performed on trauma victims who were brought to emergency rooms at lengthy periods of time after injury."
- 5/8 of the trauma patients were arrests in the field after MVA.



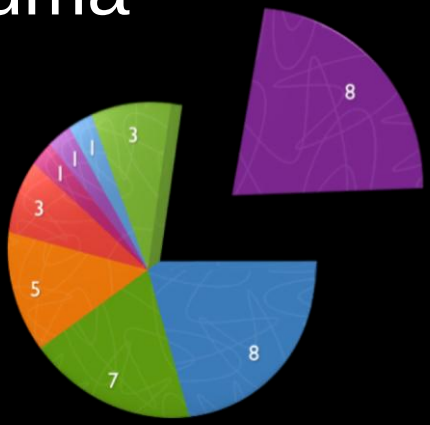
Cesarean Section for Trauma

Morris et al. Am Surg 1996; 223

- 441 admissions of pregnant trauma patients yielding 32 emergent (but not perimortem) cesarean sections from nine Level 1 centers.
- 15 (45%) babies survived.
- 13 (40%) had no FHT's; none survived
- Potential survivors (>26w and +FHT's)
  - 15/20 (75%) survived
  - 3/5 fetal deaths had minor maternal trauma
- 23 (72%) of mothers survived.

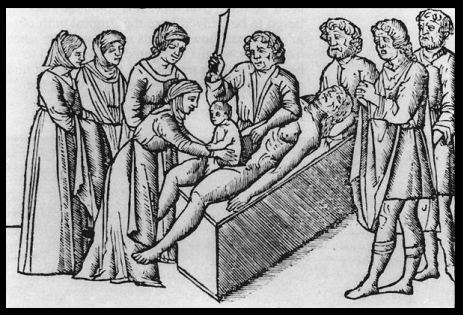
Trauma

- Outcomes may be similar as in non-trauma patients. Role of PMCS for mom remains unclear.
- If there is no fetal heartbeat, unlikely to salvage the infant.
- If there is a fetal heartbeart, go to PMCS!



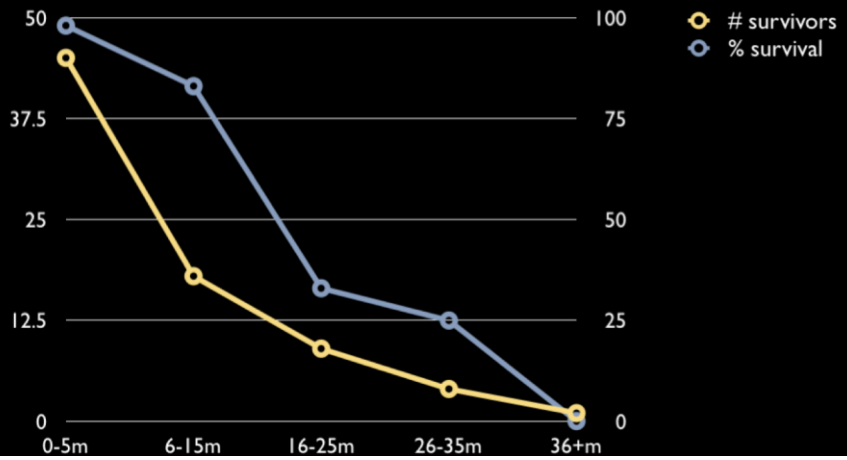
When

- THE FOUR MINUTE RULE: commencement of section within FOUR minutes with delivery of the infant by FIVE minutes.

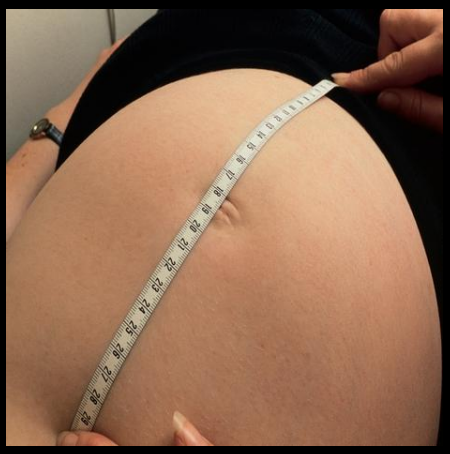


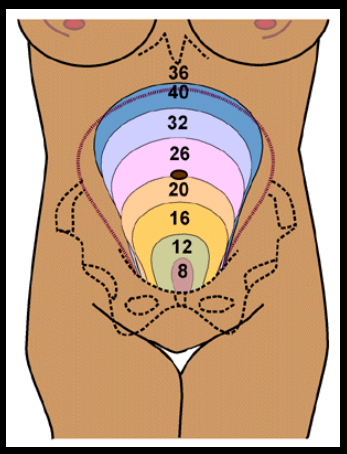
Perimortem Cesarean Delivery Katz et al. Obstet Gyn 1986; 68

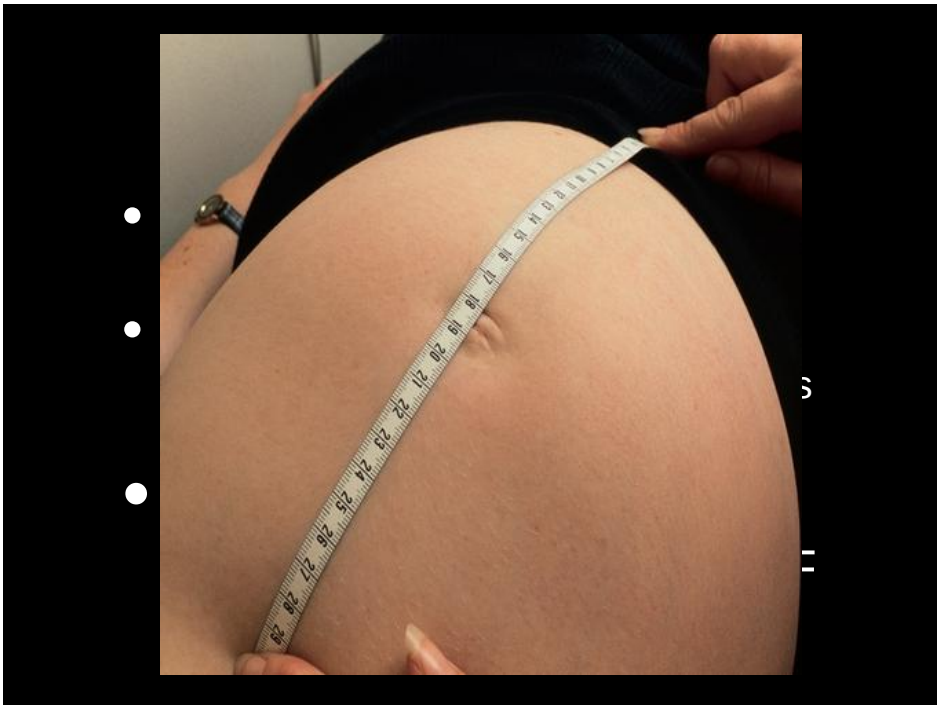
Case Reports 1900-1985

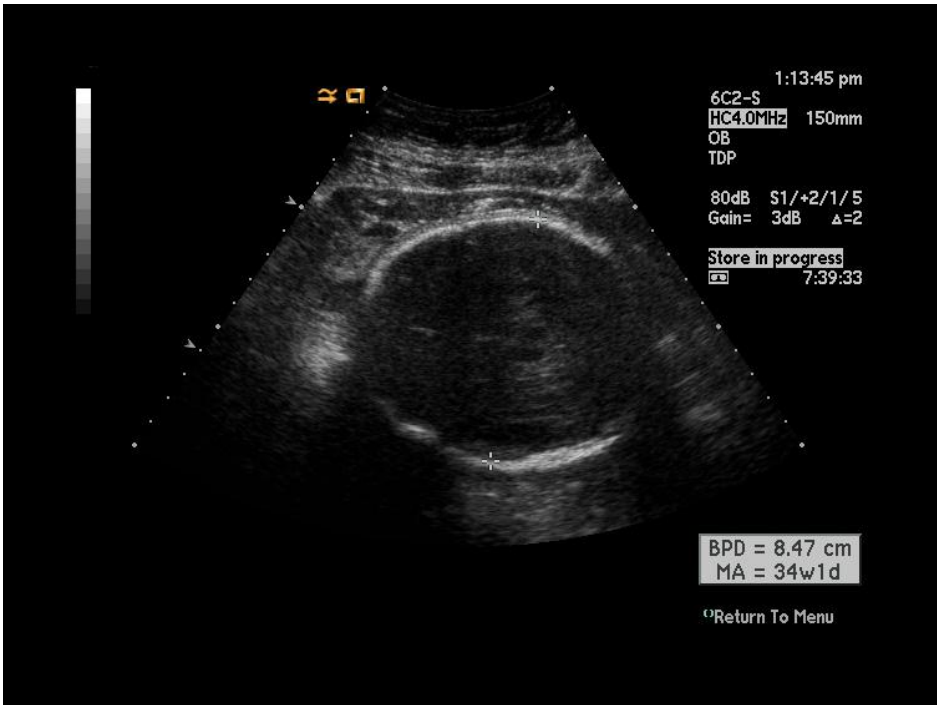


The Other 'When': Gestational Age

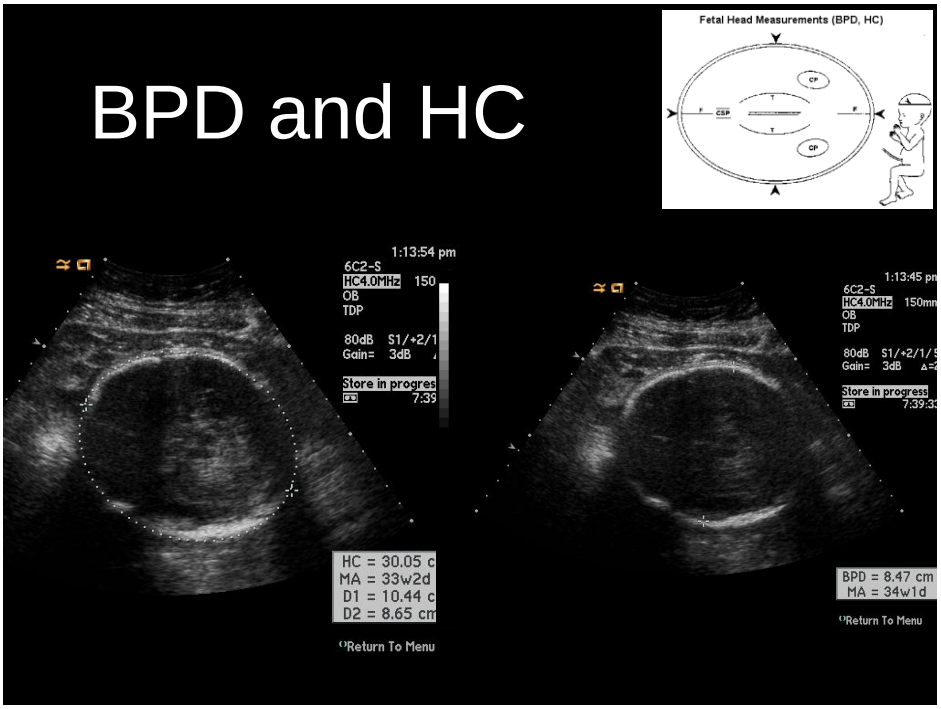







1:13:45 pm
6C2-S
HC4.0MHz 150mm
OB
TDP
80dB S1/+2/1/5
Gain= 3dB Δ=2
Store in progress
7:39:33
BPD = 8.47 cm
MA = 34w1d
Return To Menu

BPD and HC


Fetal Head Measurements (BPD, HC)
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MA = 33w2d
D1 = 10.44 c
D2 = 8.65 cm
Return To Menu
1:13:45 pm
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Store in progress
7:39:33
BPD = 8.47 cm
MA = 34w1d
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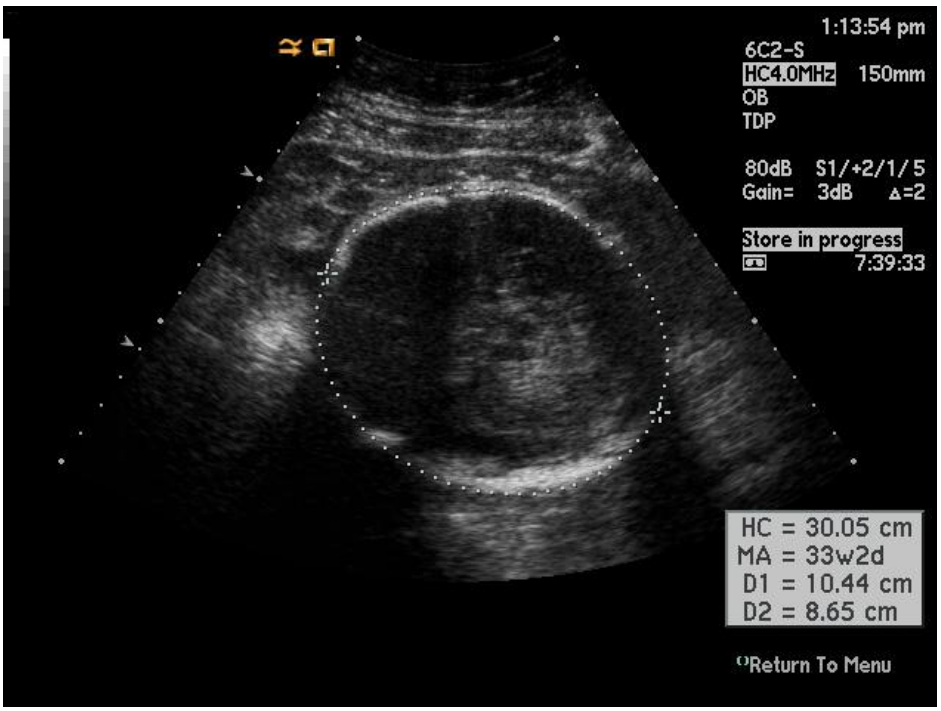
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Store in progress
7:39:33
HC = 30.05 cm
MA = 33w2d
D1 = 10.44 cm
D2 = 8.65 cm
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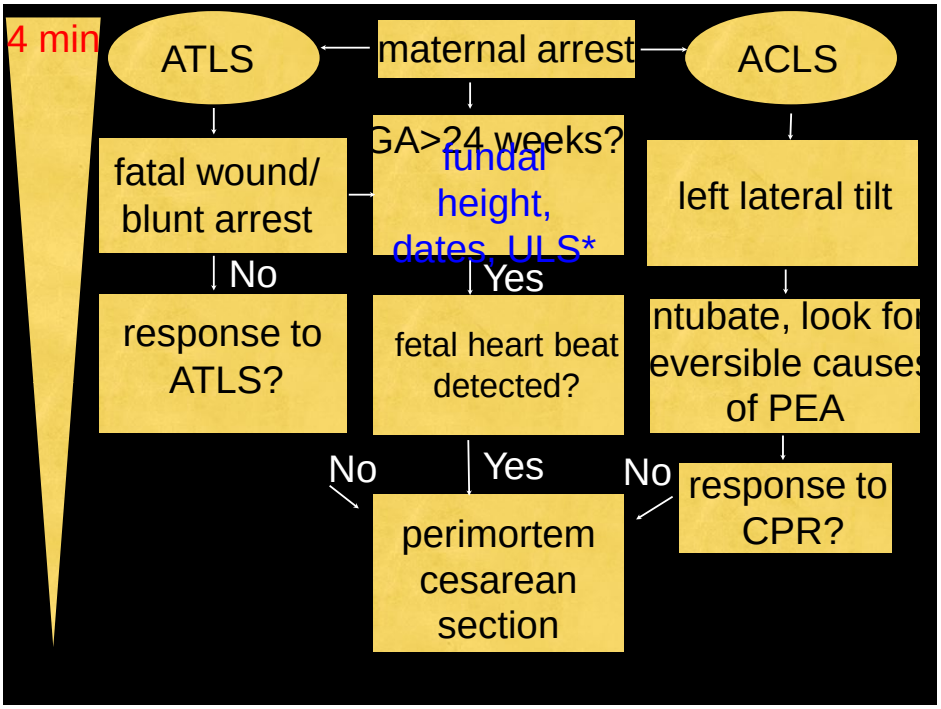


How

Perimortem cesarean section for the non-surgeon

Nobody chooses to have their baby in the ED...

- Nonsterile
- Poor lighting
- Needed supplies are seldom used/hard to find
- No specialized equipment
- No OB/Gyn

Step By Step

- Assemble people and resources
- Assemble supplies
- Incising through the peritoneum
- Entering the uterus
- Extracting the infant
- Resuscitate mother/repair damage
- Resuscitate the infant

People/Resources

- This will vary by hospital/location.
- Know your resources ahead of time.
- Know the attitudes and opinions of your consultants.
- Agree on the policy ahead of time.

Perimortem Cesarean Section Pack

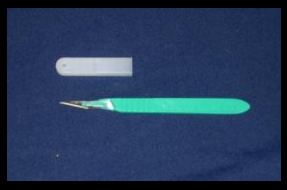
- #10 scalpel
- scissors
- suction
- retractors
- packing
- suture
- supplies for baby

If no pack available...

- Thoracotomy tray
- Cricothyrotomy tray
- Chest tube tray--clamps
- Incision and drainage kit--#11 blade, clamp

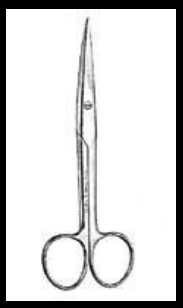
Scalpel

- #10 or #22
- #11 is in most I+D kits-try to avoid
- Incising through to the peritoneum
- Disposable scalpels NOT in packs with steel instruments because of the autoclave!



Scissors

- Used to extend the uterine incision.
- Should be LARGE.
- Should be blunt ended to minimize injury to the fetus.
- Usually not available outside the OR unless requested.



Retractors

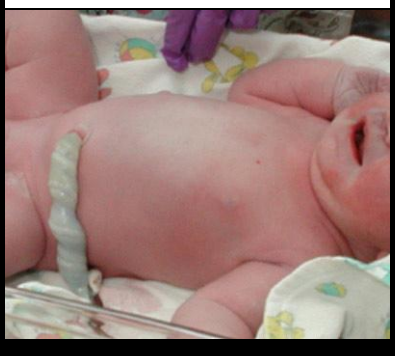
- Rarely available outside the OR unless part of some surgical tray/kit.
- Assistants can serve to retract if no retractors are unavailable.

Suction

- As much suction as possible!
- Blood and amniotic fluid will flood and obscure your field.
- UNIVERSAL PRECAUTIONS

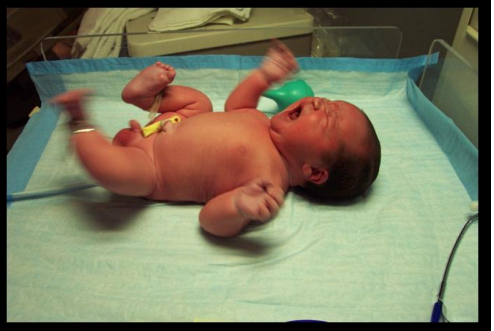
Clamps

- To clamp the cord
- Cord clamps-available separately or as part of an OB emergent delivery pack
- Large surgical clamps-not mosquitoes.



Supplies for Baby

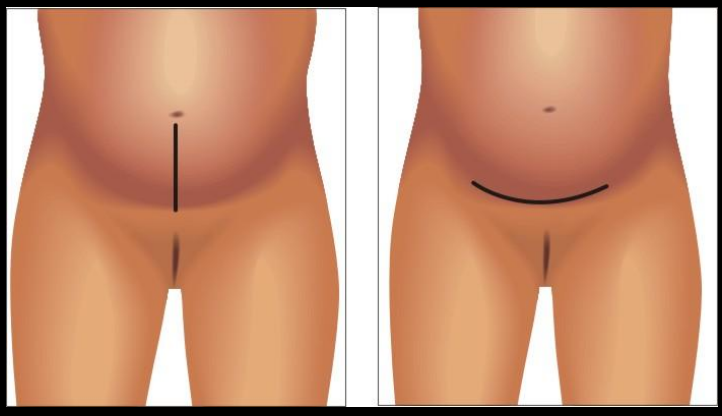
- Resuscitation surface: infant warmer, surface with plenty of dry linens near an oxygen source.
- Infant mask and anesthesia bag/ambu bag.
- Dedicated person to dry, stimulate, warm the infant

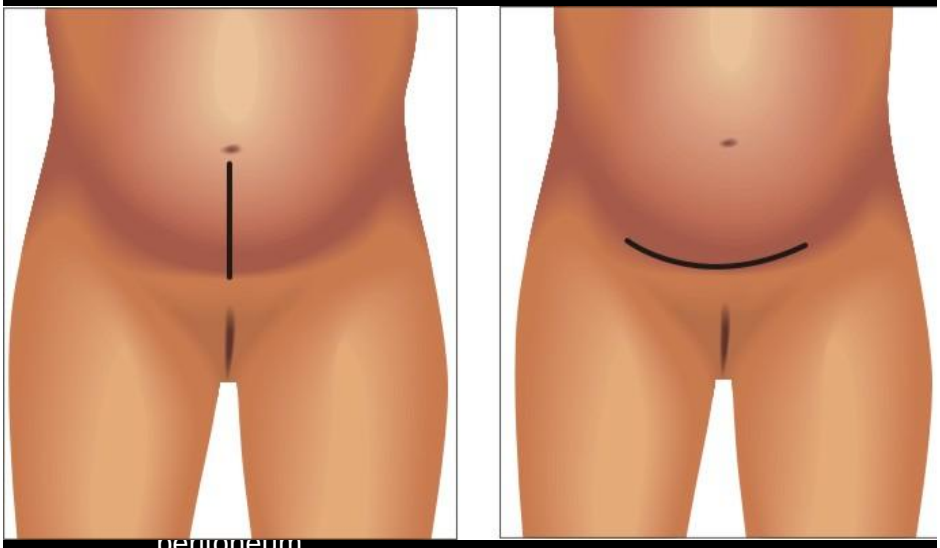


Getting Started

- Information:
  - TIME from maternal arrest
  - Gestational age
  - Underlying disease process
- Assign roles.
  - The most experienced individual leads.
  - Designate who the infant will be handed off to.
- KEEP CPR GOING!
- Prep the abdomen and drain the bladder, although these tasks should

Classic vs Low Transverse



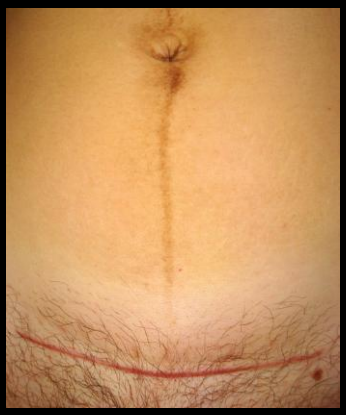


peritoneum

- MUCH slower than a classical approach

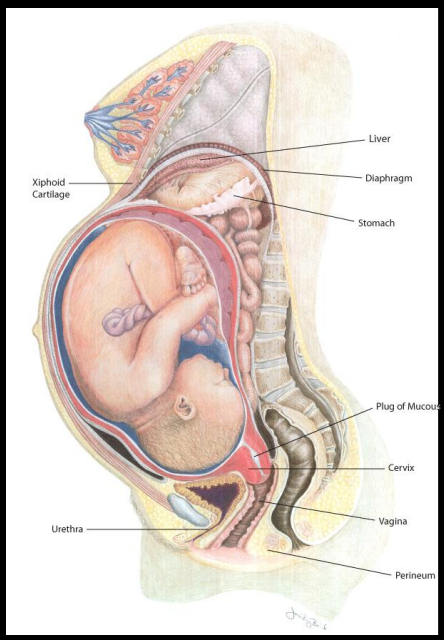
Midline Incision

- What the most experienced operator is most comfortable with.
- For non-surgeons, GO MIDLINE.
- Follow the linea nigra



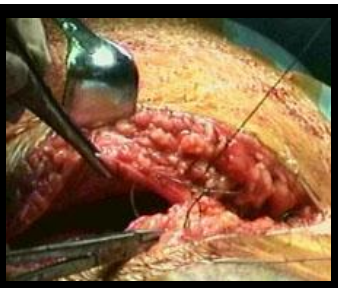
Incision

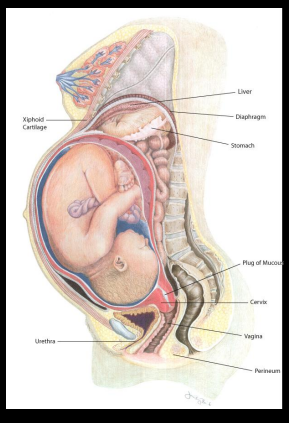
- Skin
- Subcutaneous fat
- Fascia/Rectus sheath
- Peritoneum
- Uterus



Incision

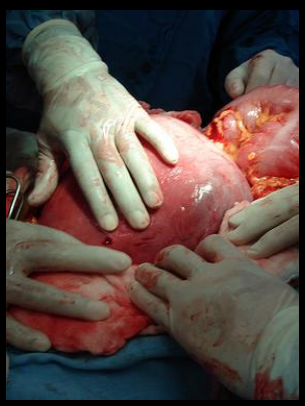
- Incise with a #10 blade down to the uterus.
- Have suction available.
- Expect a large amount of bleeding.
- Incise from the umbilicus to the symphysis pubis.
- Avoid the bladder!





Uterus

- Make a small vertical incision in the lower uterine segment.
- Lift the uterine wall away with two fingers.
- Extend the incision superiorly with scissors up to the umbilicus.

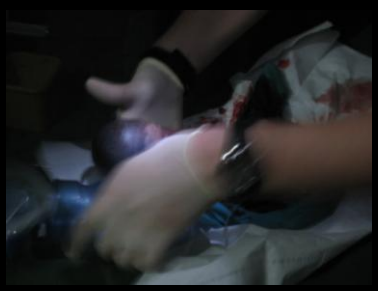


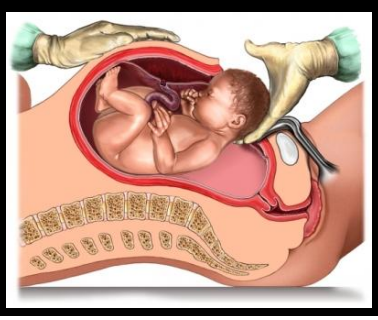
Incising the Uterus

- May encounter the placenta which is commonly anterior
- CUT STRAIGHT THROUGH THE PLACENTA
- This will create more bleeding

Extracting the Infant

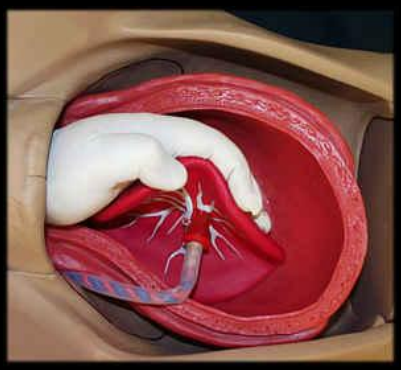
- Find the head-disengage from the pelvis if necessary.
- Premature infants more likely to be breech.
- FUNDAL PRESSURE.





Extract the Placenta

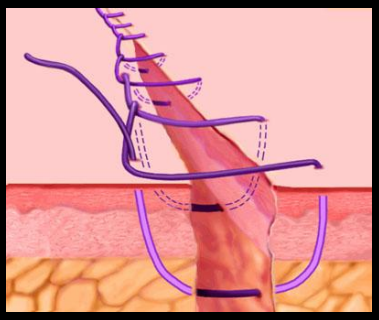
- Separate the placenta from the wall of the uterus.
- Uterine/fundal massage.

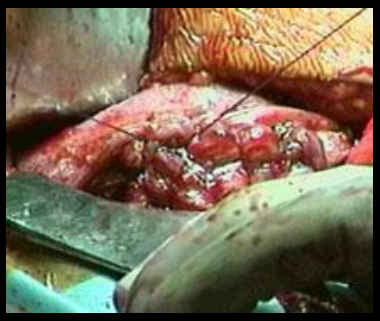


Repairing the Wound

- Not extensively described in EM literature/procedure books.
- Must be done if the PMCS is performed for resuscitation.

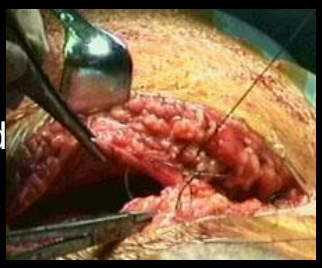
Locking stitch





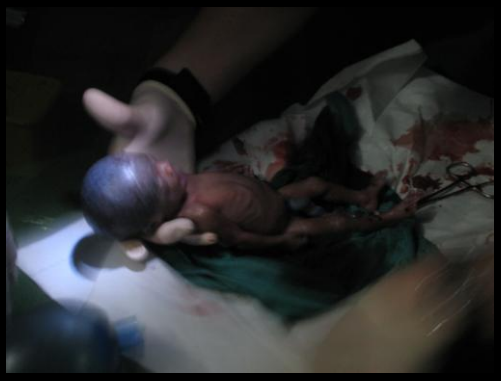
Repairing the Wound

- Absorbable suture on a large needle.
- Start at the lower uterine segment and work cephalad
- The fundus may require two layers.
- Close the peritoneum.
- Staple the skin.



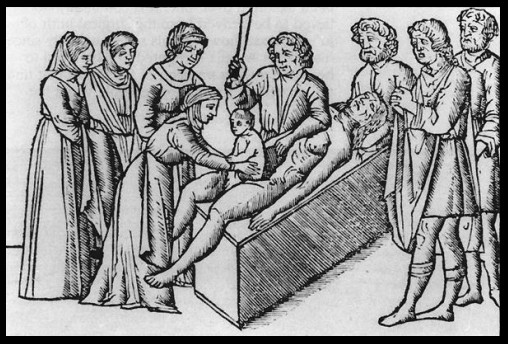
The Baby

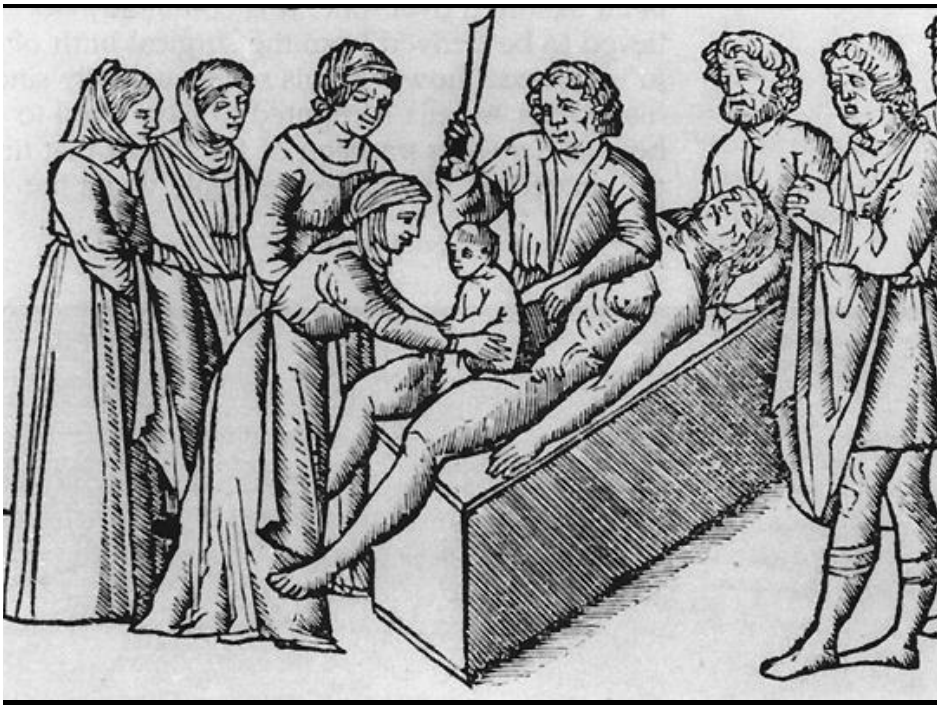
- Dry, stimulate, warm, position.
- Supplemental oxygen.
- Positive pressure ventilation.
- Start compressions for HR less than 60.



To section or not to section...

- You now know **why** to perform a PMCS
- You now know **when** to perform a PMCS
- You now know **how** to perform a PMCS





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To Section or Not to Section: Cesarean Delivery in the Emergency Department

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