Obstetric Emergencies In ICU

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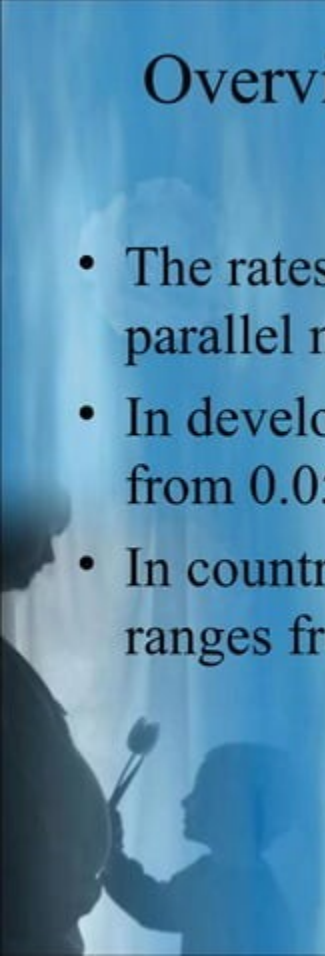


Definitions

- An *emergency* is an occurrence of serious and dangerous nature, developing suddenly and unexpectedly, demanding immediate attention.
- Obstetric: Directly related to pregnancy, or in a pregnant patient.
- Obstetric emergencies are multi-disciplinary problems.

Overview: Maternal morbidity and mortality

- The rates of severe maternal morbidity tend to parallel maternal mortality rates.
- In developed countries, morbidity rates range from 0.05 to 1.7 % of all pregnancies.
- In countries with low resources, prevalence ranges from 0.6 to 8.5%



Overview: ICU admission

- Transfer rates range from 0.5 to 7.6 per 1000 deliveries.
- Less than 1% of all ICU admissions.



Table 1. Obstetric admissions to medical/surgical intensive care units (ICUs).

Number of deliveries	Transfers to ICU	ICU admission rate per 1000 deliveries	Maternal deaths	Death to ICU transfer ratio	Country	Study period	Reference
61 435	126	2.1	1	1:126	Australia	1978–1989	Stephens[19]
8000	32	4.0	4	1:8	USA	1985–1990	Kilpatrick and Matthay[20]
13 018	7	0.54	0	0:7	Ireland	1990–1991	Fitzpatrick et al.[13]
15 323	38	2.5	7	1:5	USA	1983–1990	Monaco et al.[21]
NS	58	–	4	1:15	Israel	1985–1993	Lewinsohn et al.[22]
21 983	23	1.0	2	1:115	England	1982–1986	Graham and Luxton[23]
25 000	65	2.6	0	0:65	Canada	1990–1994	Lapinsky et al.[24]
140 323	435	3.1	22	1:20	France	1991–1992	Bouvier-Colle et al.[25]
39 354	49	1.2	2	1:25	Hong Kong, China	1988–1995	Tang et al.[26]
6039	30	5.0	2	1:15	England	1991–1992	Bewley and Creighton[3]
20 000	80	4.0	17	1:5	South Africa	1992	Platteau et al.[27]
76 119	55	0.7	2	1:28	Canada	1980–1993	Baskett and Sternadel[18]
44 340	131	3.0	3	1:44	Canada	1991–1997	Mahutte et al.[28]
58 708	364	6.2	61	1:6	Morocco	1995–2002	Mjahed et al.[15]
90 222	369	4.1	17	1:22	USA	1988–2000	Harris and Foley[29]
51 576	50	1.0	3	1:17	England	1988–1999	Murphy and Charlett[30]
49 349	233	4.7	8	1:29	USA	1991–1998	Gilbert et al.[31]
159 896	83	0.52	3	1:28	Canada	1988–2002	Baskett and O'Connell[32]
32 967	33	1.0	NS	–	England	1993–2002	Selo-Ojeme et al.[33]
28 660	68*	1.4*	23	1:3	Brazil	1991–2000	Dias de Souza et al.[34]
18 581	142	7.6	7	1:20	Netherlands	1990–2001	Keizer et al.[35]
51 165	64	1.3	NS	–	Scotland	2001–2002	Brace et al.[36]
13 333	28	2.1	2	1:14	England	2003–2005	Germain and Piercy[37]

NS, not stated.

* Forty of 28660 deliveries, 28 transfers from other hospitals.

Physiological Changes in Pregnancy

Expand maternal blood volume and support placental blood flow and fetal growth



Cardiovascular

- Cardiac output increases by 40-50% by 10 weeks due to a large increase in stroke volume and a smaller increase in heart rate
- Marked reduction in total peripheral resistance by 20-30%(systemic vasodilatation) → Decreased BP (diastolic > systolic) → return to pre-pregnancy level by 3rd trimester
- Aortocaval compression →_decreased preload and increased afterload (supine hypotension syndrome)

Respiratory

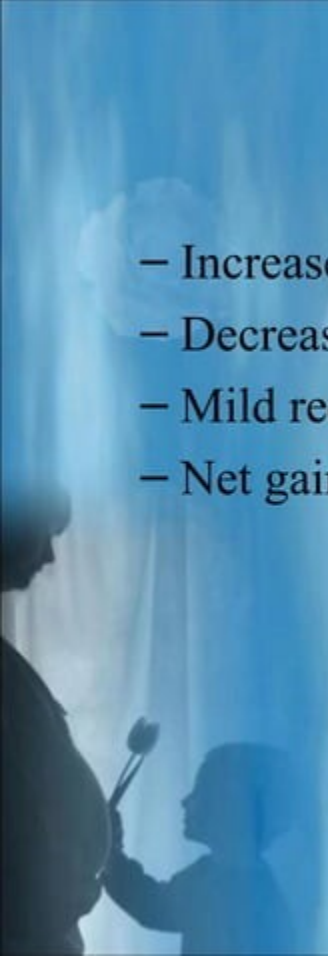
- Increase in RR and Increase in Tidal Volume
- Increase in minute volume (20-40%)
- Mild respiratory alkalosis
- Decreased diaphragmatic mobility in late pregnancy
- Increase in O2 delivery and consumption (30-50%)
- Decrease in functional residual capacity.
- Increase in airway mucosal oedema

Haematological

- Increase in Plasma volume > Increase in Red cell volume
- Dilutional reduction in Hb concentration
- Increase in WBC, with Neutrophilia
- 10-15% reduction in platelet count
- Hypercoagulable state

Renal

- Increase in glomerular filtration rate
- Decrease in urea, creatinine concentration
- Mild reduction in sodium level
- Net gain in fluid balance (mineralocorticoid effect)



GastroIntestinal

Increase gastric acidity, cardiac sphincter relax, decrease in oesophageal and gastric motility → Aspiration risk.



The point is…



Emergencies Directly Related to pregnancy

- Haemorrhagic.
- Hypertensive.
- Thromboembolic.



HEMORRHAGIC

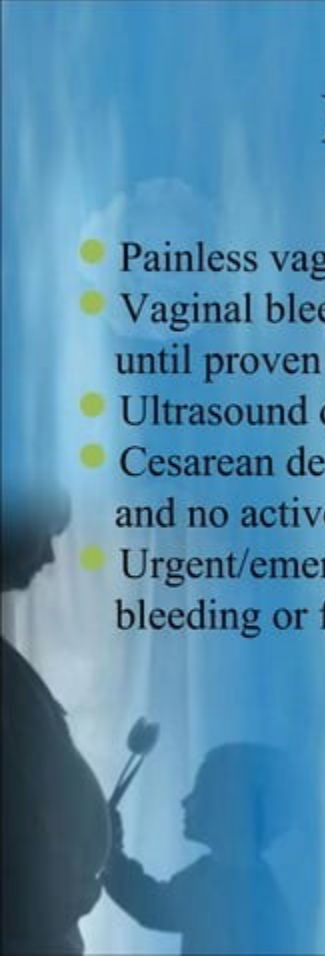
- PREPARTUM/INTRAPARTUM:
- Placenta previa
- Placenta accreta/increta/percreta
- Placental abruption
- Uterine rupture
- POSTPARTUM:
- Retained placenta
- Uterine atony
- Uterine inversion
- Birth trauma/laceration

PLACENTA PREVIA

- 1 in 200-250 deliveries
- Complete, partial or marginal
- Most diagnosed early resolve by third trimester
- ETIOLOGY:
- Unknown
- Previous uterine scar
- Previous placenta previa
- Advanced maternal age
- Multiparity

PLACENTA PREVIA

- Painless vaginal bleeding-third trimester
- Vaginal bleeding in 3rd trimester should be considered previa until proven otherwise
- Ultrasound diagnosis
- Cesarean delivery, or expectant management if fetus immature and no active bleeding
- Urgent/emergent cesarean delivery for active or persistent bleeding or fetal distress





Stage I



Stage II



Stage III

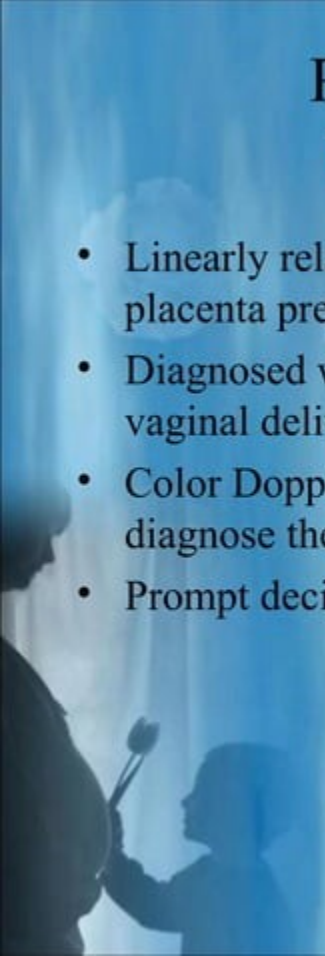


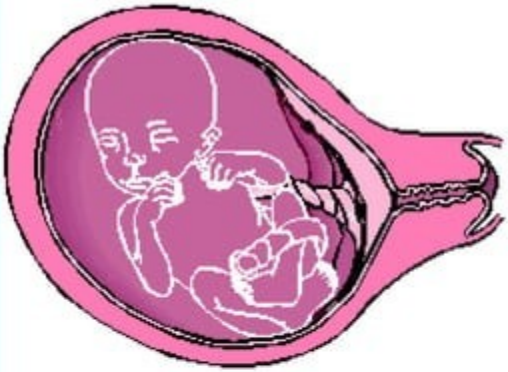
Stage IV

Classifications	*Classical*	*Contemporary*	*Ultrasound*
	Type I	Marginal	Minor
	Type II	Lateral	
	Type III	Central	Major
	Type IV		

PLACENTA ACCRETA/ INCRETA/PERCRETA

- Linearly related to number of previous scars in presence of placenta previa
- Diagnosed when placenta doesn't separate after cesarean or vaginal delivery
- Color Doppler imaging or magnetic resonance imaging may diagnose the condition antepartum
- Prompt decision for hysterectomy





Normal



Accreta



Increta

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Percreta



PLACENTAL ABRUPTION

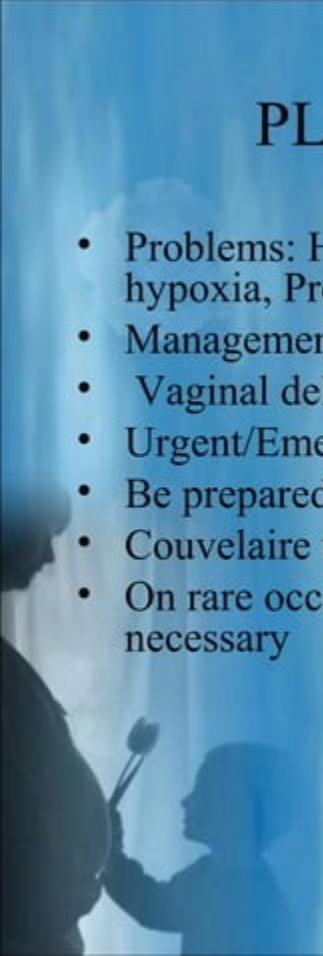
- I in 77 to 1 in 86 deliveries
- ETIOLOGY:
- Cocaine
- Hypertension: Chronic or pregnancy induced
- Trauma
- Heavy maternal alcohol use
- Smoking
- Advanced age and parity
- Premature rupture of membranes
- History of previous abruption

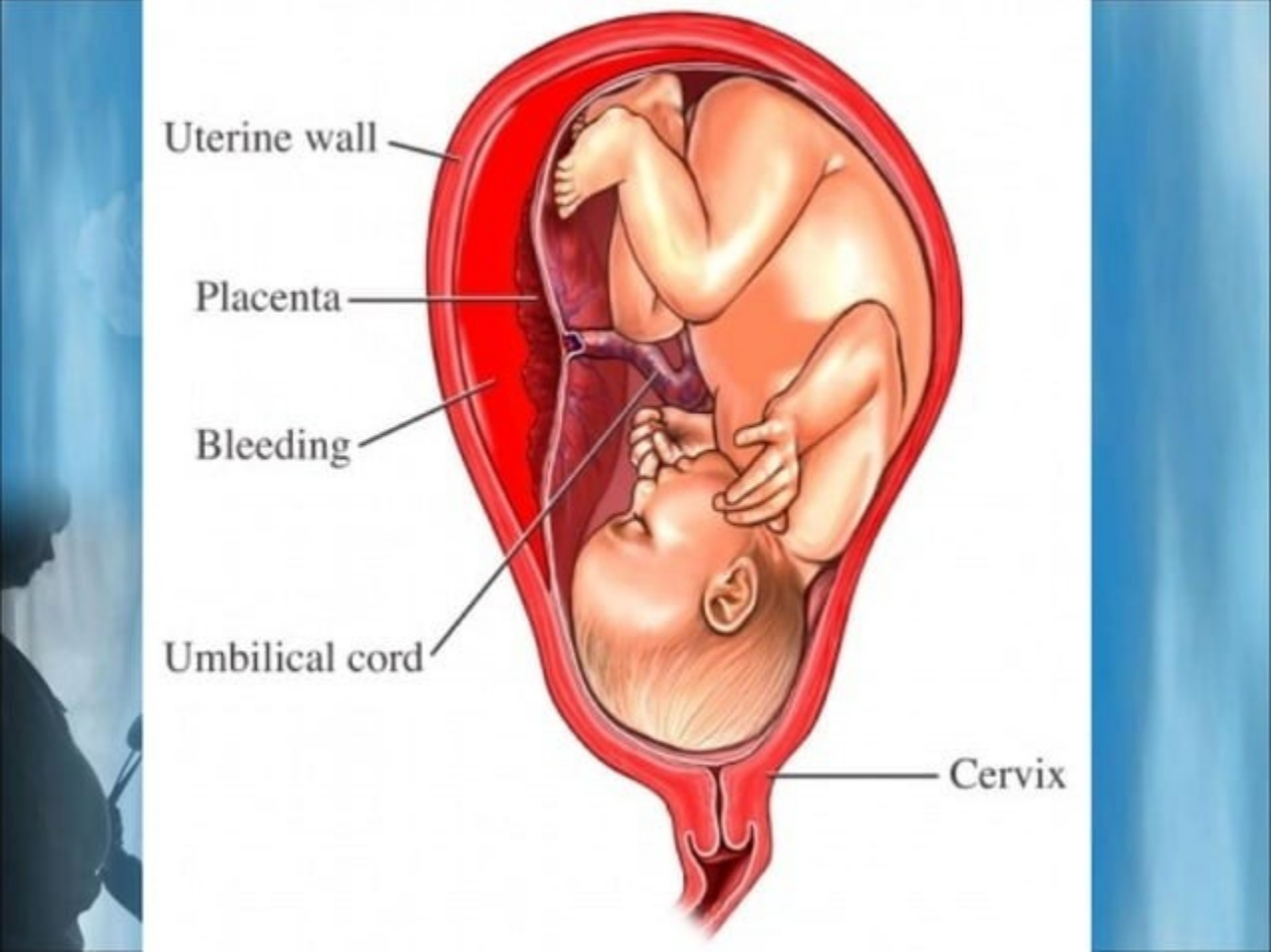
PLACENTAL ABRUPTION

- Vaginal bleeding-Classical presentation
- May not always be obvious
- 3000 ml or more blood can be sequestered behind placenta in concealed bleeding
- Uterus can't selectively constrict abrupted area
- Decreased placental area-fetal asphyxia
- 1 in 750 deliveries-fetal death
- Severe neurological damage in some surviving infants
- Upto 90% abruptions-mild to moderate

PLACENTAL ABRUPTION

- Problems: Hemorrhage, Consumptive coagulopathy, Fetal hypoxia, Prematurity
- Management depends on severity of situation
- Vaginal delivery-Fetus and mother stable
- Urgent/Emergent CS- Fetal distress or severe hemorrhage
- Be prepared for massive blood loss with C/D
- Couvelaire uterus may not contract after delivery
- On rare occasions, internal iliac ligation/hysterectomy may be necessary



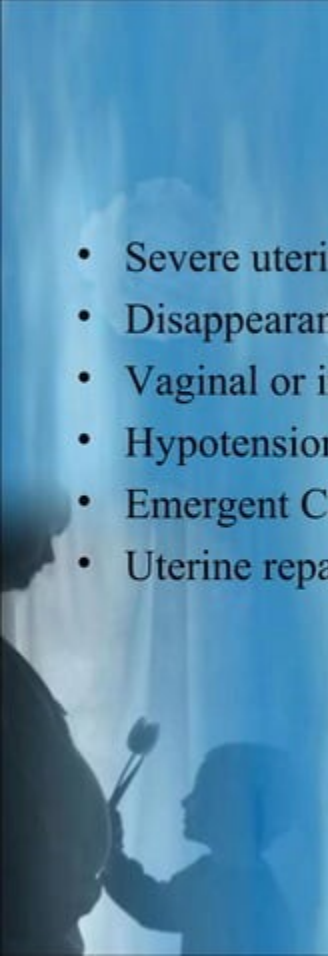

Uterine wall
Placenta
Bleeding
Umbilical cord
Cervix

UTERINE RUPTURE

- Prepartum, intrapartum or postpartum
- ETIOLOGY:
- Prior cesarean delivery especially classical cesarean scar
- Rupture of myomectomy scar
- Precipitous labor
- Prolonged labor with cephalopelvic disproportion
- Excessive oxytocin stimulation
- Abdominal trauma
- Grand multiparity
- Iatrogenic
- Direct uterine trauma-forceps or curettage

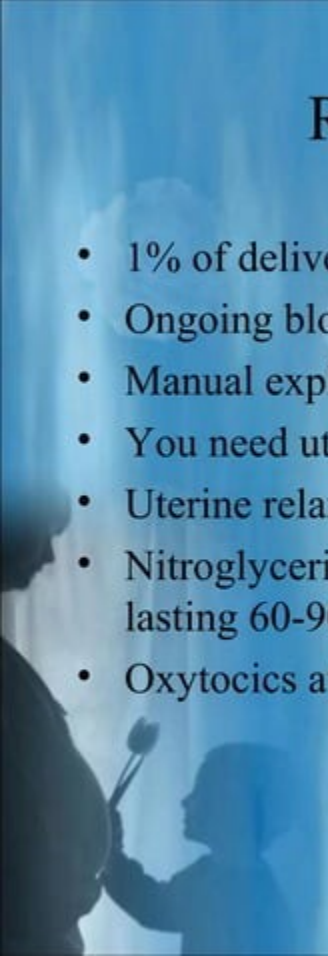
UTERINE RUPTURE

- Severe uterine or abdominal pain or shoulder pain
- Disappearance of fetal heart tones
- Vaginal or intraabdominal bleeding
- Hypotension
- Emergent CS may be necessary
- Uterine repair/Hysterectomy depending on situation



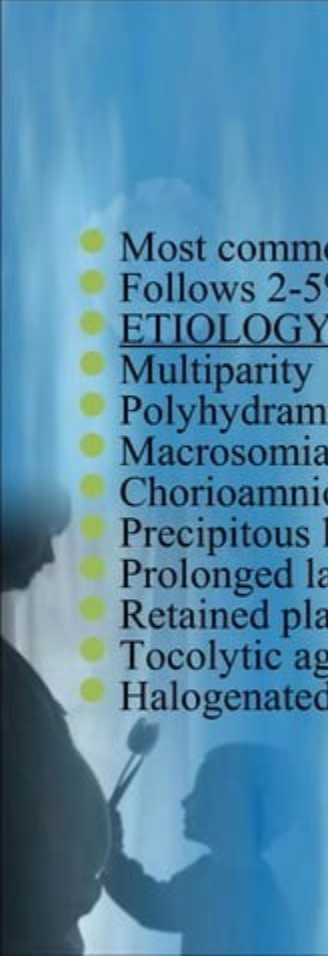
RETAINED PLACENTA

- 1% of deliveries
- Ongoing blood loss
- Manual exploration for removal
- You need uterine relaxation and analgesia
- Uterine relaxation: inhalational agents in pts receiving GETA
- Nitroglycerin: 100 ug boluses-relaxation within 30-45 seconds lasting 60-90 seconds
- Oxytocics after removal of placenta



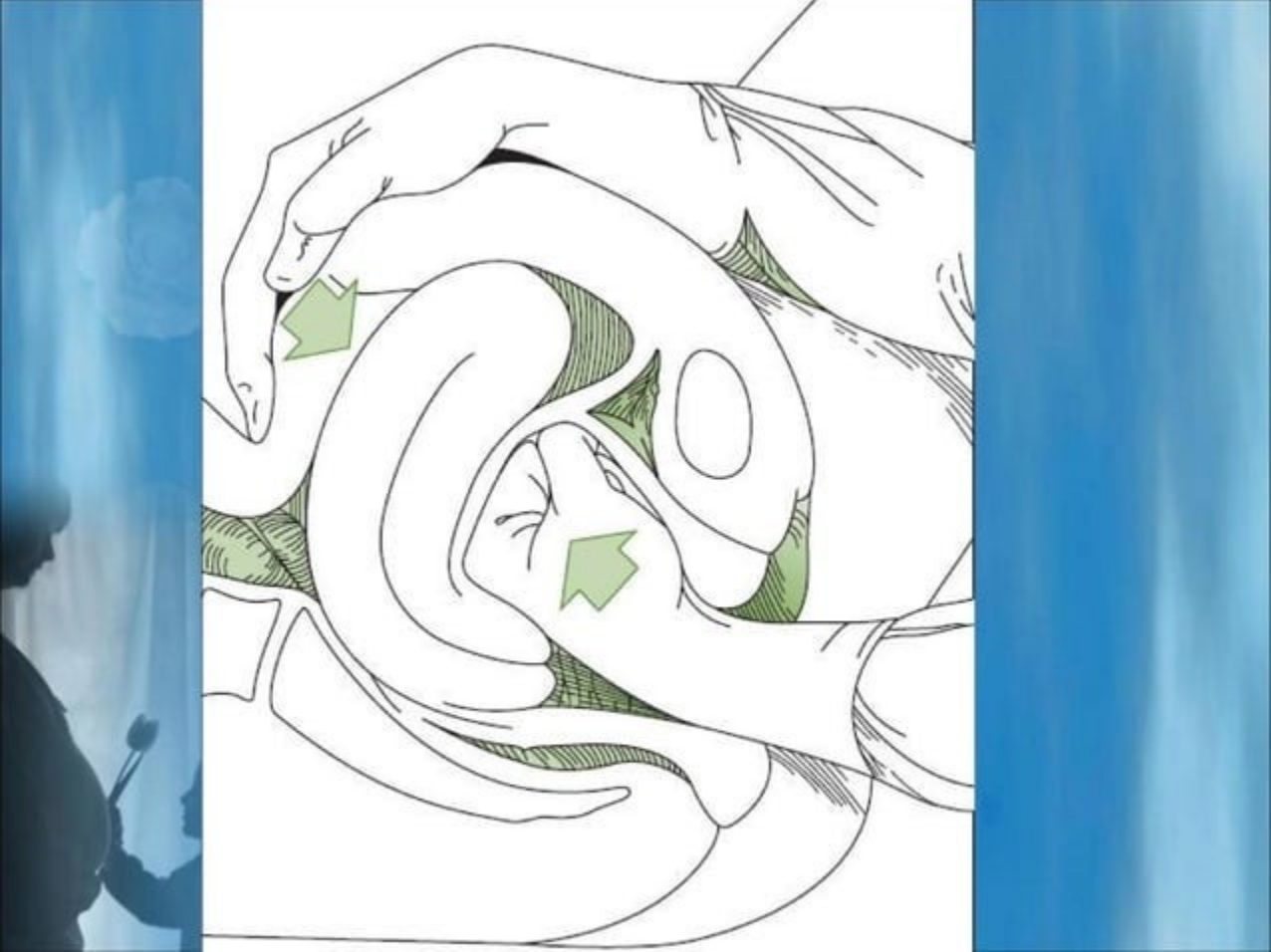
UTERINE ATONY

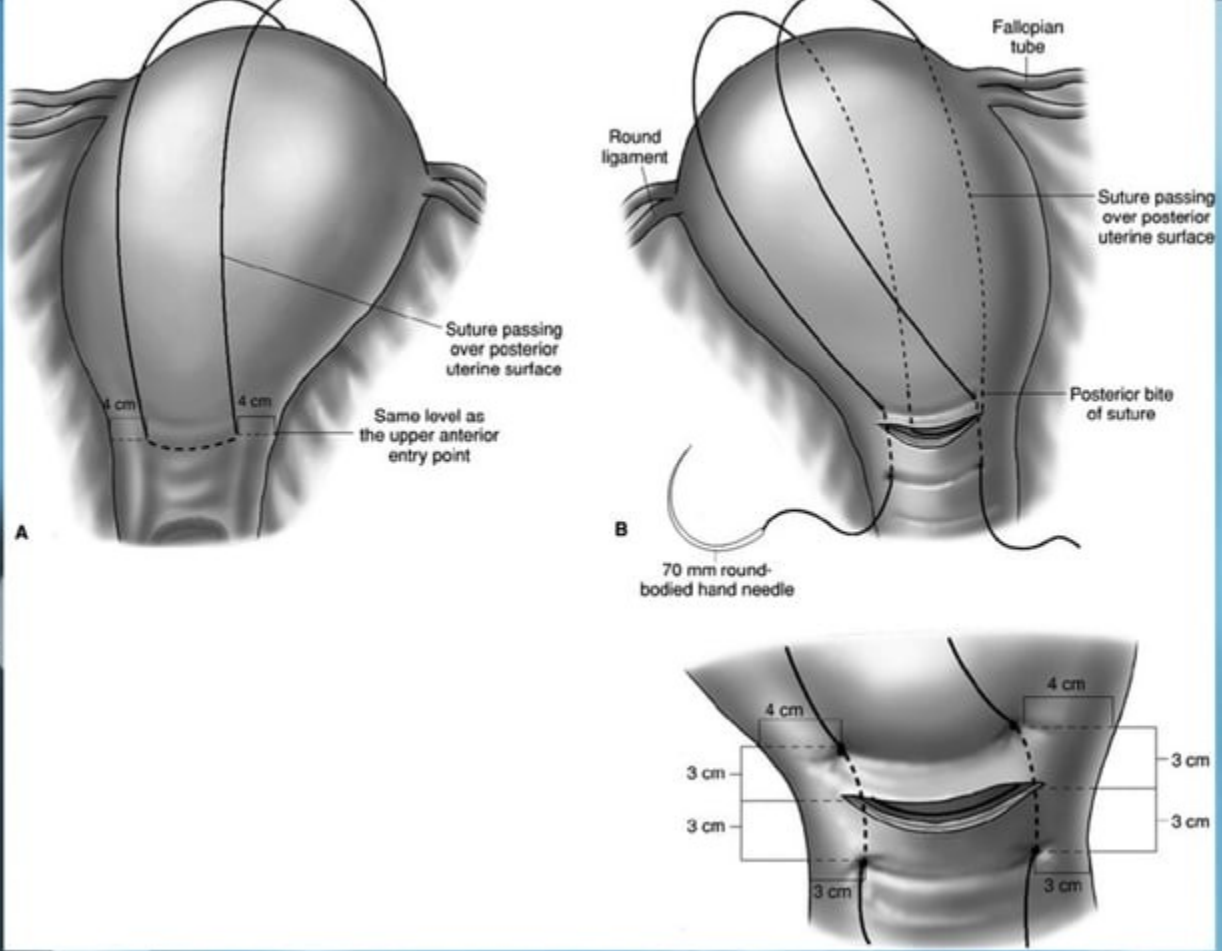
- Most common cause of postpartum hemorrhage
- Follows 2-5% deliveries
- ETIOLOGY:
- Multiparity
- Polyhydramnios
- Macrosomia
- Chorioamnionitis
- Precipitous labor or excessive oxytocin use during labor
- Prolonged labor
- Retained placenta
- Tocolytic agents
- Halogenated agents >0.5 MAC



UTERINE ATONY

- Vaginal bleeding > 500 ml
- Manual examination of uterus
- Infusion of oxytocics + bimanual compression of uterus
- Evaluation for retained placenta
- Uterine artery embolization
- Compressive sutures (B-lynch)
- Hystrectomy.




Fallopian tube
Round ligament
Suture passing over posterior uterine surface
Posterior bite of suture
Suture passing over posterior uterine surface
4 cm
4 cm
Same level as the upper anterior entry point
A
B
70 mm round-bodied hand needle
4 cm
4 cm
3 cm
3 cm
3 cm
3 cm
3 cm

UTERINE INVERSION

Uncommon problem

- Results from inappropriate fundal pressure or excessive traction on umbilical cord especially if placenta acreta is present.



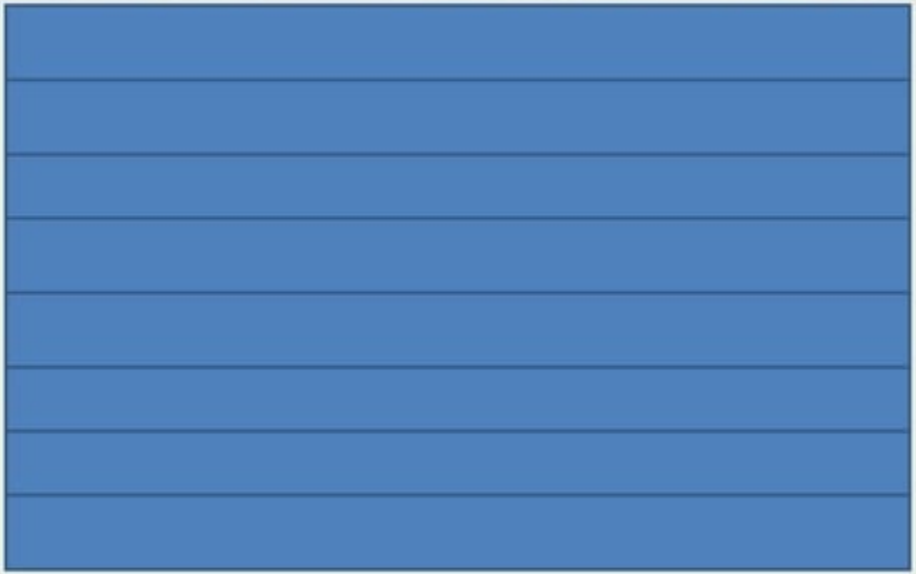
BIRTH TRAUMA/LACERATIONS

- Lesions range from laceration to retroperitoneal hematoma requiring laparotomy
- Can result from difficult forceps delivery
- Precipitous vaginal delivery
- Malpresentation of fetal head
- Laceration of pudendal vessels
- Clinical presentation of postpartum bleeding with contracted uterus

ICU Management



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Blood Loss Needs

- Appropriate intravenous (IV) access is critical.
- This includes two large-bore IV catheters.
- The patient's blood type should be confirmed and held for possible cross matching needs.
- Baseline laboratory evaluations of hemoglobin, hematocrit, platelet count, fibrinogen, prothrombin time, and partial thromboplastin time should be taken.

Loss Estimation

Hemorrhage class	Acute blood loss	% Lost	Physiologic response
1	1000 cc	15	Dizziness, palpitations, minimal blood pressure change
2	1500 cc	20-25	Tachycardia, tachypnea, sweating, weakness, narrowed pulse pressure, orthostatic hypotension
3	2000 cc	30-35	Significant tachycardia, restlessness, pallor, cool extremities, hypotension
4	≥2500 cc	40	Shock, air hunger, oliguria or anuria



Etiology

Uterine atony
Lower genital tract lacerations (perineal, vaginal, cervical, periclitoral, labial, periurethral, rectum)
Upper genital tract lacerations (broad ligament)
Lower urinary tract lacerations (bladder, urethra)
Retained products of conception (placenta, membranes)
Invasive placentation (placenta accreta, placenta increta, placenta percreta)
Uterine rupture
Uterine inversion
Coagulopathy (hereditary, acquired)



Estimated blood loss Replacement

- Warmed crystalloid solution in a 3:1 ratio to EBL will provide the initial volume necessary to stabilize a bleeding patient.
- There is no consensus regarding optimal blood product replacement.
- However, newer data suggest improved outcomes when the ratio of packed red blood cells (PRBC) to fresh frozen plasma (FFP) to platelets is 1:1:1

Estimated blood loss Replacement

- Massive transfusion protocols have been successful in management of postpartum hemorrhage.
- Transfusion of 10 units of PRBC in a 24-hour period.
- This correlates with massive hemorrhage defined as loss of greater than 50% of the patient's blood volume
- Stanford University Medical Center has incorporated a fixed protocol of 6:4:1 for PRBC to FFP to platelets

Estimated blood loss Replacement

- Expected effect of blood components:

Component	Contents	Indications	Volume (mL)	Shelf life	Expected effect
PRBCs	Red cells, some plasma, few WBCs	Correct anemia	300	42 d	Increase Hct 3% per unit, Hgb 1 g/U
Leukocyte-poor blood	RBCs, some plasma, few WBCs	Correct anemia, reduce febrile reactions	250	21-24 d	Increase Hct 3% per unit, Hgb 1 g/U
Platelets	Platelets, some plasma, RBCs, few WBCs	Bleeding due to thrombocytopenia	50	Up to 5 d	Increase total platelet count 7500/mm^3/U
Fresh frozen plasma	Fibrinogen, plasma, clotting factors V, XI, XII	Treatment of coagulation disorders	250	2 h thawed, 12 mo frozen	Increase total fibrinogen 10-15 mg/dL/U
Cryoprecipitate	Fibrinogen, factors V, VIII, XIII, von Willebrand factor	Hemophilia A, von Willebrand disease, fibrinogen deficiency	40	4-6 h thawed	Increase total fibrinogen 10-15 mg/dL/U

Estimated blood loss Replacement

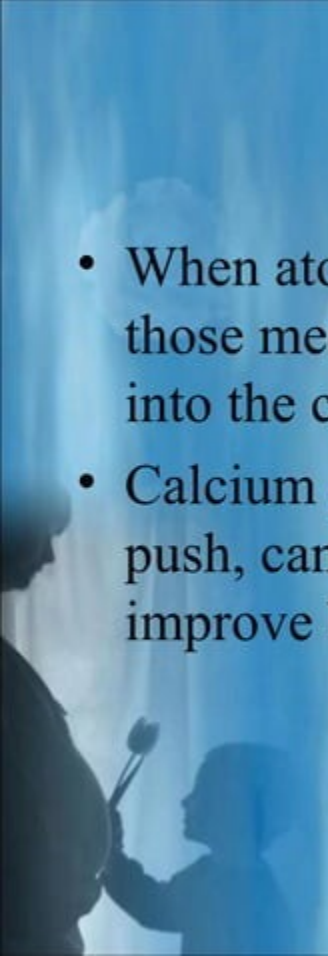
- **Aim of transfusion:**
- Hematocrit greater than 21 percent
- Platelet count greater than 50,000/uL
- Fibrinogen greater than 100 mg/dL
- Prothrombin (PT) and partial thromboplastin time (PTT) less than 1.5 times control

Drug Therapy

Agent	Dose	Route	Dosing frequency	Side effects	Contraindications
Oxytocin (Pitocin)	10-80 units in 1000 cc of crystalloid solution	First line: IV Second line: IM or IU	Continuous	Nausea, emesis, water intoxication	None
Misoprostol (Cytotec)	600-1000 µg	First line: PR Second line: PO	Single dose	Nausea, emesis, diarrhea, fever, chills	None
Methylergonovine (Methergine)	0.2 mg	First line: IM Second line: IU	Every 2-4 h	Hypertension, hypotension, nausea, emesis,	Hypertension, preeclampsia
Prostaglandin $F_{2\alpha}$ (Hemabate)	0.25 mg	First line: IM Second line: IU	Every 15-90 min (8 doses maximum)	Nausea, emesis, diarrhea, flushing, chills	Active cardiac, pulmonary, renal, or hepatic disease
Prostaglandin E_2 (Dinoprostone)	20 mg	PR	Every 2 h	Nausea, emesis, diarrhea, fever, chills, headache	Hypotension

Drug Therapy

- When atony is due to tocolytic therapy, that is, those medications that impair calcium entry into the cell (magnesium sulfate, nifedipine).
- Calcium gluconate given as an intravenous push, can effectively improve uterine tone and improve bleeding due to atony.



Drug Therapy: Recombinant Factor VIIa (NovoSeven)

- Developed in 1999
- Approved indication: Treatment of bleeding episodes in haemophilia A or B, patients exhibiting inhibitors to factors VIII or IX, congenital factor VII deficiency, or acquired haemophilia
- 'Off-label' use for haemostasis in obstetric and/or gynaecological haemorrhage
- Doses of 16.7 to 120 mcg/kg as a single bolus injection over a few minutes every two hours until hemostasis is achieved have been effective, and usually control bleeding within 10 to 40 minutes of the first dose

Drug Therapy

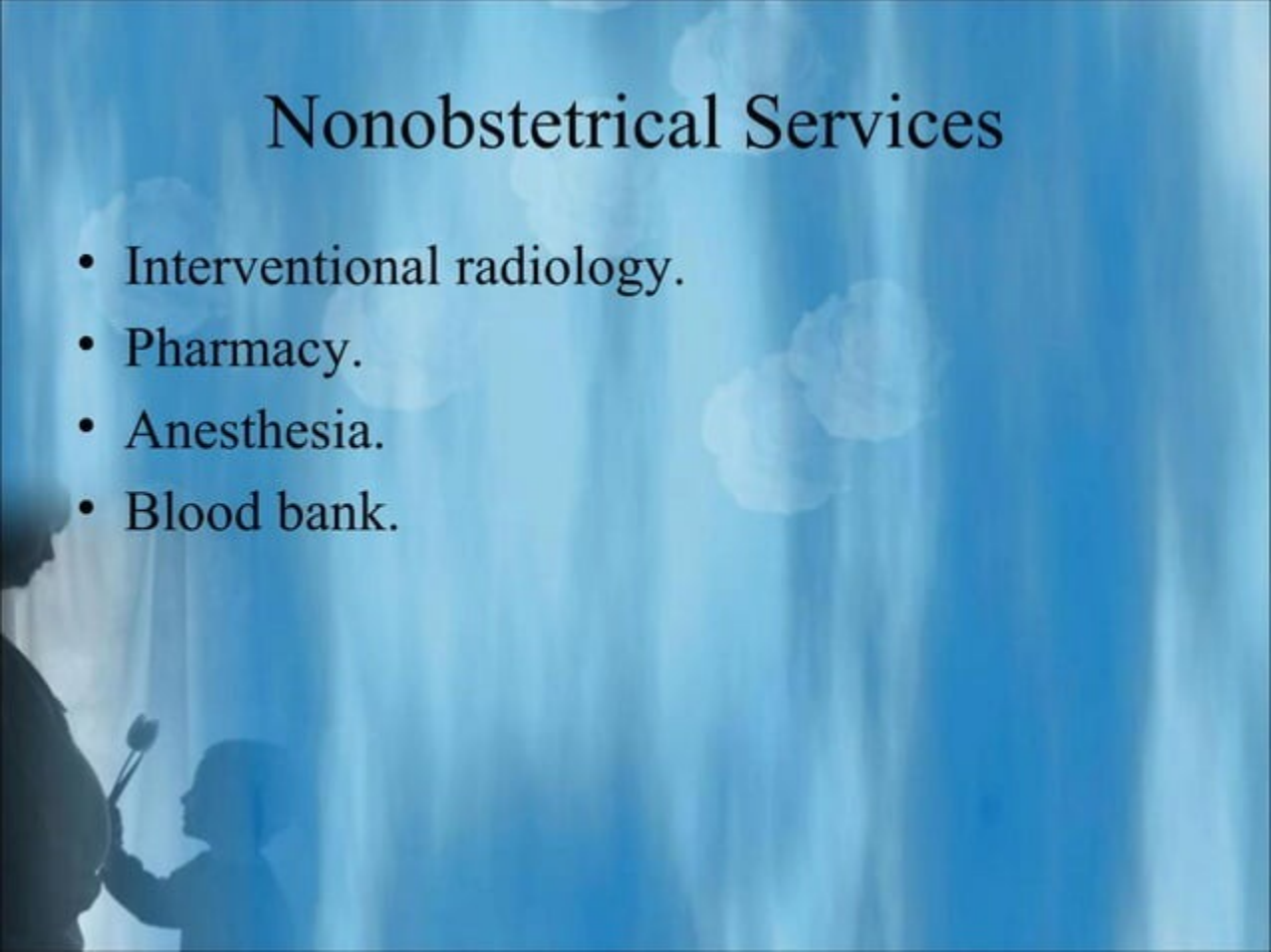
- A promising pharmaceutical agent for coagulopathy management is RiaSTAP, or fibrinogen concentrate.
- RiaSTAP is an intravenous therapy of fibrinogen made from human plasma.
- Recently approved by the Food and Drug Administration
- RiaSTAP has been successfully used in Europe for the treatment of massive hemorrhage due to consumptive coagulopathy (trauma, surgery, gastrointestinal hemorrhage) and congenital fibrinogen deficiency.

Intraoperative Management

- Bimanual massage (atony)
- Uterine curettage (retained parts)
- Uterine replacement (inversion)
- Compressive sutures
- Internal iliac artery ligation and embolization.
- Repair of lacerartions, rupture.
- Hysterectomy.

Nonobstetrical Services

- Interventional radiology.
- Pharmacy.
- Anesthesia.
- Blood bank.



General Complication Assessment

- Hypoperfusion injuries to the brain, heart, and kidneys.
- Infection: due to transfusion, wounds, lines.
- Persistent coagulopathy.
- Acute lung injury due to massive transfusion
- Pituitary necrosis

HYPERTENSIVE

- Most common medical complications of pregnancy, affecting 5% to 10% of all pregnancies.
- Approximately 70% are due to gestational hypertension.
- The spectrum of the disease ranges from mildly elevated blood pressures with minimal clinical significance to severe hypertension and multiorgan dysfunction.

I. Gestational hypertension
   Mild
   - Systolic < 160 mm Hg or
   - Diastolic < 110 mm Hg

   Severe
   - Systolic ≥ 160 mm Hg or
   - Diastolic ≥110 mm Hg

II. Gestational proteinuria
   Mild (≥1 + on dipstick and <5 g/24 h)
   Severe (≥5 g/24 h)

III. Preeclampsia (hypertension + proteinuria)
   Onset >20 weeks' gestation
   Mild
   - Mild hypertension and mild proteinuria

   Severe
   - Severe hypertension and proteinuria
   - Mild hypertension and severe proteinuria
   - Persistently severe cerebral symptoms
   - Thrombocytopenia
   - Pulmonary edema
   - Oliguria (<500 mL/24 h)

IV. Chronic hypertension
   Hypertension before pregnancy
   Hypertension before 20 weeks' gestation

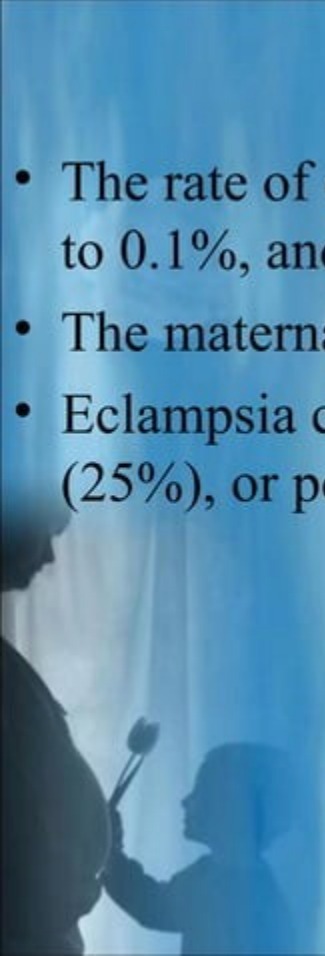
V. Superimposed preeclampsia
   Exacerbation of hypertension and/or new-onset proteinuria

- These measurements must be made on at least two occasions, no less than 6 hours and no more than a week apart.
- Abnormal proteinuria in pregnancy is defined as the excretion of ≥300 mg of protein in 24 hours.



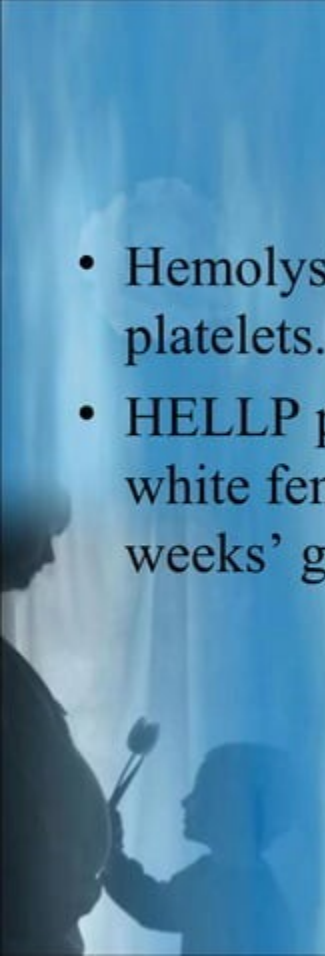
ECLAMPSIA

- The rate of eclampsia in the United States is 0.05% to 0.1%, and much higher in developing countries.
- The maternal mortality rate is approximately 4.2%.
- Eclampsia can occur antepartum (50%), intrapartum (25%), or postpartum (25%).



HELLP Syndrome

- Hemolysis, elevated liver enzymes, and low platelets.
- HELLP patients generally are multiparous, white females who present at less than 35 weeks' gestation.



HELLP Syndrome

Diagnostic criteria:

Hemolysis	• Abnormal peripheral smear • Total bilirubin ≥1.2 mg/dL • Reduced serum haptoglobin
Elevated liver enzymes	• Serum aspartate aminotransferase >70 U/L • Lactate dehydrogenase 2 × upper limit of normal
Low platelets	• <100,000/mm^3

HELLP Syndrome

	HELLP	TTP/HUS	AFLP
Ammonia	Normal	Normal	Elevated
Anemia	±	Severe	Normal
Antithrombin III	±	Normal	Decreased
AST	Elevated	Normal	Elevated
Bilirubin	Elevated, mostly indirect	Elevated	Elevated, mostly direct
Creatinine	±	Significantly elevated	Significantly elevated
Fibrinogen	Normal	Normal	Decreased in all cases
Glucose	Normal	Normal	Decreased
Hypertension	Present	±	±
LDH	Elevated	Significantly elevated	Elevated
Proteinuria	Present	±	±
Thrombocytopenia	Present	Severe	±



Adverse outcome of hypertension in pregnancy

Maternal complications

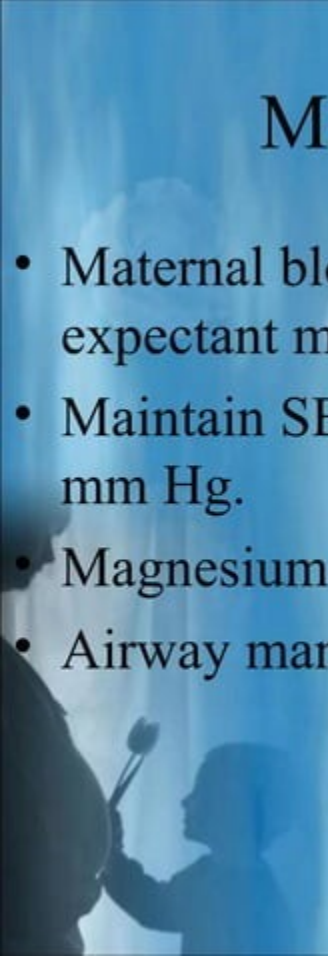
- Abruptio placentae
- Disseminated intravascular coagulopathy
- Eclampsia
- Renal failure
- Liver hemorrhage or failure
- Intracerebral hemorrhage
- Hypertensive encephalopathy
- Pulmonary edema
- Death

Fetal-neonatal complications

- Severe intrauterine growth retardation
- Oligohydramnios
- Preterm delivery
- Hypoxia-acidosis
- Neurologic injury
- Death

Management in the ICU

- Maternal blood pressure control is essential with expectant management or during delivery.
- Maintain SBP 140 - 155 mm Hg and DBP 90-105 mm Hg.
- Magnesium Sulfate.
- Airway management during siezures.

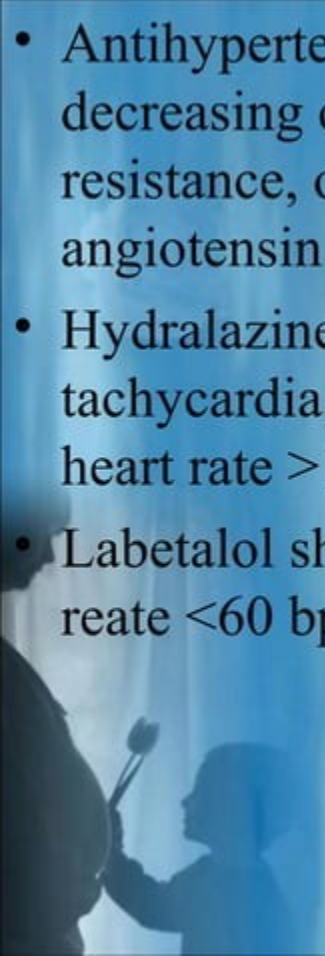


Common antihypertensives

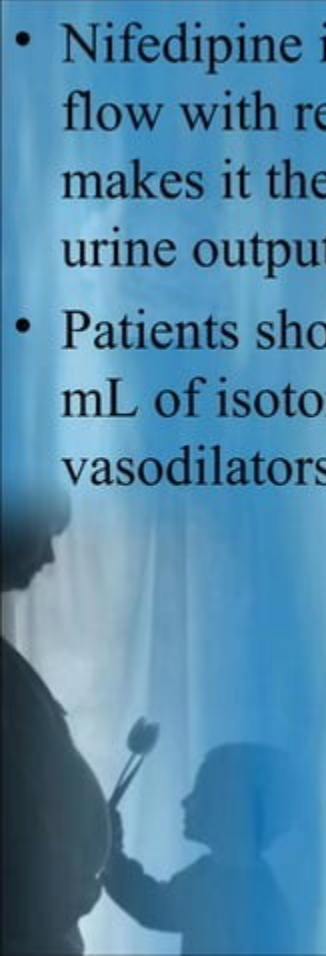
Medication	Onset of action (min)	Dose
Hydralazine	10-20	5-10 mg IV every 20 min up to maximum dose of 30 mg
Labetalol	10-15	20 mg IV, then 40-80 mg every 10 min up to maximum dose of 300 mg or continuous infusion at 1-2 mg/min
Nifedipine	5-10	10 mg po, repeated in 30 min, (20 mg po) × 2 doses, prn; then 10-20 mg every 4-6 h up to maximum dose 240 mg/24 h
Nicardipine		As continuous infusion at 3 mg/h with increments of 0.5 mg/h (titrated according to blood pressure)
Sodium nitroprusside	0.5-5	0.25-5 µg/kg/min IV infusion Risk of fetal cyanide poisoning with prolonged treatment.



- Antihypertensive agents can exert an effect by decreasing cardiac output, peripheral vascular resistance, or central blood pressure, or by inhibiting angiotensin production.
- Hydralazine and nifedipine are associated with tachycardia, should not be used in patients with heart rate >100 bpm.
- Labetalol should be avoided in patients with heart reate <60 bpm, asthma, and congestive heart failure.



- Nifedipine is associated with improved renal blood flow with resultant increase in urine output which makes it the drug of choice in those with decreased urine output.
- Patients should receive bolus infusion of 250-500 mL of isotonic saline prior to the administration of vasodilators.



Magnesium Sulfate

- Magnesium sulfate is used for the prevention of eclamptic seizures.
- The exact mode of action is unknown.
- Patients receiving MgSO4 are at increased risk for postpartum hemorrhage due to uterine atony.
- Close monitoring for signs of toxicity, and if present the patient should be treated with 10 mL of 10% calcium gluconate solution, infused over 3 minutes.
- Calcium competitively inhibits magnesium at the neuromuscular junction.

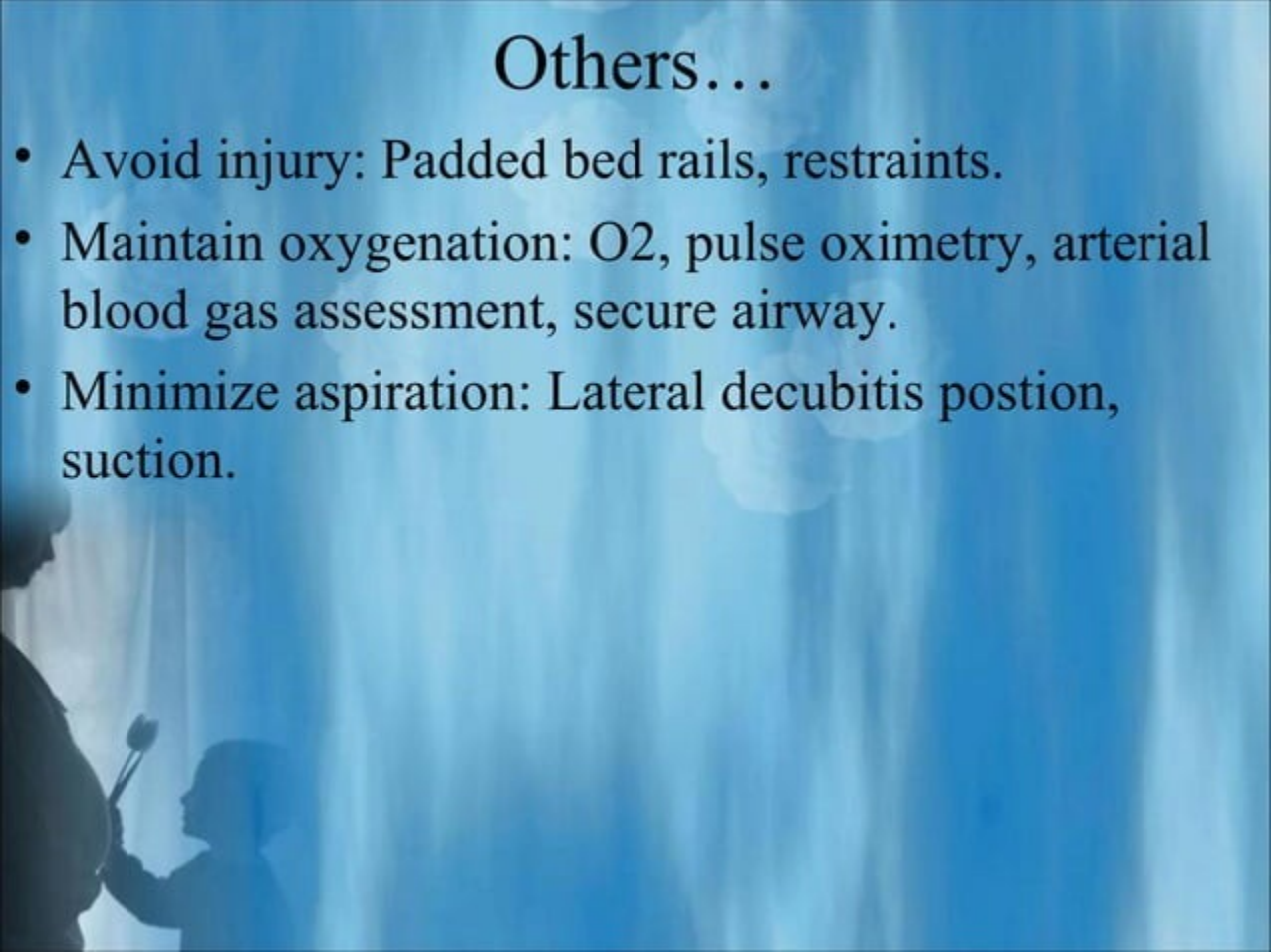
Magnesium doses	
Loading dose:	6 g IV over 20-30 min (6 g of 50% solution diluted in 150 mL D_5W)
Maintenance dose:	2-3 g IV per hour (40 g in 1 L D_5LR at 50 mL/h)
Recurrent seizures:	Reload with 2 g over 5-10 min, 1-2 times and/or 250 mg sodium amobarbital IV

Magnesium levels and associated findings	
Loss of patellar reflexes	8-12 mg/dL
Feeling of warmth, flushing, double vision	9-12 mg/dL
Somnolence	10-12 mg/dL
Slurred speech	10-12 mg/dL
Muscular paralysis	15-17 mg/dL
Respiratory difficulty	15-17 mg/dL
Cardiac arrest	20-35 mg/dL



Others…

- Avoid injury: Padded bed rails, restraints.
- Maintain oxygenation: O2, pulse oximetry, arterial blood gas assessment, secure airway.
- Minimize aspiration: Lateral decubitis postion, suction.



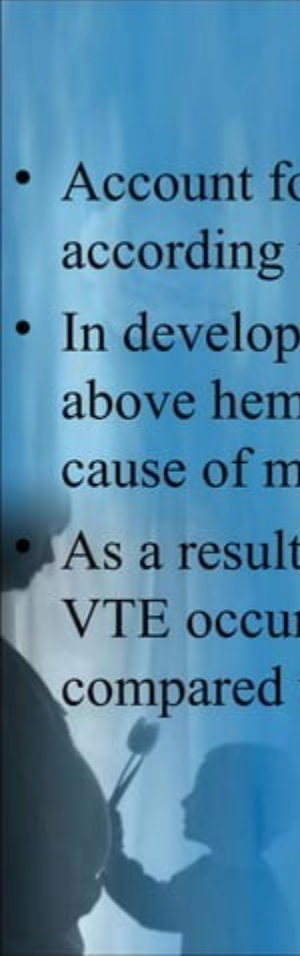
THROMBO-EMBOLIC

- VTE and PE.
- Amniotic fluid embolism.



VTE and PE

- Account for 14.9% of maternal deaths in 2006, according to WHO.
- In developed countries, thromboembolism has risen above hemorrhage and hypertension as the leading cause of maternal mortality.
- As a result of physiologic changes in pregnancy, VTE occurs at a rate that is fourfold higher compared to the nonpregnant state.



VTE and PE: *Signs and Symptoms*

- Acute onset of symptoms
- Unilateral extremity erythema, pain, warmth, edema
- May have reflex arterial spasm, with cool, pale extremity and decreased pulses
- Lower abdominal pain
- Homan sign

- Acute onset of symptoms
- Dyspnea, tachypnea, pleuritic chest pain, hemoptysis
- Tachycardia
- Cyanosis
- Syncope

VTE and PE: *Treatment*

- Five categories of treatment are: heparins, warfarin, surgery, IVC filter, and thrombolytics.
- Heparin has No teratogenicity and does not cross placenta or enter breast milk.
- Anticoagulation can be restarted safely 6 hours after vaginal delivery and 8 to 12 hours after cesarean delivery.
- Warfarin readily crosses placenta.

Amniotic Fluid Embolism

- Amniotic fluid embolism is a catastrophic syndrome occurring during labor and delivery or immediately postpartum.
- The true incidence is unclear because this syndrome is difficult to identify and the diagnosis remains one of exclusion, with possible underreporting of nonfatal cases.
- Common clinical features include shortness of breath, altered mental status followed by sudden cardiovascular collapse,DIC, and maternal death.

Amniotic Fluid Embolism

1. Acute hypotension or cardiac arrest
2. Acute hypoxia, defined as dyspnea, cyanosis, or respiratory arrest
3. Coagulopathy, defined as laboratory evidence of intravascular consumption, fibrinolysis or severe clinical hemorrhage in the absence of other explanations
4. Onset of the above during labor, cesarean section, dilatation and evacuation, or within 30 min postpartum
5. Absence of any other significant confounding condition or potential explanation for the signs and symptoms observed

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Source: As suggested by Clark SL, Hankins GD, Dudley DA, et al. Amniotic fluid embolism: analysis of the National Registry. *Am J Obstet Gynecol.* 1995;172:1158-1169.

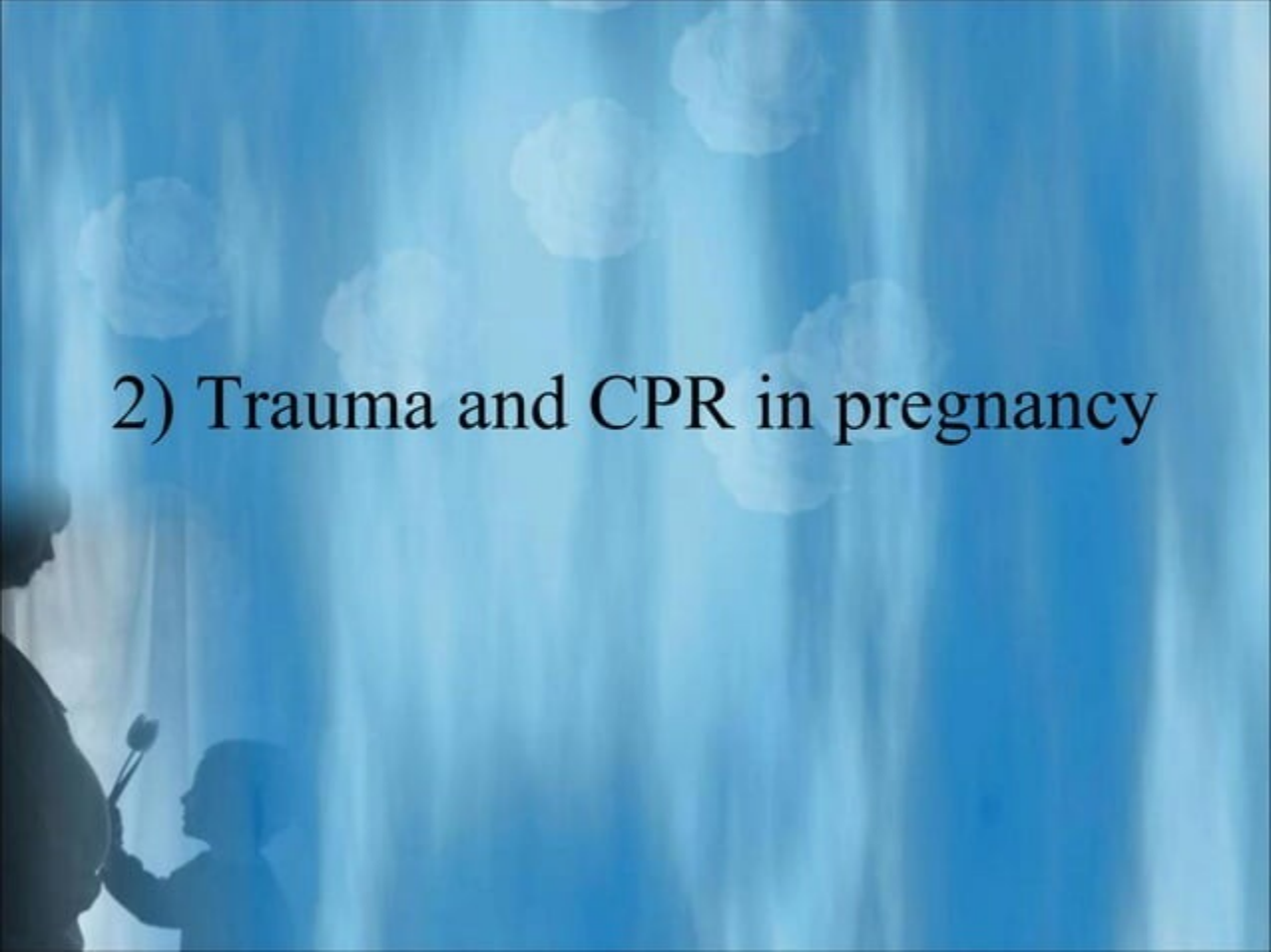
Amniotic Fluid Embolism

- The primary management goal includes rapid maternal cardiopulmonary stabilization with prevention of hypoxia and maintenance of vascular perfusion.
- This may require endotracheal intubation to keep oxygen saturation at 90% or greater.
- Treatment of hypotension should include optimization of preload with infusion of crystalloid solutions.
- In cases of refractory hypotension, vasopressors such as dopamine or norepinephrine may be used.

Amniotic Fluid Embolism

- In a mother who is hemodynamically unstable but has not yet undergone cardiac arrest, maternal considerations must be weighed carefully against those of the fetus.
- The decision to subject such an unstable mother to a major abdominal operation is difficult.
- In cases in which asystole or malignant arrhythmia is present for greater than 4 minutes, perimortum cesarean delivery should be considered.

2) Trauma and CPR in pregnancy



Incidence

- 4-8% of trauma cases involve pregnant women.
- Motor vehicle crash (55%).
- Fall (13%).
- Violence (10%).
- Bicycle/recreation (4%).
- Pedestrian struck (4%).
- And other (11%).

Gestational age

- The uterus is protected within the pelvis until 12 weeks, so chances of injury are limited.
- At 20 weeks, the uterus is at the level of the umbilicus.
- After 20 weeks, the fundal height (in centimeters) corresponds to weeks of gestation.
- The bladder is displaced
- upward as the uterus grows, making it an intra-abdominal organ vulnerable to injury.

1ry trauma survey

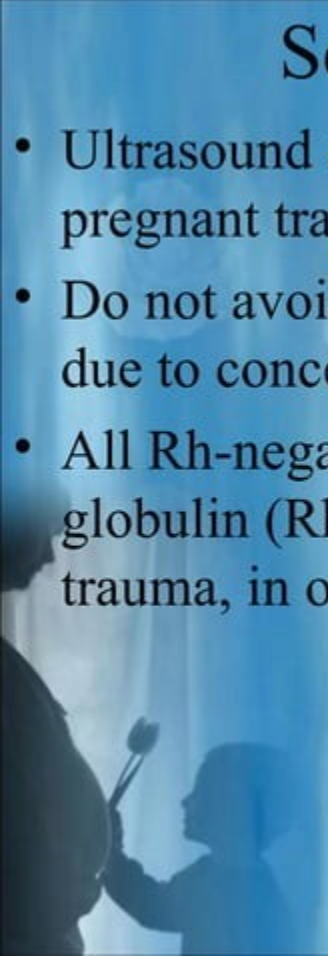
A—Airway	Immobilize the cervical spine. Clear obstruction or secretions. Maintain neutral head position. Use laryngeal mask airway or endotracheal tube if needed.
B—Breathing	Check respiratory rate and effort. Supply supplemental oxygen in most cases. Use continuous pulse oximetry.
C—Circulation	Assess pulse and BP, including orthostatics if needed. Establish two large-bore IV lines. Replete blood loss with isotonic crystalloid in a 3:1 ratio.
D—Disability	Assign injury severity score (ISS)[a] or Glasgow Coma Scale (GCS) score Report alertness (alert, respond to voice or pain, unresponsive).
E—Expose the patient	Remove all clothing; inspect the entire body for wounds or ecchymoses.

Secondary Assessment

- Early vaginal and rectal examination, with attention to dilation and effacement of the cervix.
- If vaginal bleeding is present in the 2nd or 3rd trimester, cervical examination should be deferreduntil sonography excludes placenta previa.
- External fetal monitoring.
- The Kleihauer-Betke (KB) test detects fetal hemoglobin in the maternal circulation, a positive KB test is associated with significant fetomaternal hemorrhage and preterm labor.

Secondary Assessment

- Ultrasound is the method of choice for evaluating pregnant trauma patients.
- Do not avoid or delay necessary radiologic studies due to concerns about fetal radiation exposure.
- All Rh-negative patients should receive Rh immune globulin (RhIG) 300 μg IM within 72 hours of trauma, in order to prevent maternal sensitization.



CPR in pregnancy

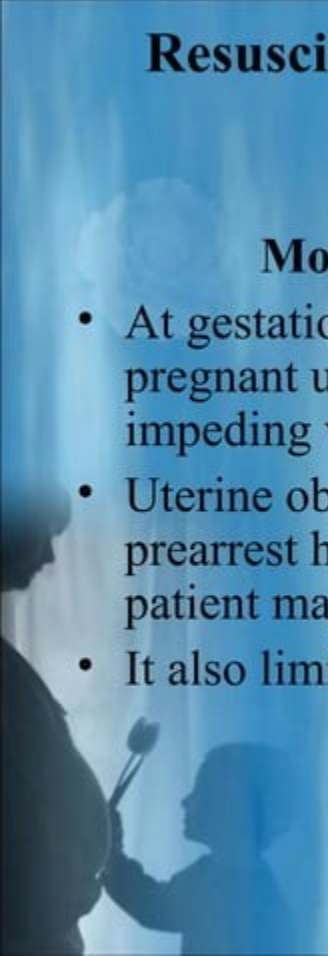
- There are no published randomized controlled clinical trials of CPR during pregnancy.
- Protocols of BLS and ACLS apply with some variations.



Resuscitation of the Pregnant Woman in Cardiac Arrest

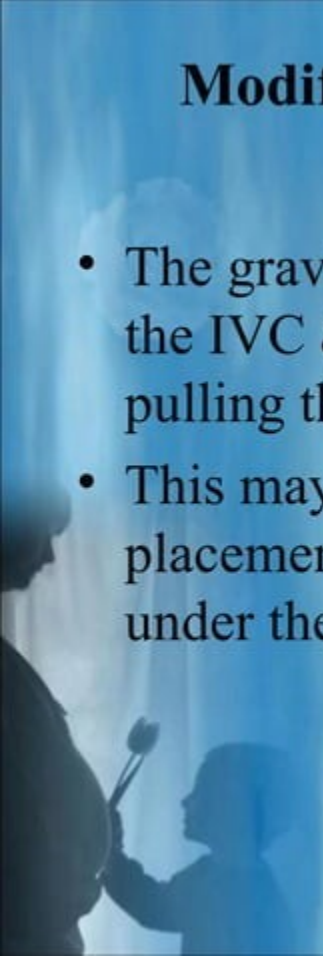
Modifications of Basic Life Support

- At gestational age of greater than 20 weeks, the pregnant uterus can press against the IVC & aorta, impeding venous return and cardiac output
- Uterine obstruction of venous return can produce prearrest hypotension or shock and in the critically ill patient may precipitate arrest
- It also limits the effectiveness of chest compressions



Modifications of Basic Life Support

- The gravid uterus may be shifted away from the IVC & aorta by placing in LUD or by pulling the gravid uterus to the side
- This may be accomplished manually or by placement of a rolled blanket or other object under the right hip and lumbar area





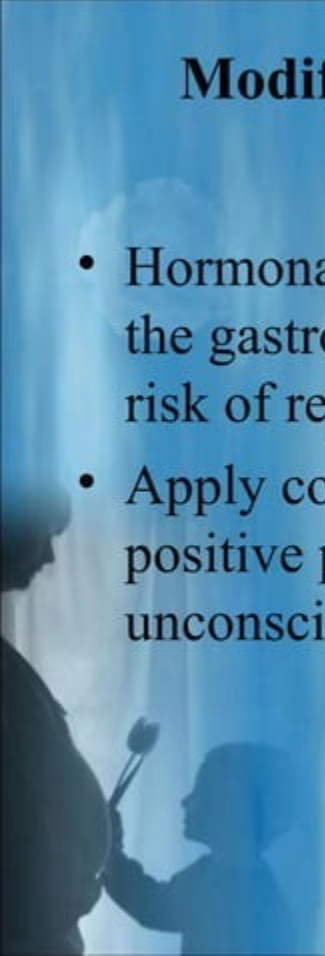




Modifications of Basic Life Support

Airway

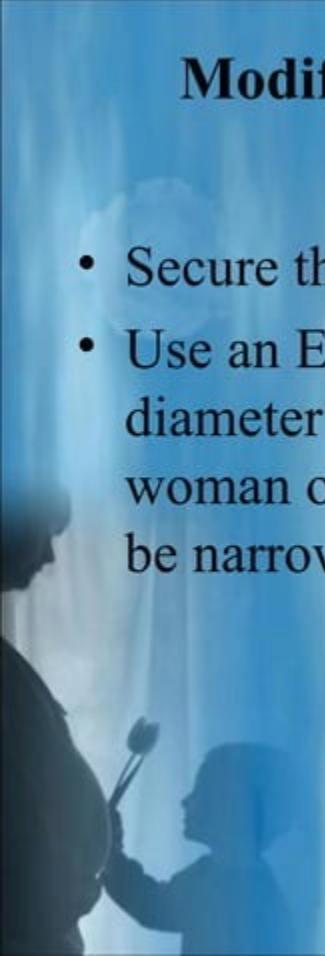
- Hormonal changes promote insufficiency of the gastroesophageal sphincter, increasing the risk of regurgitation.
- Apply continuous cricoid pressure during positive pressure ventilation for any unconscious pregnant woman



Modifications of Basic Life Support

Airway

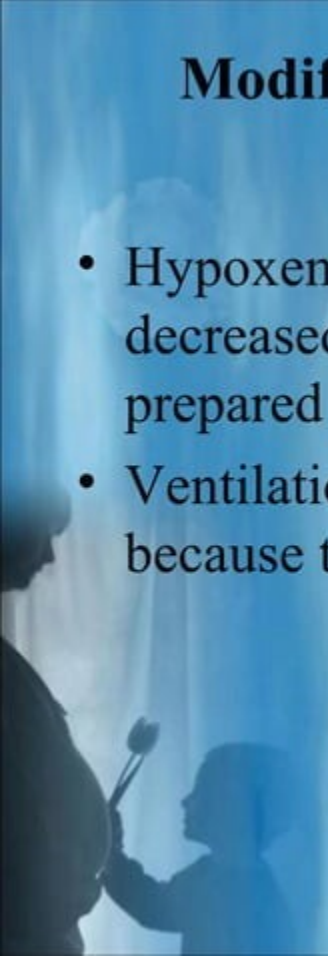
- Secure the airway early in resuscitation
- Use an ETT 0.5 to 1 mm smaller in internal diameter than that used for a nonpregnant woman of similar size because the airway may be narrowed from edema



Modifications of Basic Life Support

Breathing

- Hypoxemia can develop rapidly because of decreased FRC & increased O2 demand, so be prepared to support oxygenation & ventilation
- Ventilation volumes may need to be reduced because the mother's diaphragm is elevated



Modifications of Basic Life Support

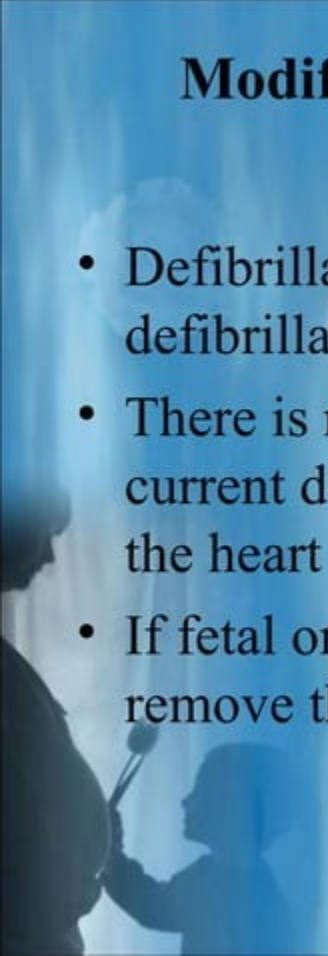
Circulation

- Perform chest compressions higher, slightly above the center of the sternum to adjust for the elevation of the diaphragm & abdominal contents
- Vasopressor agents, including epinephrine & vasopressin, will decrease blood flow to the uterus, but since there are no alternatives, indicated drugs should be used in recommended doses

Modifications of Basic Life Support

Defibrillation

- Defibrillate using standard ACLS defibrillation doses
- There is no evidence that shocks from a direct current defibrillator have adverse effects on the heart of the fetus
- If fetal or uterine monitors are in place, remove them before delivering shocks



Modifications of Basic Life Support

Differential Diagnosis

Excess magnesium sulfate

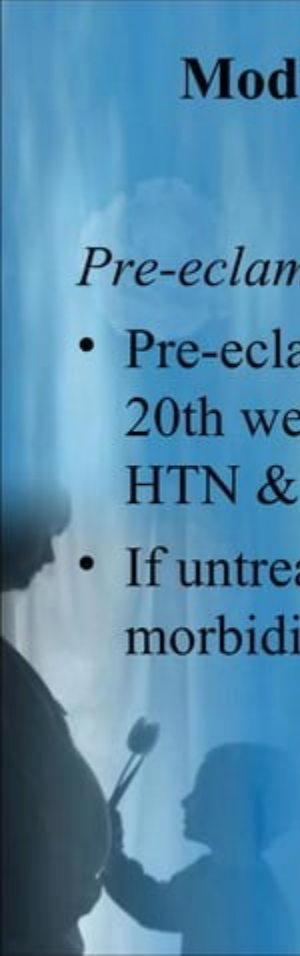
- Iatrogenic overdose is possible in women with eclampsia, particularly if the woman becomes oliguric
- Administration of calcium gluconate (1 amp/1 g) is the treatment of choice
- Empiric calcium administration may be lifesaving

Modifications of Basic Life Support

Differential Diagnosis

Pre-eclampsia/eclampsia

- Pre-eclampsia/eclampsia develops after the 20th week of gestation & can produce severe HTN & ultimate diffuse organ system failure
- If untreated it may result in maternal and fetal morbidity & mortality



The 4-Minute Rule

- If the mother remains pulseless, and the baby is viable, caesarean delivery should be started by 4 minutes and completed by 5 minutes into the code.



Thank You

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धन्यवाद

Salamat

شکرا

شکریہ

Terima Kasih