Pregnancy in Trauma

Objectives

At the conclusion of this presentation the participant will be able to:

- Discuss the epidemiology, incidence and prevention of trauma in pregnancy
- Identify physiologic & anatomic changes in pregnancy pertinent to trauma care
- Discuss resuscitative management unique to the pregnant trauma patient

Epidemiology

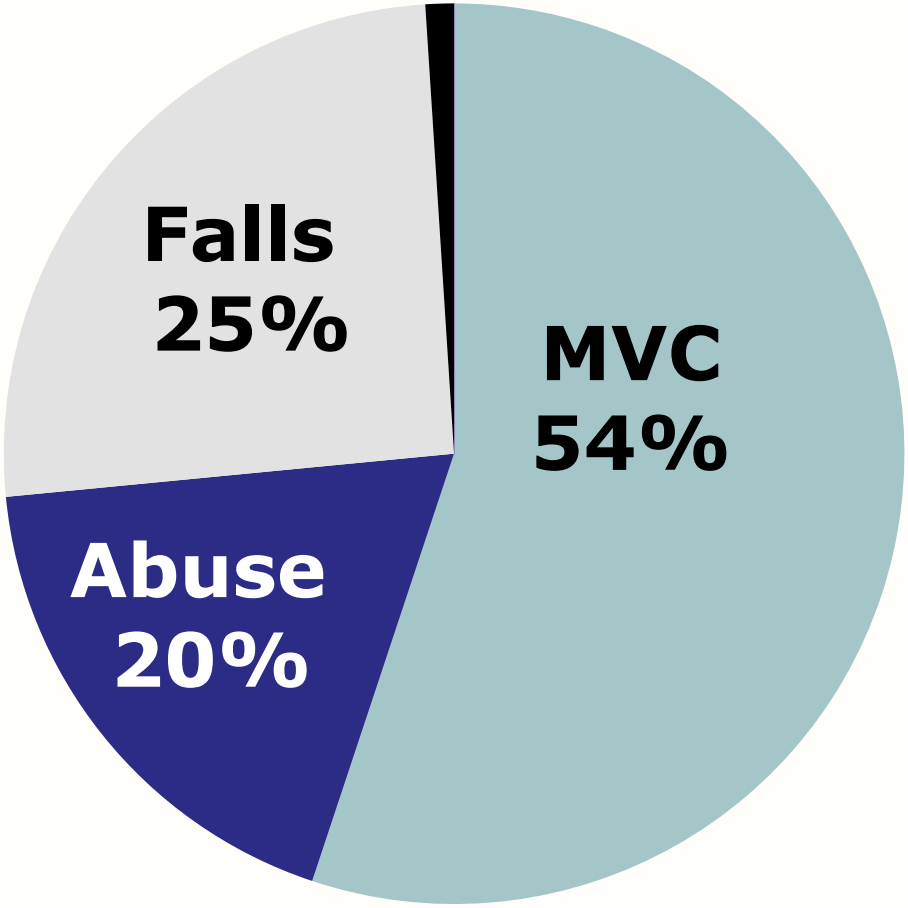
- Leading cause non-obstetric maternal death
- 7% of pregnancies experience trauma
- Most common:
  - Motor vehicle crashes (MVC)
  - Falls
  - Battering or physical abuse

Who is at Increased Risk for Injury During Pregnancy?

- Young
- Non-Caucasian
- Driving unrestrained
- Intimate partner abuse
- Drug and/or alcohol abuse
- Low socio-economic status
- Pregnancy alone - independent risk factor!

Mechanism of Injury

Most Common Mechanisms In Maternal Trauma



Mechanism of Injury: Motor Vehicle Crash

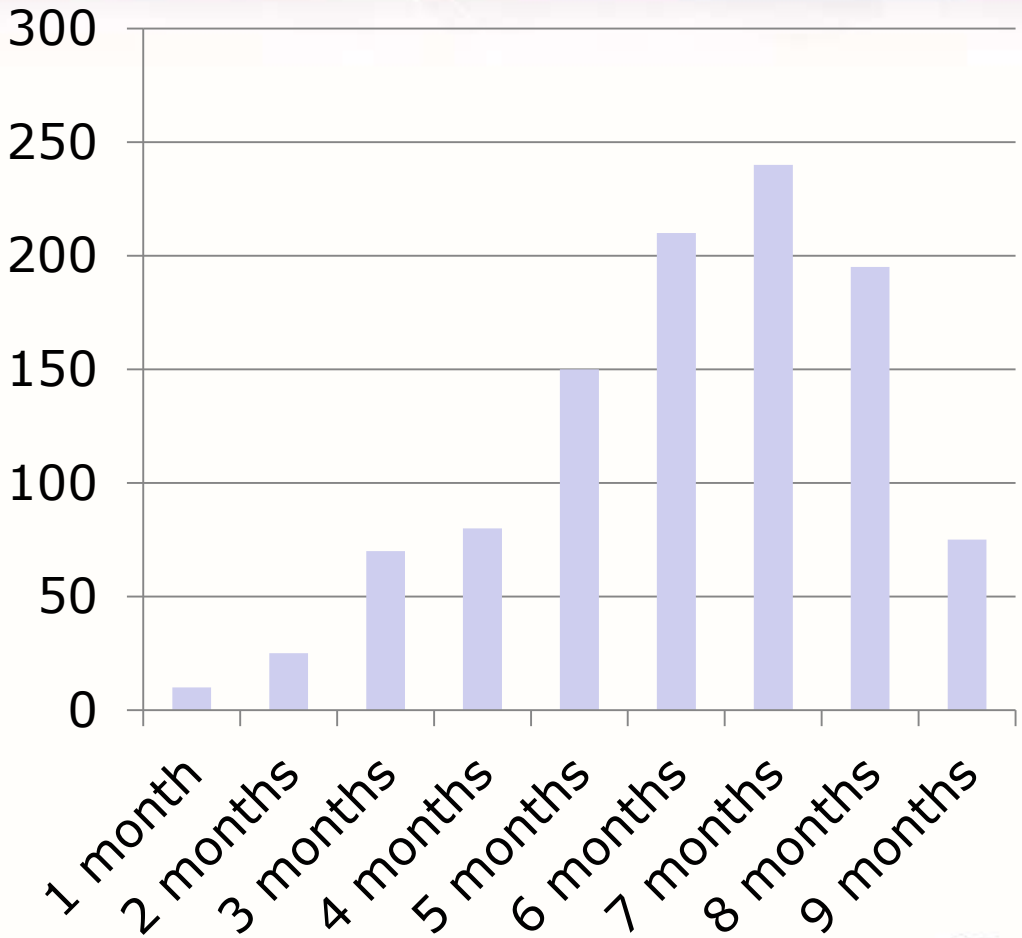
- Seatbelt Safety in Pregnancy Misinformation Common
  - Only 46% of pregnant trauma patients use restraints
- Airbags are supplemental
  - Protective if patient restrained
- Unrestrained Preg Trauma
  - 2.3 times more likely to give birth < 48 hours
  - Fetal death 4 times more likely

Proper Seat Belt Positioning

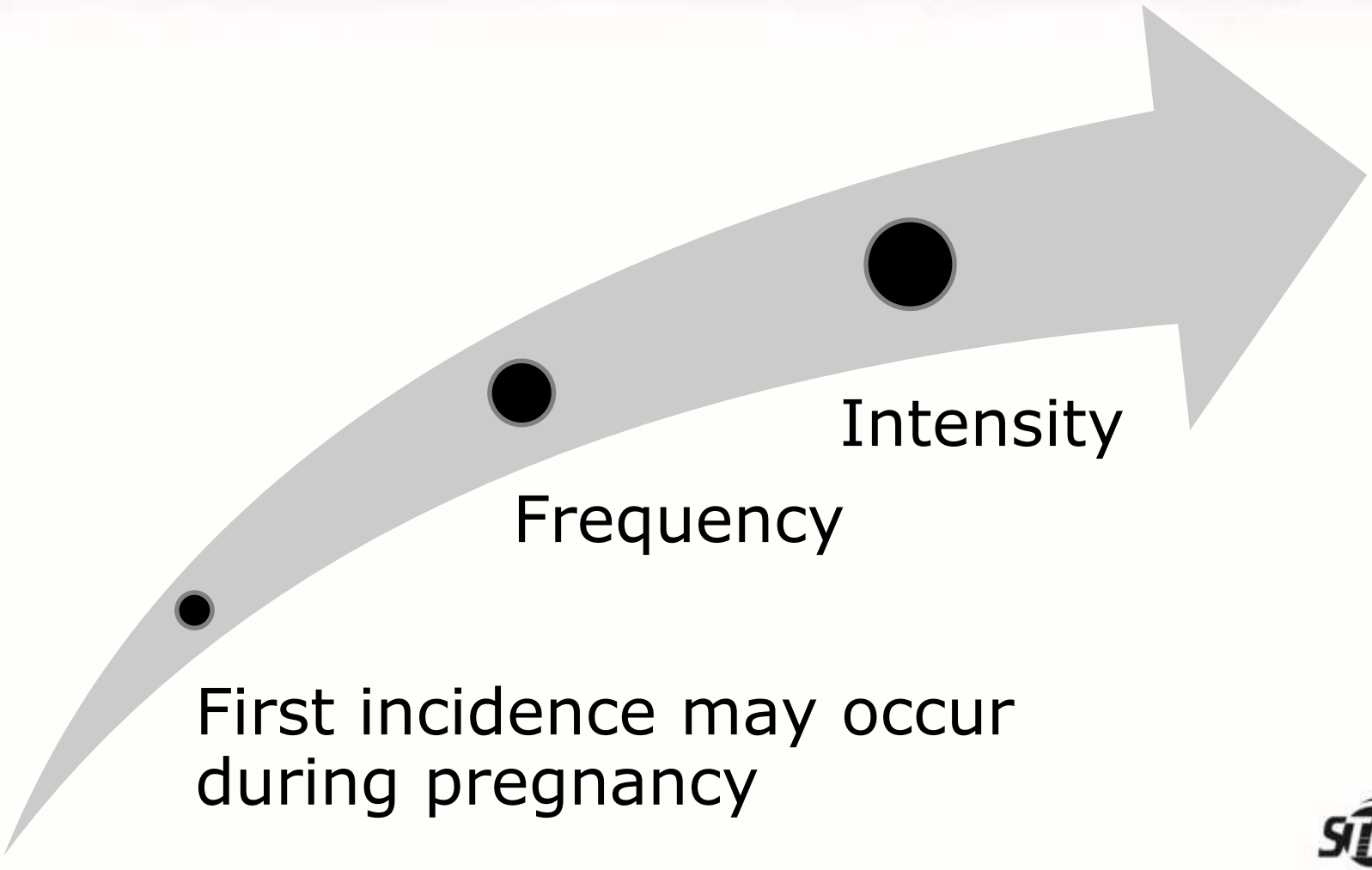
- **Shoulder belt-** mid-clavicular between breasts
- **Lap belt-** under abdomen

Mechanism of Injury: Falls

- Related to anatomic and physiologic changes
- Fall details give clues to possible injuries
- High suspicion for abuse



Intimate Partner Violence Progression During Pregnancy



Intimate Partner Violence Screening Tool

(performed in absence of patient partner)

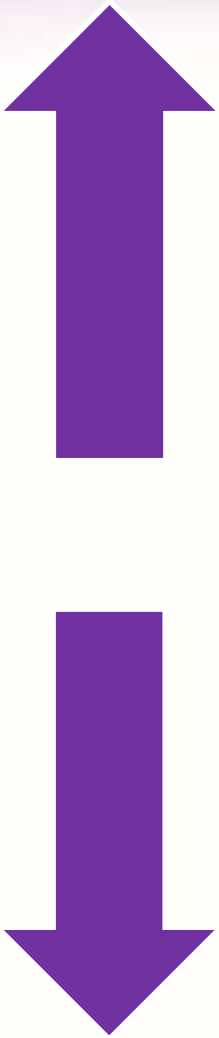
1. Within the past year -- or since you have been pregnant -- have you been hit, slapped, kicked or otherwise physically hurt by someone?

2. Are you in a relationship with a person who threatens or physically hurts you?

3. Has anyone forced you to have sexual activities that made you feel uncomfortable?

(ACOG, 2012)

Hemodynamic Changes in Pregnancy



Heart rate 10-15 bpm

Blood volume by 45%

Cardiac output by 30-35%

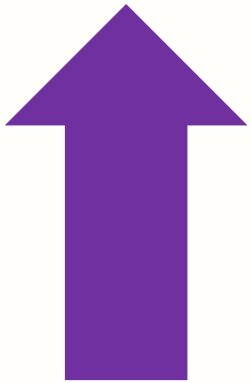
B/P by 10 mmHg

Systemic Vascular Resistance

HCT (dilutional)

Net Effect May Mask Shock

Pulmonary Changes in Pregnancy



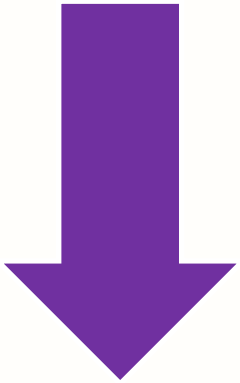
Engorged mucosa

Oxygen consumption 15-20%

Minute ventilation

Tidal volume

Resp Alkalosis



O2 reserve

Buffering capacity

Total lung capacity

Functional residual capacity

Intubate Early

High risk:
-Hypoxia

Neurological Changes in Pregnancy

Normal Changes

- Dizziness
- Syncope
- Balance changes
- Gait changes

Neurologic Complications

- Pre-eclampsia / Eclampsia
  - Hypertension
  - Headaches
  - Vision changes
  - Hyperreflexia
  - Seizures

Can mimic head injury!

Gastrointestinal Changes in Pregnancy

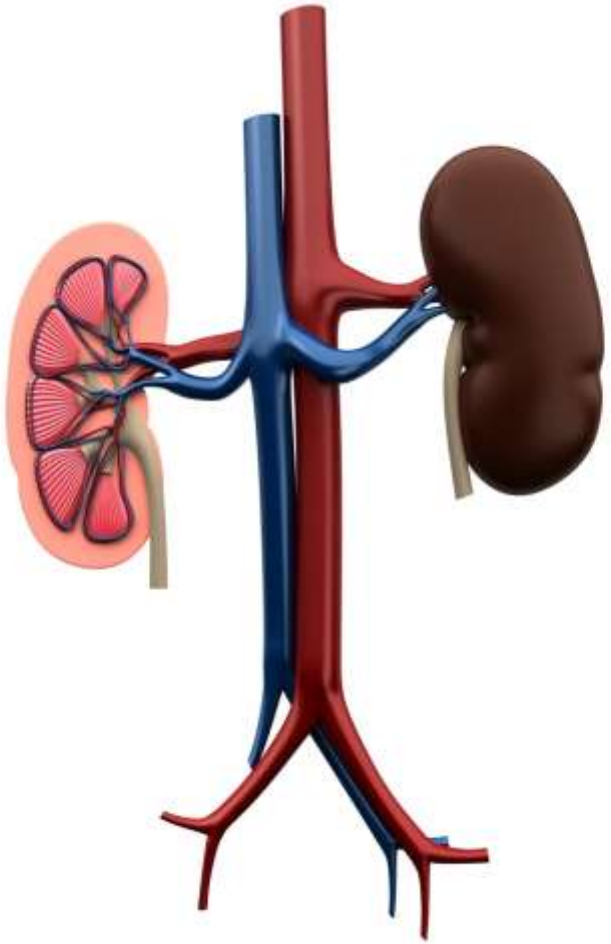
- Decreased gastric motility
- Relaxed gastric and esophageal sphincters
- Bowel displaced, cephalad and anterior

Urologic Changes in Pregnancy

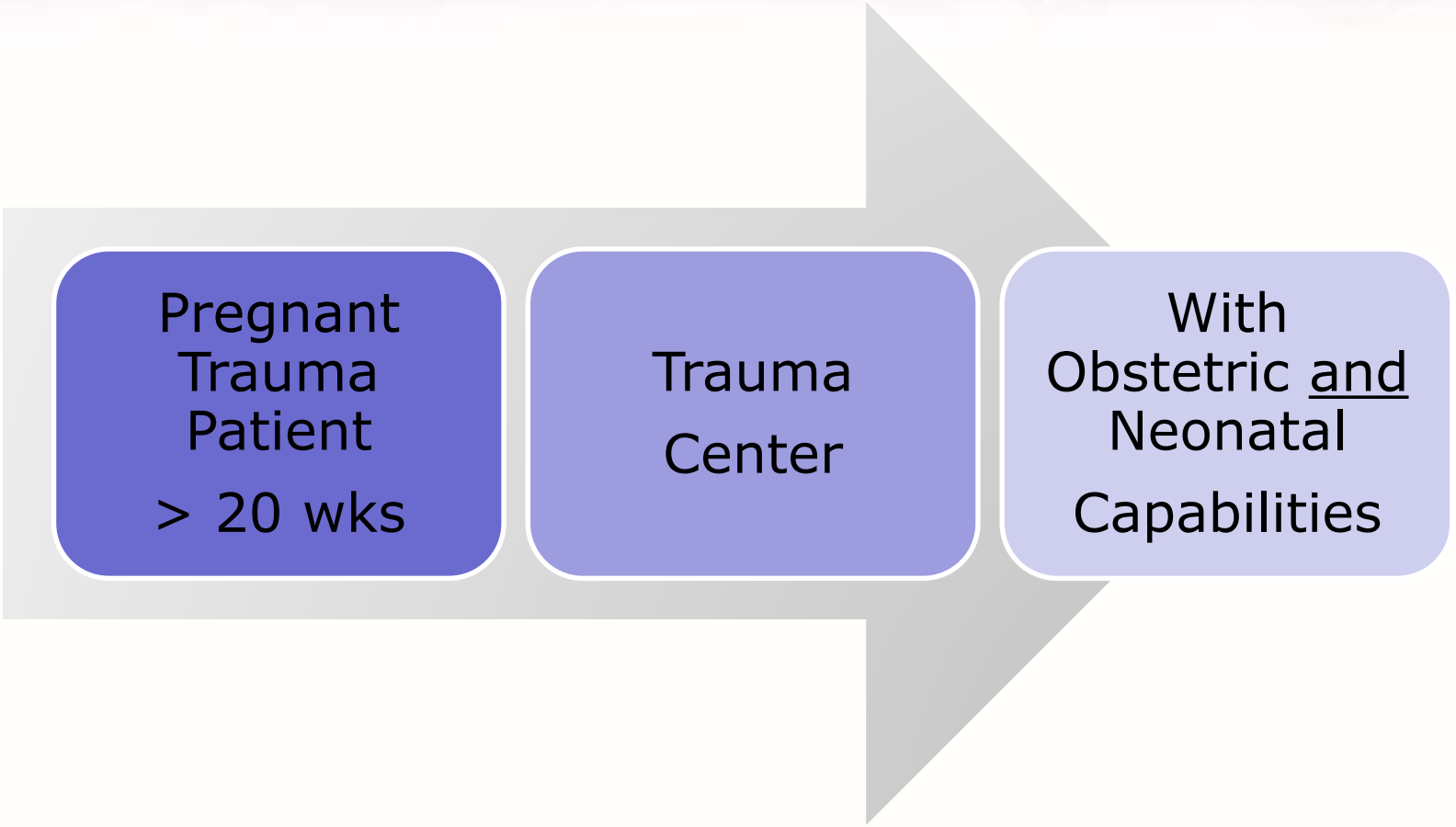
- Increased pelvic blood flow
- Bladder
  - Displaced anterior and superior (> 12 wks)
- Increased glomerular filtration rate
- Low: BUN

  creatinine, calcium

  and magnesium



Triage



2011 Trauma Field Triage Guidelines, CDC

Assessment and Management of The Pregnant Patient with Trauma

Team Work

- Trauma Team
- Obstetrician
- Nurse
- Consult radiologist for radiation exposure
- Neonatologist
  - imminent delivery

Initial Assessment

- Transport to trauma center
- Assess mother FIRS
- Identify pregnancy
- Assess during secondary survey
-

Pregnancy Test

- All female trauma
- Childbearing age

Treatment decisions based on gravid status

Primary Survey

Displace uterus to left - Log roll
15-30 degree tilt

- Airway/breathing
- C-spine control
- Oxygen
- Prevent aorto-caval compression
- If bleeding, aggressive volume resuscitation

Resuscitation Tube Tips

- Airway edema common → difficult Intubation
  - Consider smaller ETT
- Delayed gastric emptying ↑ risk of aspiration →
  - Consider early NGT
- Elevated diaphragm
  - Consider higher Chest tube placement

Fetal death more common than maternal death.

What is the #1 cause of fetal death in trauma?

Resuscitation Guiding Principle

Resuscitation – Maternal Shock

Adaptations to blood loss

Mild 1200-1500ml

HR 95-105, cold pale extremities, MAP 70-75mm Hg

Moderate 1500-2000ml

HR 105-120, restlessness, tissue hypoxia, MAP 50-60mm Hg, oliguria

Severe >2000ml

HR >120 hemorrhagic shock, tissue hypoxia, MAP <50mm Hg, altered LOC, anuria, DIC

Two Different Patients!

Mother may lose up to 1500 cc of blood without hemodynamic instability WHILE the fetus may be in shock!

Secondary Survey

- Head to toe assessment
- Obtain obstetrical history:
  - Last menstrual period (LMP)
  - Due date
  - Previous pregnancies:
    - miscarriages
    - premature deliveries
    - abortions
  - Delivery history
    - type, complications

Fetal Assessment

Fetal heart tones	• 120-160 • Continuous >24wks
Abdominal exam	• Gestational age • Contractions
Vaginal exam	• Bleeding • Ruptured membranes

Fetal Monitoring

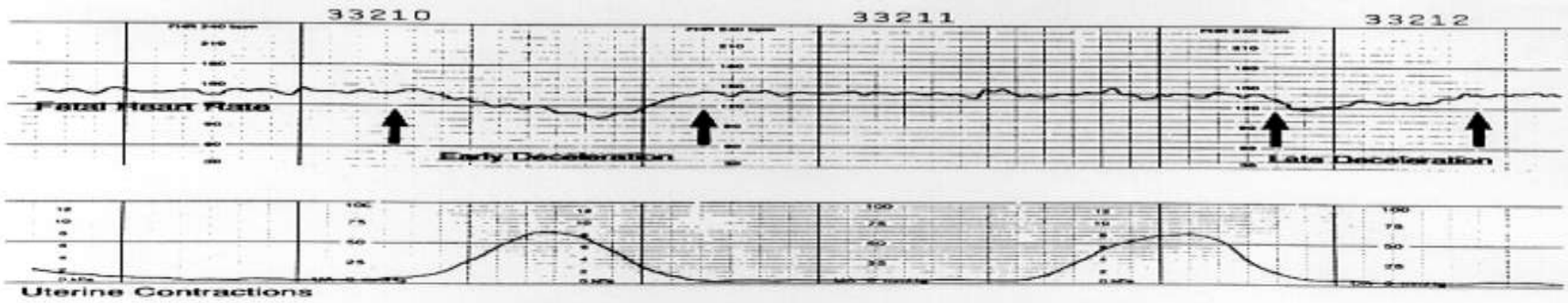
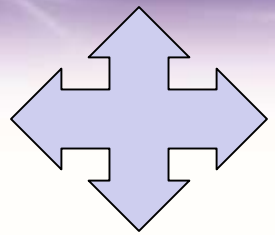


Figure 3. Tocodynamometry tracing that depicts early (Type I) and late (Type II) fetal heart rate decelerations.

- All pregnant trauma > 20 weeks' gestation
- Minimum of 4 hours continuous fetal monitoring
- Further continuous monitoring and evaluation if:
  - uterine contractions
  - non-reassuring fetal heart rate pattern
  - vaginal bleeding
  - significant uterine tenderness or irritability
  - serious maternal injury
  - rupture of the amniotic membranes

EAST 2005

Who Admits & Where?



To Trauma ICU

- Mother severely injured & viable fetus
- Admit to trauma
- Double teamed
  - Trauma Nurse
  - L & D Nurse
  - At minimum remote continuous fetal monitoring

To Obstetric Unit

- Mother less injured, stable & viable fetus
- Initially admitted to trauma surgeon with OB on consult
- Care may be transferred to OB after 24-48 hrs

Labs
Specific to Pregnancy

Blood & Antibody Status

- Mother Rh neg & no antibodies:

  give Rh immunoglobulin therapy (Rhogam)

Kleihauer-Betke (KB) Test

(detects feto-maternal hemorrhage)

- Draw in all pregnant trauma patients > 12 weeks gestation (EAST, 2005)
- Guides Rhogam dosage Rh- mothers
- Controversial as correlate to risk for preterm labor

Radiology in Trauma and Pregnancy

Benefits to the mother outweigh small risks to the fetus!

Radiation Exposure Risks

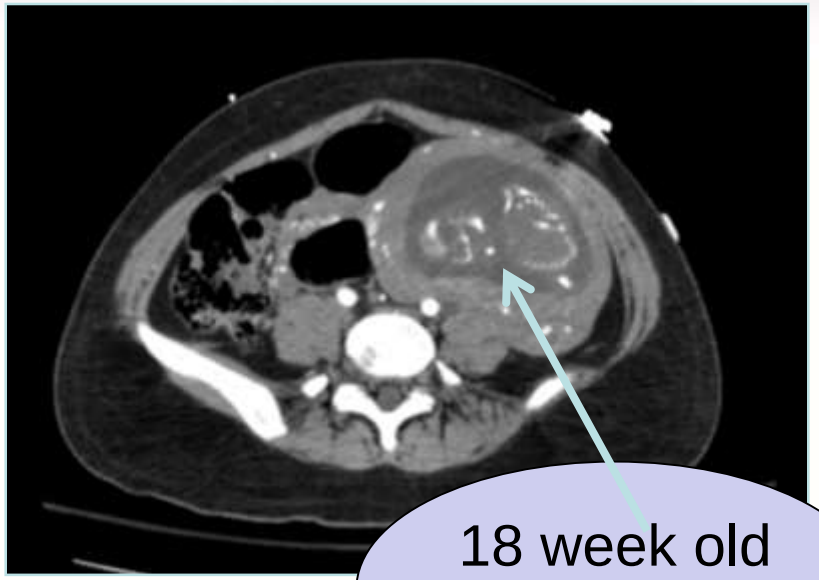
Greatest risk first 25 weeks

- Week 1-3: embryo death
- Week 8-25: CNS effects (↓ IQ)
- Week > 25: childhood cancer

- CT highest rad dose
- Weigh risks & benefits

Radiologic Studies

- Ultrasound
  - Preferred test for mom & fetus
- Plain films
  - useful
  - exposure low
- CT
  - ↑ radiation dose



- Provide shielding when possible

No needed study should be deferred if the mother's life is at risk

Placental Abruption

- Placental uterine separation
- Blood Loss:
  - External: vaginal bleeding
  - Occult: accumulates behind placenta, bleeding may not be seen

Case study: Hypo-perfused regions of placenta = abruption. No vaginal bleeding, normal fetal heart tones, frequent uterine contractions. C-section performed. Fetus survived.

Placental Abruption

- 3% of minor trauma
- 50% of severe trauma
- Cannot predict based on ISS

- Signs and Symptoms: rigid abdomen, abdominal tenderness, tetanic contractions, fetal distress, may or may not have vaginal bleeding

- *Fetal monitoring* → *early warning system!*

Uterine Rupture

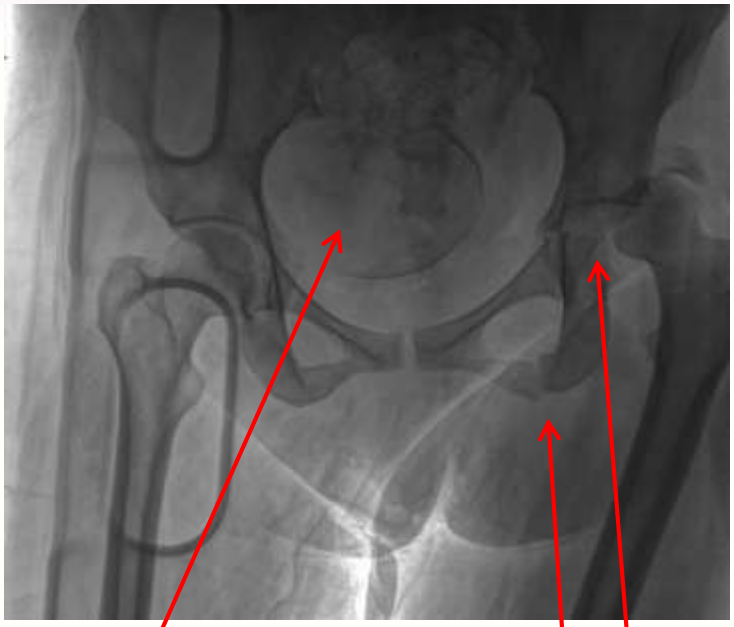
- Rare and catastrophic
- High maternal and fetal death
- May result from: uterine avulsions, disruptions of placenta, fetus or umbilical cord
- Presents with: shock, poor FHT, distention, rigidity, guarding, peritoneal irritation

Direct Fetal Injury

- Rare - 1% of blunt trauma
- Maternal tissues protective for the fetus
- Fetal head injury
  - most common
- CT scan to assess fetus
- Prepare for cesarean section if indicated

3D reconstruction of 37 week fetus after MVC

Pelvic Fractures



- Most common in MVC
- Anticipate hemorrhage from engorged pelvic vessels
- Fetal mortality 35%
  Maternal mortality 9%
- Associated bladder or urethral trauma

Pelvic Fractures

- Management :
  - internal fixation
  - non-operative approach
- Angiography & Embolization:
  - may be used with caution
- Vaginal delivery:
  - not completely contraindicated

Repair after birth by cesarean section

Penetrating Abdominal Trauma

- Uterus is the dominant organ and likely target
- Fetal demise 40-70% due to:
  - direct fetal injury and early birth
- Risk for massive hemorrhage from uterine injury

Perimortem Cesarean Section

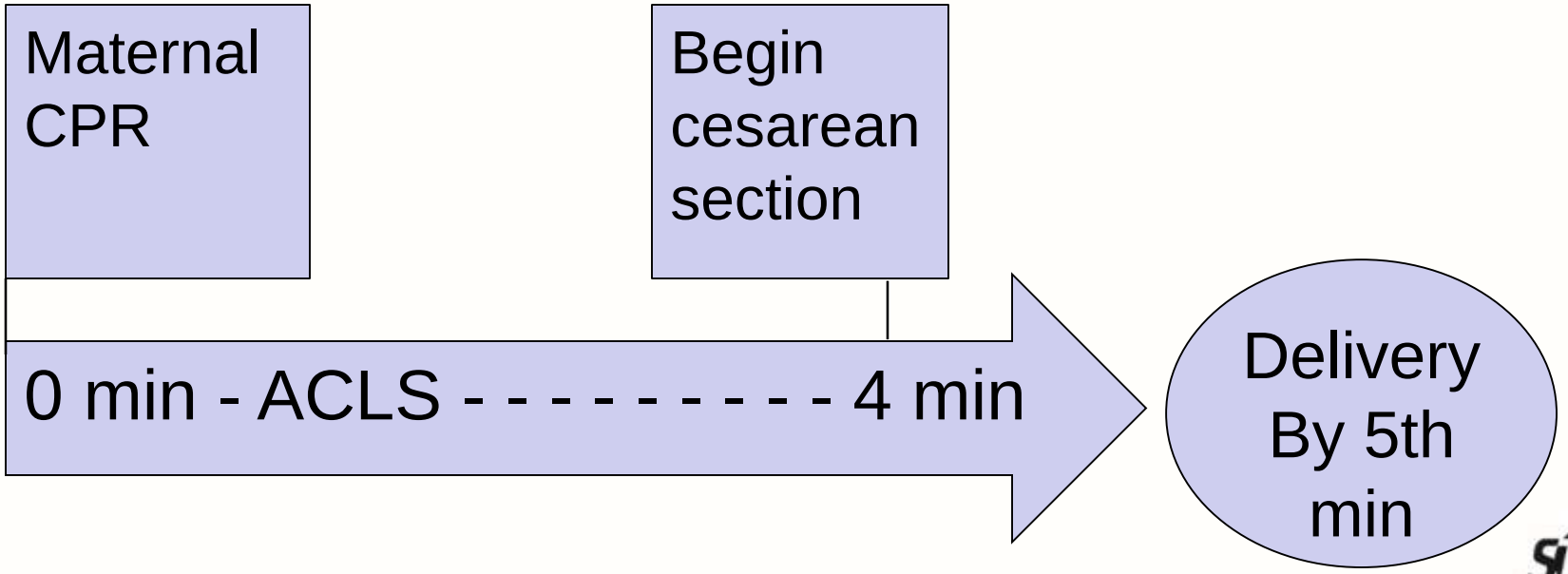
Indications:

- Fetus > 23 weeks gestation
- Reasonable certainty of maternal demise
- Knowledge of operative technique
- Available resources to resuscitate neonate
- Presence of fetal heart activity

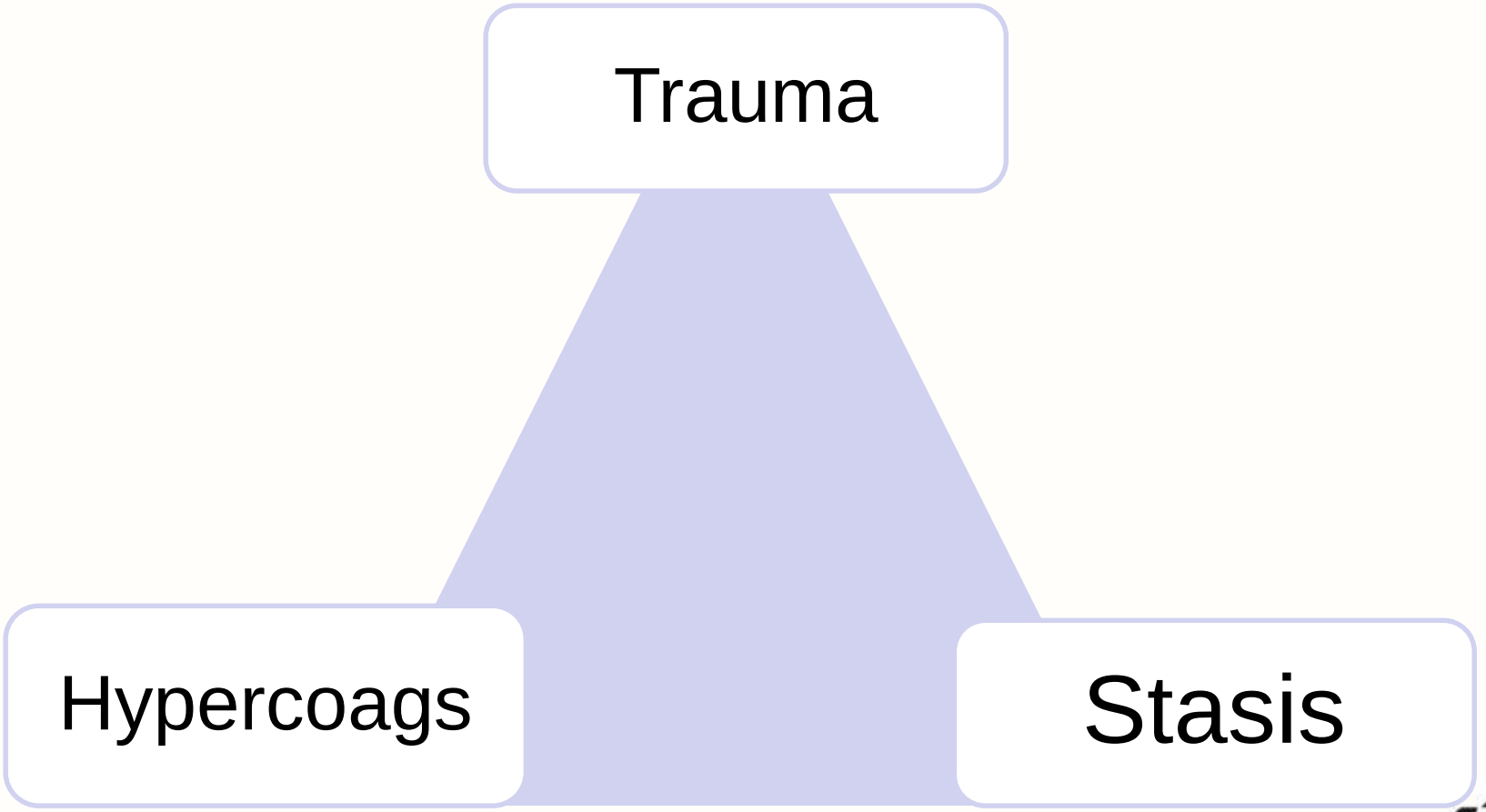
Perimortem Cesarean Section

EAST 2005 Guideline

Delivery should be carried out within 4 minutes of unsuccessful maternal arrest



Virchow's Triad in Pregnancy



Thrombotic Disease in Pregnancy

- Pregnancy → hypercoaguable state
- Incidence of DVT of 0.1-0.2%
- Recommended treatment:
  - Sequential compression devices
  - Heparin
  - Low molecular weight Heparin
- CONTRAINDICATED:
  - Coumadin (severe fetal malformations)