



The Pregnant Trauma Patient

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Trauma in Pregnancy: Significance

- ✦ Although most injuries during pregnancy are relatively minor, 1 in 12 pregnant women sustains a significant traumatic injury, making trauma the leading non-obstetrical cause of maternal death
- ✦ Fetal death rates, reported to be as high as 65%, are actually higher than maternal deaths secondary to trauma
- ✦ Even apparently minor trauma can cause significant maternal & neonatal morbidity & mortality

Trauma in Pregnancy: Incidence

- ✦ Occurs in 7 - 10% of all pregnancies
- ✦ MVAs account for approx. 2/3 of cases
- ✦ Physical abuse accounts for 10%
- ✦ Other causes include falls, burns, and firearm injuries
- ✦ Approx. 10% of injuries occur in 1st trimester, 40% in 2nd trimester, & 50% in 3rd trimester



Nursing Considerations

- ✦ Understanding of the potential impact of traumatic injury on both the mother and fetus
- ✦ Knowledge of the physiologic adaptations of pregnancy impacting trauma care
- ✦ Maternal/fetal trauma assessment
- ✦ Clinical interventions and treatments for the pregnant trauma patient





Trauma: Goal of Care

- ✦ Altered maternal physiology & anatomy impact management of maternal trauma & the effects of trauma on the fetus
- ✦ Goal of care is to medically stabilize the mother and preserve fetal well-being
- ✦ Initially, maternal stabilization takes precedence, as fetal survival is naturally dependent upon maternal survival

Maternal Injuries Unique to Pregnancy

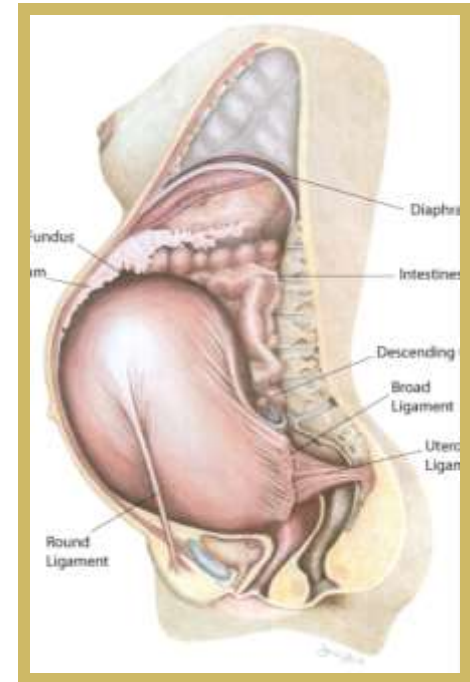
- ✚ Uterine damage
- ✚ Transplacental hemorrhage
- ✚ Placental abruption
- ✚ Significant hemorrhage
- ✚ DIC
- ✚ Intrauterine fetal demise
- ✚ Anaphylactoid Syndrome of Pregnancy





Additional Injuries Complicated by Pregnancy

- ✦ Abdominal injuries
- ✦ Lacerations of liver &/or spleen
- ✦ Bladder rupture
- ✦ Urethral lacerations
- ✦ Renal contusions or avulsion
- ✦ Pelvic trauma
- ✦ Bleeding secondary to increased uterine blood flow/engorged pelvic vasculature





Potential Problems Related to Trauma in Pregnancy

- ✦ Maternal hemorrhage and shock secondary to:
 - Traumatic injury
 - Uterine damage
 - Placental abruption
 - Decreased cardiac output
- ✦ Venous stasis and/or pulmonary emboli related to hypercoagulability and immobility

Trauma: Effects on the Fetus

- ✦ Even minor trauma can cause fetal death
- ✦ Usually related to partial or complete placental separation (abruption)
- ✦ Most common direct fetal injuries are skull fracture & intracranial hemorrhage
- ✦ Rupture of membranes may occur



Fetal Effects of Maternal Hypovolemia/Hypotension

- ✚ Results in significant reduction in uteroplacental perfusion
- ✚ Contributes to fetal hypoxia & acidemia
- ✚ Results in non-reassuring fetal heart rate pattern
- ✚ With maternal shock, fetal death approaches 80%





Potential Problems Related to Trauma in Pregnancy



Fetal Compromise/Fetal Hypoxemia

- Maternal shock and/or cardiovascular compromise
- Uterine damage
- Placental abruption
- Premature rupture of membranes
- Preterm labor
- Direct fetal injury
- Emergent delivery

Maternal Assessment

- ✦ Assess abdomen for bruising &/or tenderness
- ✦ Assess for uterine contractions: frequency, intensity & duration
- ✦ Palpate uterus for resting tone
- ✦ Inspect perineum for presence of blood or leakage of amniotic fluid
- ✦ Perform vaginal exam if indicated





Fetal Assessment

- ✚ Initial assessment may be limited to estimation of gestational age and evidence of fetal life
- ✚ Auscultate the fetal heart rate (FHR)
- ✚ Normal FHR baseline is 110 to 160 bpm
- ✚ If the gestational age is estimated to be greater than or equal to 24 weeks (age of viability), external electronic fetal monitoring should be initiated by the OB staff

Measuring Fundal Height to Determine Gestation



- ✦ Place the zero line of the tape measure on the anterior border of the symphysis pubis and stretch tape over midline of abdomen to top of fundus.
- ✦ The height of the fundus in centimeters equals the number of weeks gestation plus or minus 2.
- ✦ After 32 weeks the relationship is less accurate.

Laboratory Tests and Ultrasound Assessment

- ✦ Kleinhauer Betke
- ✦ (Give Rhogam to Rh negative moms)
- ✦ CBC, PTT
- ✦ Hold clot for Type & Cross
- ✦ Coag. studies
- ✦ Ultrasound to attempt to R/O abruption (not very accurate) and assess fetal well-being (biophysical profile)



Cardiac Adaptations of Pregnancy

High-flow, low-resistance state

- Heart increased in size, shifted to left
- Heart rate increases 15-20 bpm at term
- Blood volume increases
- Increased cardiac output
- At term, cardiac output is 6 – 7 L/min
- Decreased systemic vascular resistance
- Uterus & placenta receives up to 30% of cardiac output, compared with 2-3% in non-pregnant woman
- At term, 500-700 ml/min of blood flow through the uterus





Hematologic Adaptations of Pregnancy

- ✦ Plasma & blood volume increase by 40-50% with singleton pregnancy
- ✦ RBCs increase by 17-32 to meet additional O₂ demands of pregnancy
- ✦ WBC production increases (6,000-20,000) without infection
- ✦ Dilutional anemia present
- ✦ Pregnancy is a hypercoaguable state
 - increasing risk for thrombosis & alterations in coagulation (DIC)

Cardiac Output

- ✦ Non-pregnant woman: ~ 3 – 4 L/min
 - ✦ Pregnant woman (rest): ~ 6 – 7 L/min
 - ✦ Pregnant woman (labor): ~ 9 -11 L/min
 - ✦ Active pushing: ~11-14 L/min
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- ✦ The increase in blood volume may initially mask significant hemorrhage
 - ✦ When pulse begins to rise, consider hemorrhage

Obstetrical Hemorrhage

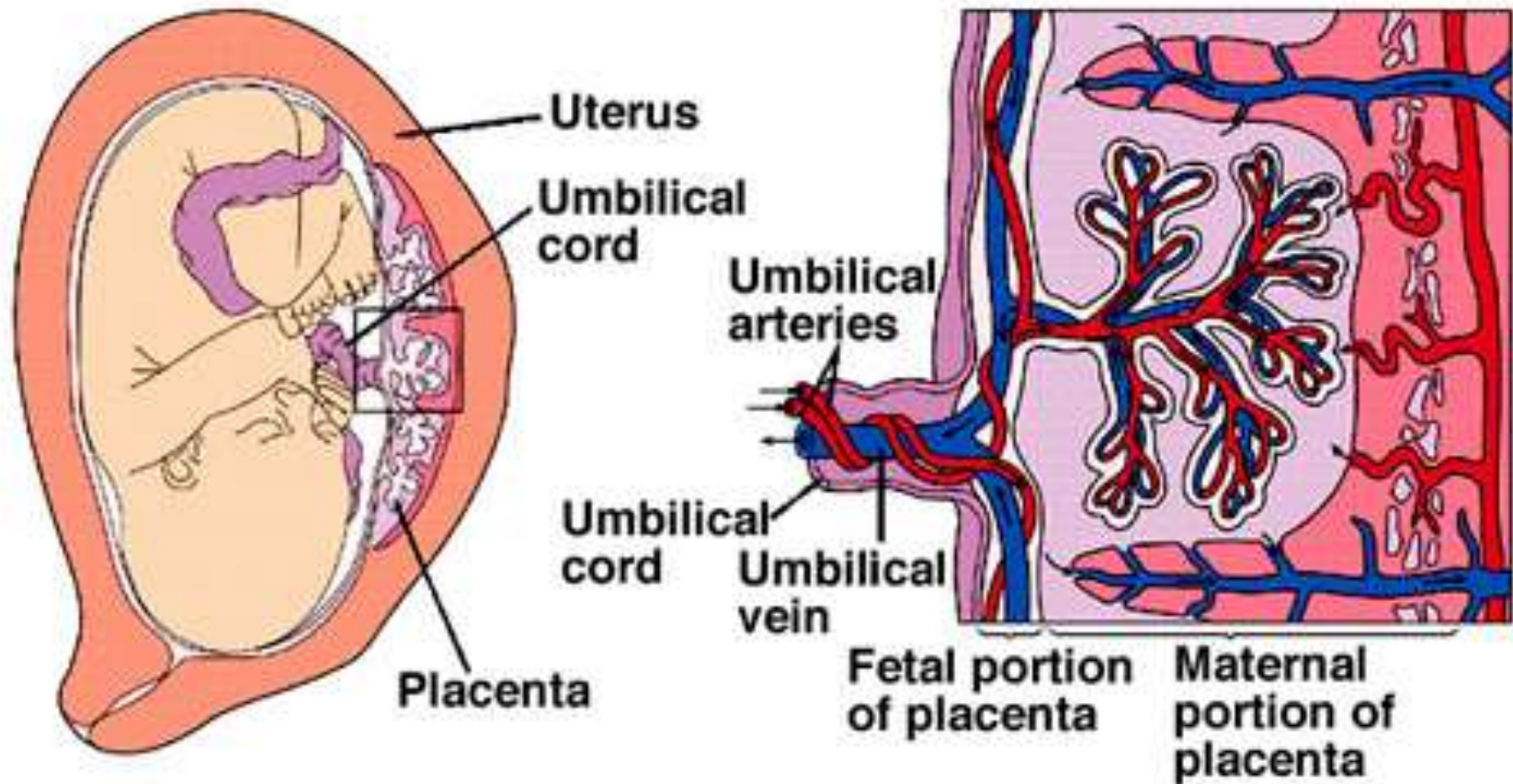
- ✦ Be prepared for potential with every pregnant trauma patient
- ✦ Respond & intervene early for best results
 - Blood loss is almost always *underestimated*
 - Pregnant patients can lose up to 40% of their blood volume (compared to 25% in non-pregnant patients) before showing signs of hemodynamic instability
 - **Don't wait for hypotension to start replacing volume**
 - Start weighing pads and estimating blood loss with any heavy bleeding



Uteroplacental Blood Flow

- ✦ The uteroplacental bed functions as a dilated, passive, low-resistance system
- ✦ Perfusion pressure determines blood flow to the uterus & normally there's no uteroplacental vasoconstriction to impeded blood flow
- ✦ A decrease in maternal BP (hemorrhage or hypovolemia) results in vasoconstriction of the uterine artery & shunting of blood to maternal vital organs

The Placenta and the Umbilical Cord





Maternal Position

- Maternal positioning has significant effects on maternal blood pressure and uterine blood flow
- In a supine position, the gravid uterus compresses the inferior vena cava
- This results in a decrease in venous return, cardiac output, & uterine blood flow, having profound effects on both normal and hemodynamically compromised patients

Aortic and Vena Cava Compression



Maternal Positioning

- ✦ Avoid supine position whenever possible
- ✦ Tilt woman 15 to 30 degrees
- ✦ When not possible, may displace uterus manually



Uterine Displacement





Pulmonary Adaptations

- ✦ The diaphragm is displaced by 4-7 cm
- ✦ Tidal volume increases by 40-70%
- ✦ Oxygen consumption increases by 20%
- ✦ **Compensatory respiratory alkalosis facilitates maternal/fetal gas exchange across placenta**
- ✦ Normal respiratory rate is **20-24** breaths/min
- ✦ Ten times greater increased risk of failed intubation (one in every 250 women)



Pulmonary Implications

- ✦ The pregnant woman has diminished O₂ reserve and decreased blood buffering capacity, and is vulnerable to hypoxemia and less able to compensate when acidemia occurs
- ✦ When placing a chest tube, a higher insertion point should be used (usually between the third and fourth intercostal space)
- ✦ When intubating, a half-size smaller ET may be needed and adequate preoxygenation is critical

Interventions to Maximize Maternal/Fetal Circulation & Perfusion

- ✚ Place the patient in right or left lateral position when possible, or tilt or manually displace uterus
- ✚ Provide 100 % O₂ via non-rebreather mask (8-10 L/min)
- ✚ Maintain pulse oximetry $\geq 96\%$
- ✚ Establish IV access and give fluid bolus of 500 mL RL
- ✚ Lower extremity IO contraindicated in pregnancy
- ✚ When bagging, breath at a minimum rate of 20 to 24 bpm



Additional Considerations

- ✦ Gastrointestinal adaptations
 - Relaxation of the gut
 - Slow gastric emptying
 - High-risk for aspiration
 - Proceed to advanced airway ASAP
 - **ET intubation preferred**
 - May use LMA if unable to intubate, but aspiration risk remains higher





Placental Abruption

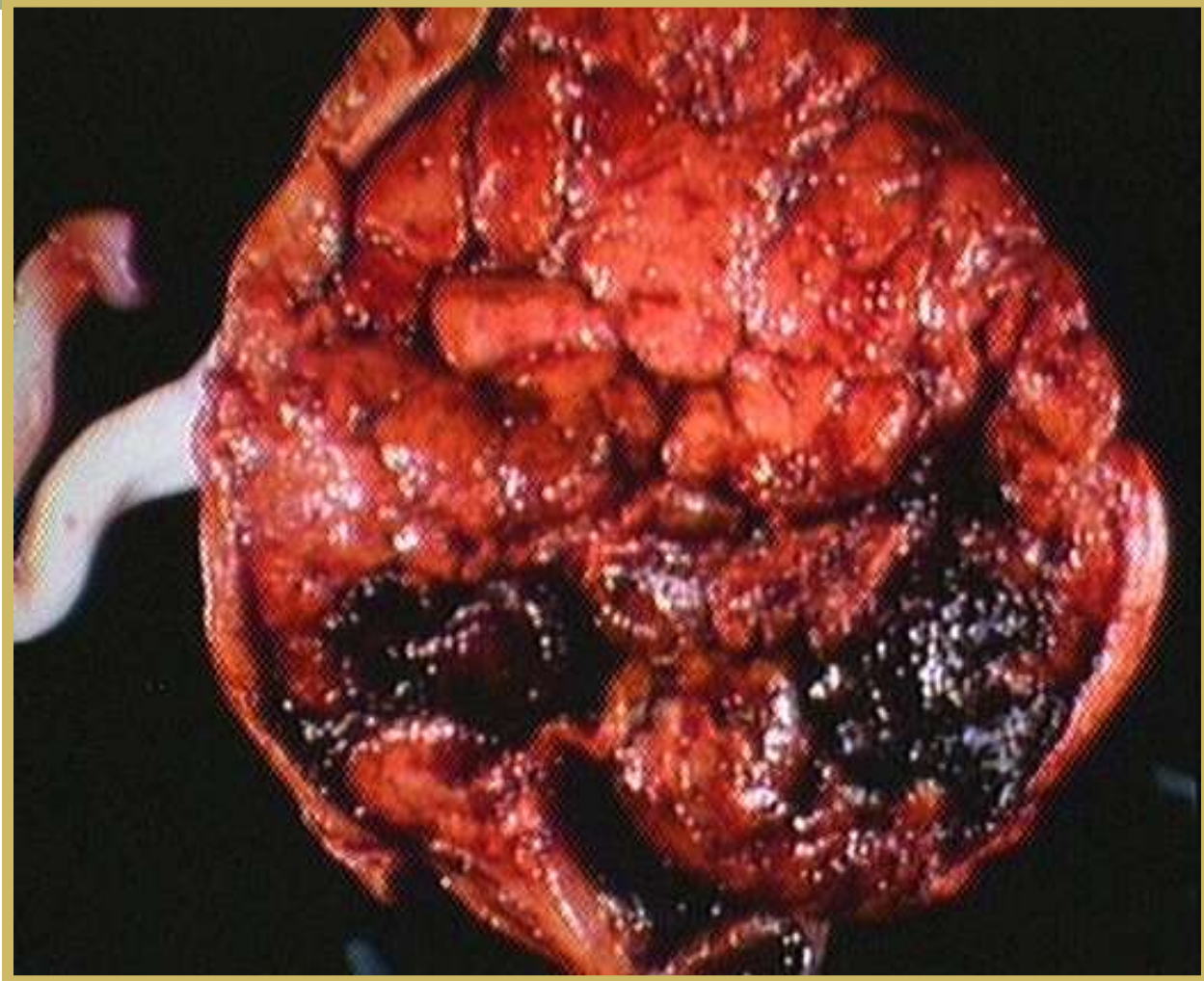
- ✦ Premature separation of the placenta
- ✦ Detachment of part or all of the placenta from its implantation site
- ✦ Typically occurs after 20 weeks gestation
- ✦ Classified as partial, marginal, or complete
- ✦ Responsible for approximately 41% of neonatal deaths related to maternal trauma



Signs and Symptoms of Placental Abruption

- ✚ Frequent uterine contractions
- ✚ Sudden onset uterine pain/tenderness
- ✚ Pain may be localized
- ✚ Increased uterine resting tone
- ✚ May progress to rigid abdomen
- ✚ Vaginal bleeding may be present
- ✚ Deteriorating fetal heart rate pattern

Placental Abruption





Uterine Rupture

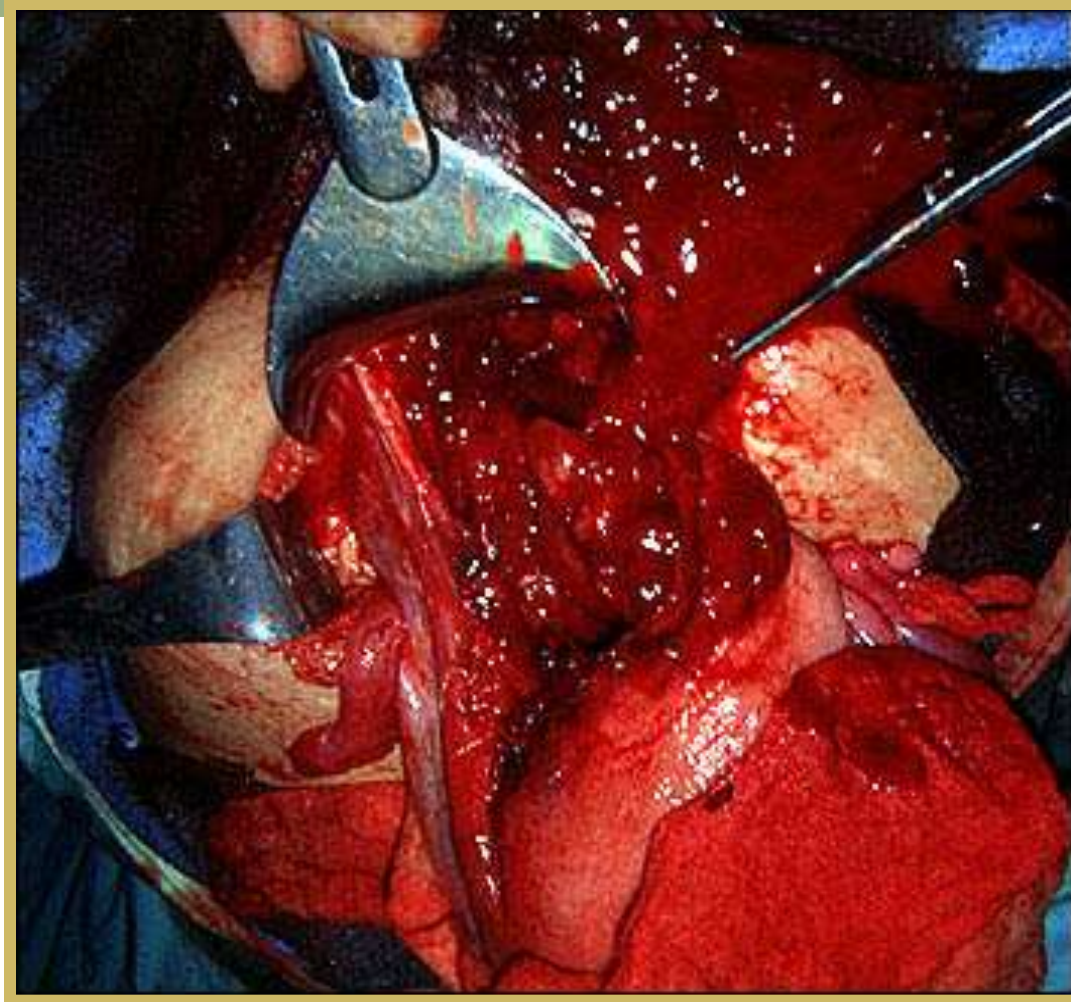
- ✦ Rupture: Separation of the uterine myometrium or previous uterine scar with extrusion of the fetus or fetal parts into the peritoneal cavity.
- ✦ Dehiscence: Partial separation or thinning of the myometrium at a scar or injury site and is typically asymptomatic.
- ✦ In maternal trauma patients without a previous scar, rupture is frequently on posterior wall, making detection more difficult



Signs and Symptoms of Uterine Rupture

- ✚ Complaint of tearing sensation and/or suprapubic and stabbing pain
- ✚ Increasing uterine hypertonus
- ✚ Non reassuring fetal heart rate pattern
- ✚ Palpation of fetal parts over abdomen
- ✚ Ascending station of fetal presenting part
- ✚ Vaginal bleeding and/or blood tinged urine
- ✚ Restlessness, hypovolemia & shock

Uterine Rupture





Perinatal Asphyxia

- ✦ Can occur within ten minutes after onset of prolonged decelerations resulting from placental abruption, uterine rupture, or prolapsed or completely occluded umbilical cord
- ✦ Fetal pH decreases 0.3/10 minutes
- ✦ Significant neonatal morbidity reported when time between onset of prolonged decelerations and birth is ≥ 18 minutes

Maternal Code

☛ Circulation

- Perform chest compressions higher on sternum
- **Displace uterus manually**

☛ Airway and Breathing

- Apply constant cricoid pressure during bag & mask
- Insert advanced airway (ET) ASAP
- **Breathe at rate of 20 breaths/minute & reduce ventilation volume**

☛ Defibrillation

- **“Sandwich” pad placement (front & back)**
- Use standard defibrillation dose
- Remove FHR and uterine monitors before shocking
- **Do not administer Amiodarone until fetus delivered (Lidocaine OK)**

Primary Goals of Resuscitation

- ✦ Maintain adequate circulation to maternal brain and vital organs
- ✦ Restore spontaneous circulation by treating the primary cause of the arrest ASAP
- ✦ **Maximize perfusion to both mom and baby by evacuating the uterus**



Perimortem Cesarean Delivery

- After 20 weeks, the compromise in venous return and cardiac output by the gravid uterus limits effectiveness of chest compressions.
- Mother cannot be resuscitated until venous obstruction, aortic compression, and cardiac demands are relieved.
- Delivery of the baby empties the uterus and improves circulation with cardiac compressions.
- Best survival rate for fetus > 24 weeks occurs when delivery is within 5 minutes of cardiac arrest.
- Delivery allows access to the infant and allows neonatal resuscitation to begin.

Three Team Approach Essential

OB/Maternal Team
OB/Medical history
Uterine displacement
Assess fetal viability
Perimortem Cesarean
Treat primary OB cause

Trauma/Code Team
Primary & Secondary BLS/ACLS
Intubation
IV medications
Treat primary cause
Cardiac stabilization

Neonatal team
Maternal history
Gestational age of fetus
Resuscitation, stabilization,
& disposition of neonate

Not Much Time . . .

✚ In summary. . .

- Best maternal/neonatal outcome occurs when fetus is delivered within 5 minutes following arrest.

✚ Therefore. . .

- Incision must start by 4 minutes (following 2nd cycle).

✚ Which means. . .

- **It's imperative to gather the appropriate teams immediately when a pregnant mother arrests.**



Summary

- ✦ Trauma is the leading non-obstetrical cause of death for childbearing women.
- ✦ Awareness of the physiological adaptations of pregnancy and their impact on the assessment and management of the pregnant trauma patient can maximize maternal and neonatal outcomes.



Thank you! Questions?

