THE ANESTHETIC IMPLICATIONS AND MANAGEMENT OF MAJOR OBSTETRIC HEMORRHAGE

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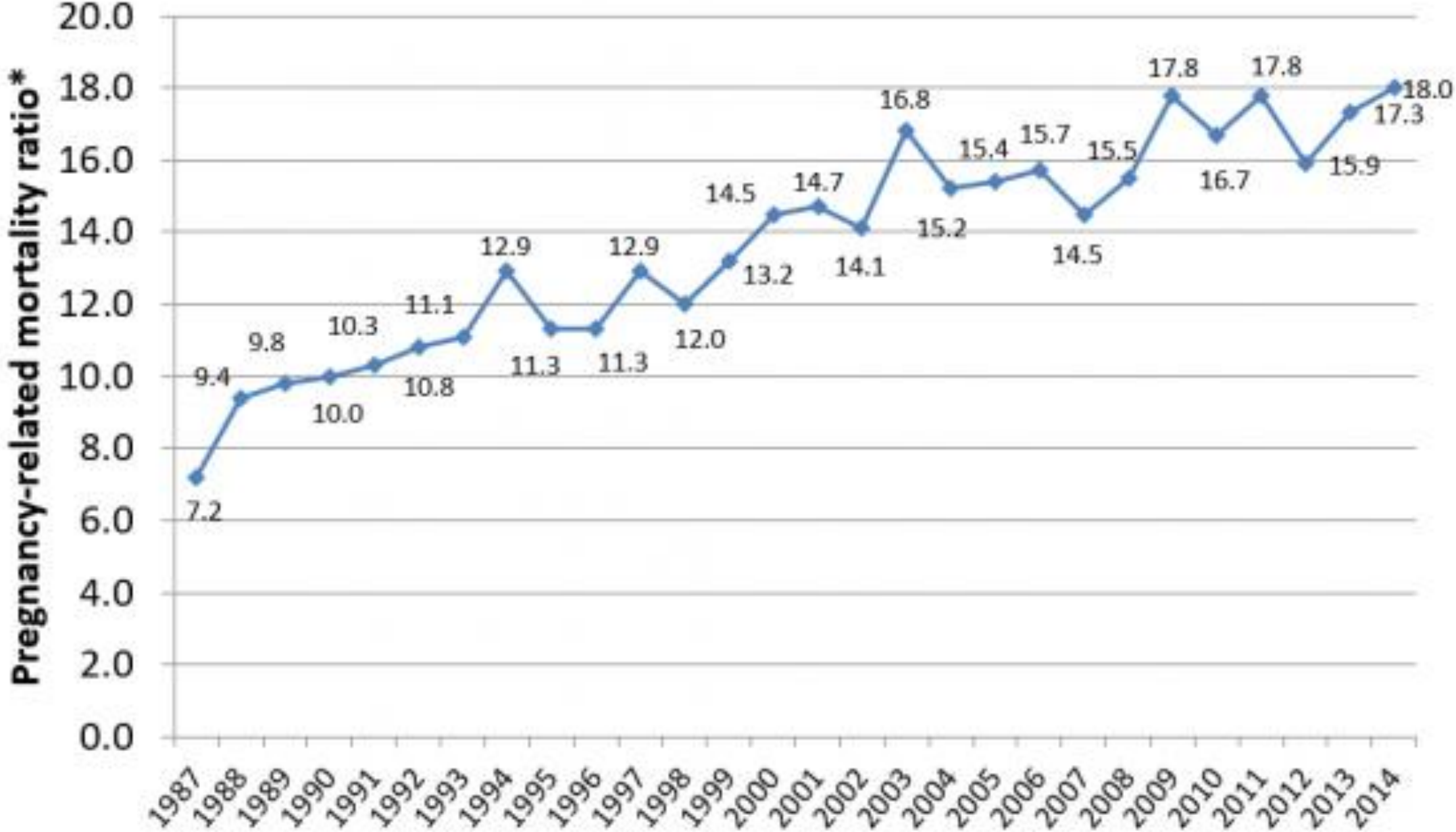
OBJECTIVES

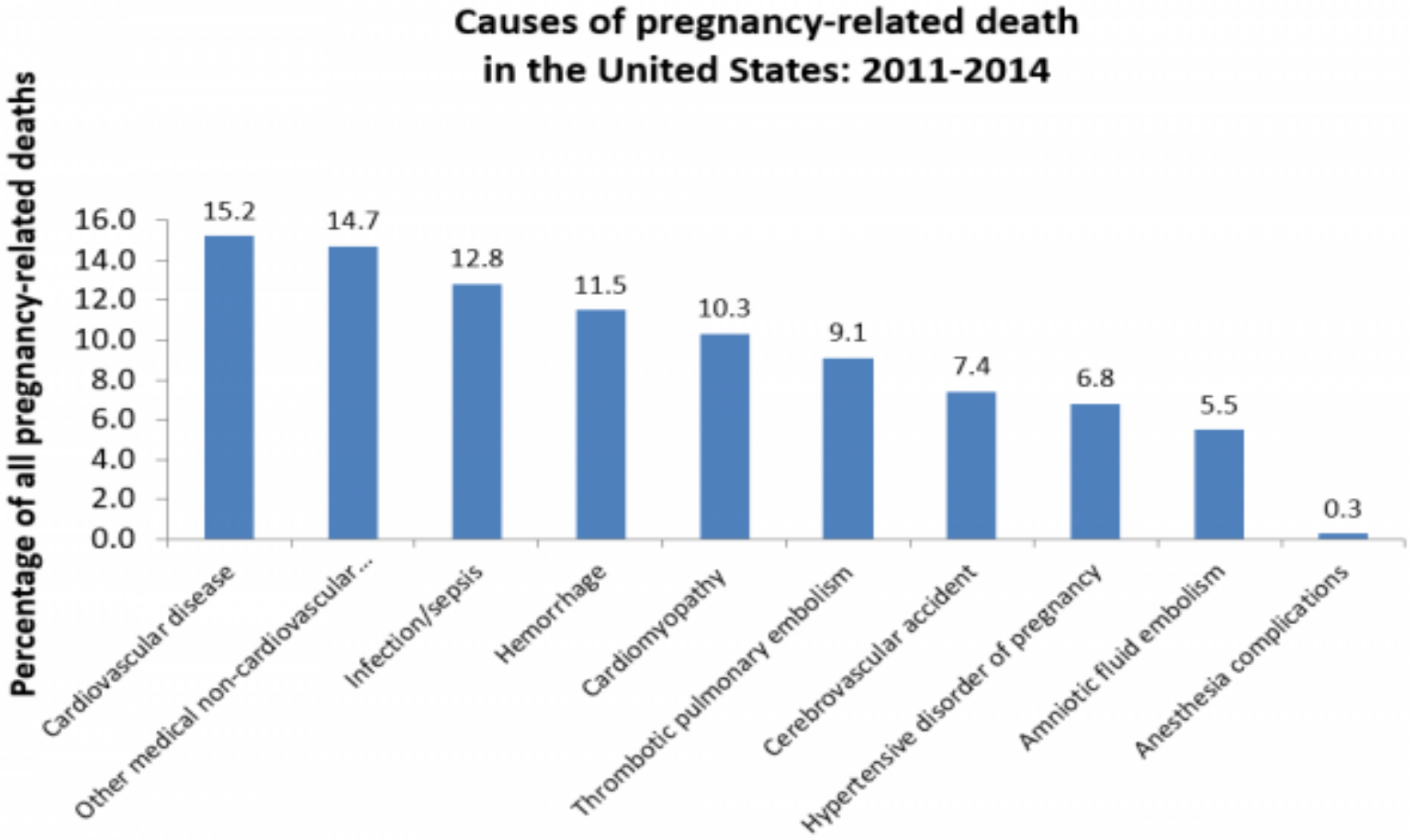
- The attendees will be able to identify causes and risk factors for obstetric hemorrhage
- The attendees will be able to discuss the implications of hemorrhage in the obstetric patient
- The attendees will be able design and formulate a management plan to respond to hemorrhage in the obstetric patient.

STATISTICS

- United States
  - Pregnancy Mortality Surveillance System
  - Pregnancy related death defined as death of a woman while pregnant or within a year of the end of pregnancy
  - Death certificates from 52 reporting areas

in the United States: 1987–2014





Note: The cause of death is unknown for 6.5% of all pregnancy-related deaths.

MAJOR OBSTETRIC HEMORRHAGE (MOH)

- Remains one of leading causes of maternal death worldwide
- WHO – 25-30% of maternal deaths are d/t peripartum hemorrhage
- Much higher in developing countries
- Has increased in developed countries
- Likely d/t increase in PPH

MOH

- With proper planning often preventable
- Plan B – successful management through proper planning
- Role of anesthesia is very critical
- Plan should be a multidisciplinary approach

MOH DEFINED

- Singleton pregnancy – 500 mL in vaginal delivery and 1000 mL in cesarean
- Definitions vary from source to source and article to article
- > 2500 mL with hysterectomy or critical care needed
- Treatment of coagulopathy
- Replacement of entire blood volume or > 10 units in 24 hours
- Replacement of 50% of volume in 3 hours or loss of > 150 mL/min

THINGS WE NEED TO KNOW

- The differences maternal hemorrhage has from conventional hemorrhage
- Etiology and classifications
- Our role as anesthesia providers

01

Unrecognized risk factors

02

Difficulty in assessing blood loss

03

Difficulty in early diagnosis

04

Physiology of uterine blood flow

HEMORRHAGE IN THE OBSTETRIC PATIENT

UNRECOGNIZED RISK FACTORS

- Inappropriate clinical evaluations
- Lack of further investigation of mother
- Delayed or lack of prenatal care
- Under utilization of USG
  - Parturient may not have access to adequate prenatal care and assessment until time of birth
- Lack of vigilance in assessing blood loss and failure to consider all parturients as susceptible

BLOOD LOSS ESTIMATION

- Difficult at best even by the experienced
- Dilution by amniotic fluid
- Can be concealed
- Stafford et al. study found only 18% of cesareans were estimated correctly

EARLY DIAGNOSIS

- Often difficult due to natural physiology of pregnancy
  - Maternal blood volume
  - Contraction of uterus
- Compensatory measures make it imperative to recognize early

Blood Loss	SBP	HR	Symptoms
1000 mL	> 100	< 100	palpitations, light headedness
1500 mL	90- 100	100 – 120	weakness and diaphoresis
2000 mL	70 – 80	120 – 140	restlessness, confusion, and pallor
3000 mL	50 – 70	> 140	lethargy and air hunger

UTEROPLACENTAL BLOOD FLOW

- Receives 12% of cardiac output
- 700 mL/min
- Source for rapid blood loss
- Untreated can quickly become life threatening

COAGULATION IN THE PARTURIENT

- Normal coagulation is a dynamic equilibrium between coagulation and fibrinolysis
- Pregnancy is associated with an increase in the majority of clotting factors
- Platelet count decreases from destruction and hemodilution with maximal decrease in 3rd trimester
- VIII, vWf, ristocetin cofactor, and factors X & XII increase
- VII steadily increases and peaks at about 1000% of normal by term
- Fibrinogen levels peak at around 200% of pre-pregnant levels
- Decreased tPa results in a decrease in fibrinolysis

LABS TO ASSESS COAGULATION

- Platelet count
- PTT – VIII, IX, XI, XII
- PT – II, VII, IX, X
- Bleeding time
  - Not predictive, highly operator dependent, insensitive to platelet defects
- TEG
  - Jury is still out – sensitivity and specificity in pregnant women is still unproven in predicting neuraxial hematoma but still can be of help in detecting and guiding treatment of coagulopathy
- Fibrinogen- shown by multiple studies to be the most sensitive predictor for maternal hemorrhage

TYPES AND CAUSES OF MOH

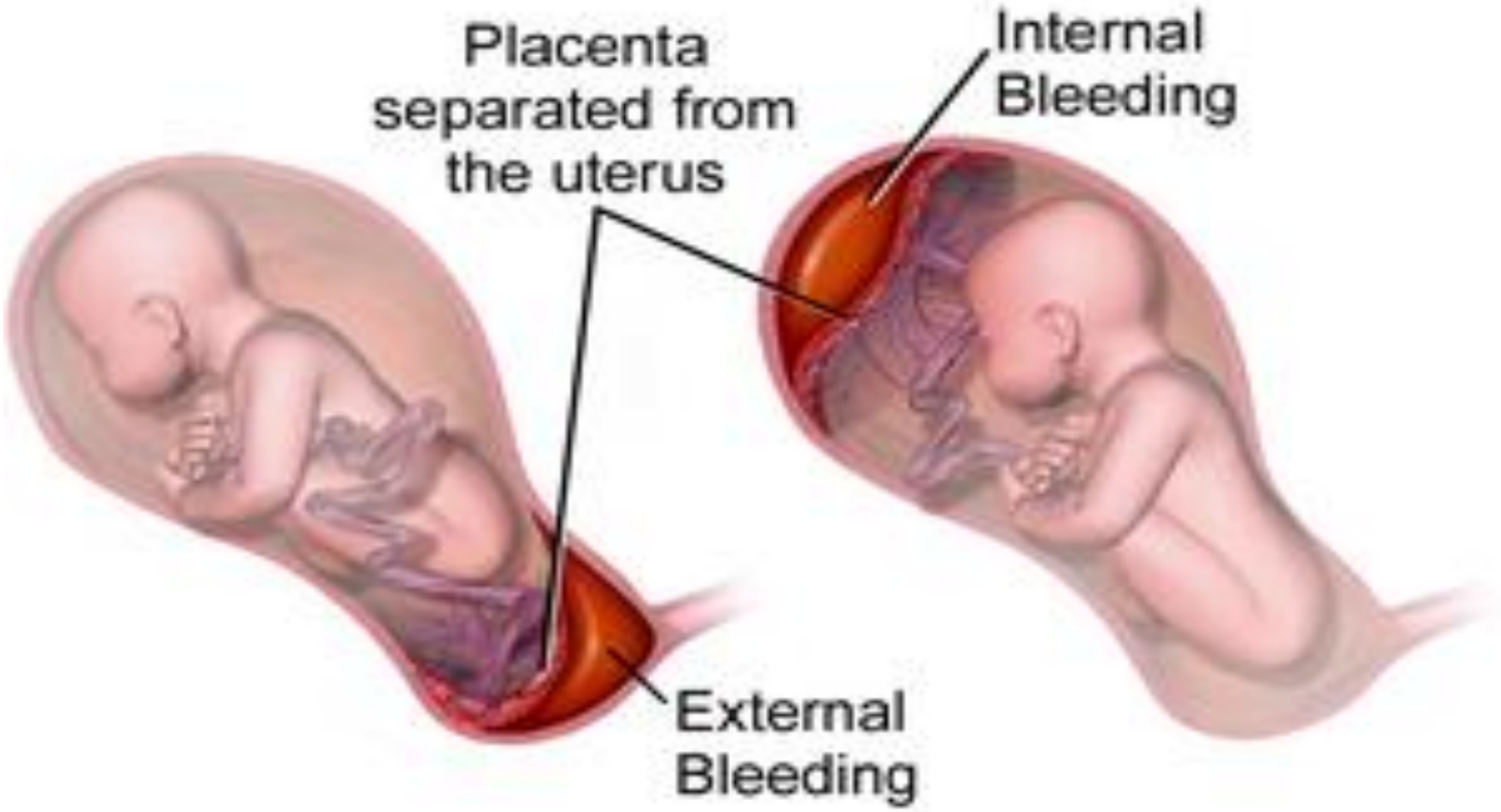
- Broad classifications
  - Antepartum
    - Abruption
    - Previa
    - Uterine rupture
  - Intrapartum
    - Abnormal placentation
    - Uterine rupture
  - Postpartum
    - 4 T's

ABRUPTION

- Premature separation from the uterus of a normally situated placenta
  - HTN
  - Multiparity
  - Uterine over distention
  - Previous abruption
  - Advanced maternal age
  - Trauma
- Increased uterine tone, abdominal pain, and premature labor
- Fetal distress is common

ABRUPTION

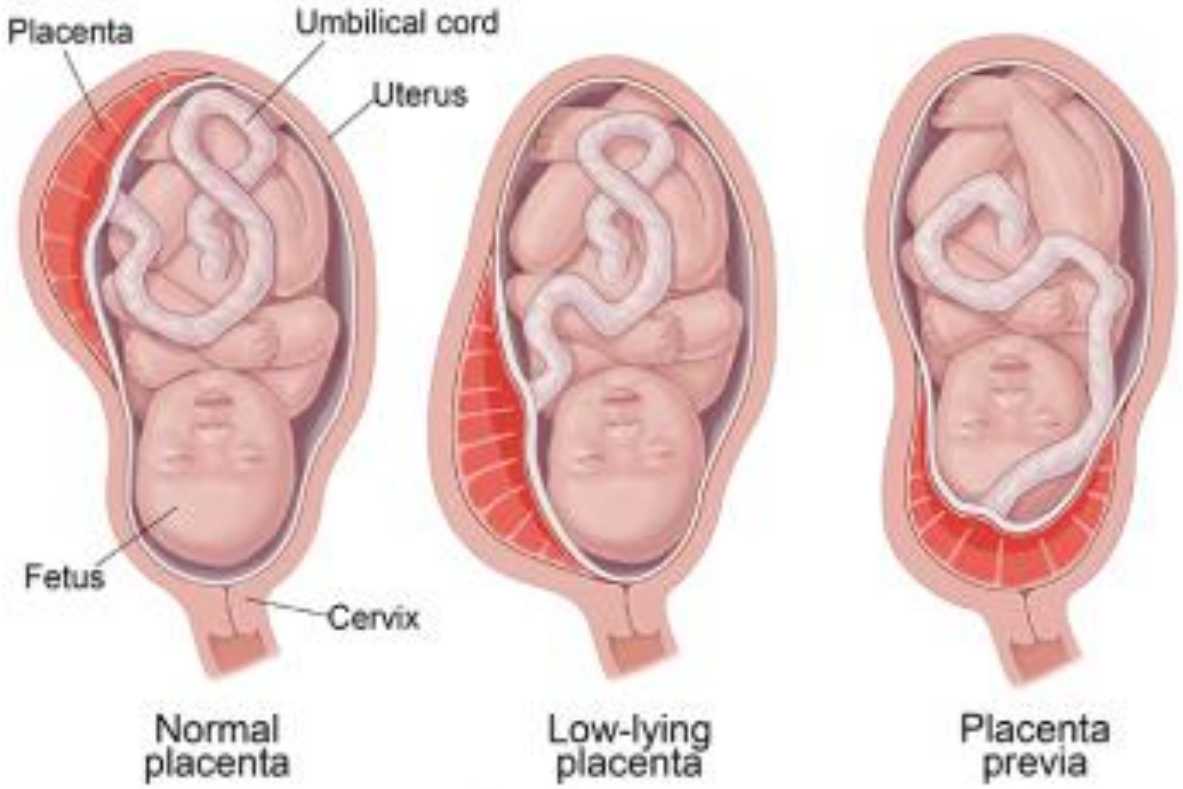
- Hemorrhagic shock, acute renal failure, fetal demise, and coagulopathy
- Most common cause of DIC in pregnancy
- Be aware that much of the bleeding can be concealed until patient becomes symptomatic
- Treatment is usually delivery of the fetus


Placenta
separated from
the uterus
Internal
Bleeding
External
Bleeding

PLACENTA PREVIA

- Abnormal implantation of the placenta in the lower uterine segment
  - Marginal, partial, or complete
- No invasion occurs, but is characterized by the placenta overlying the cervical os
- Presents as painless vaginal bleeding in 2nd or 3rd trimester
- Cesarean is the recommended mode of delivery
- Diagnosed with USG
- Site of abnormal implantation does not contract as well and leads to increased bleeding
- Incidence is rising due to increased cesarean and uterine surgery rate

PREVIA


Placenta
Umbilical cord
Uterus
Fetus
Cervix
Normal placenta
Low-lying placenta
Placenta previa
babycenter

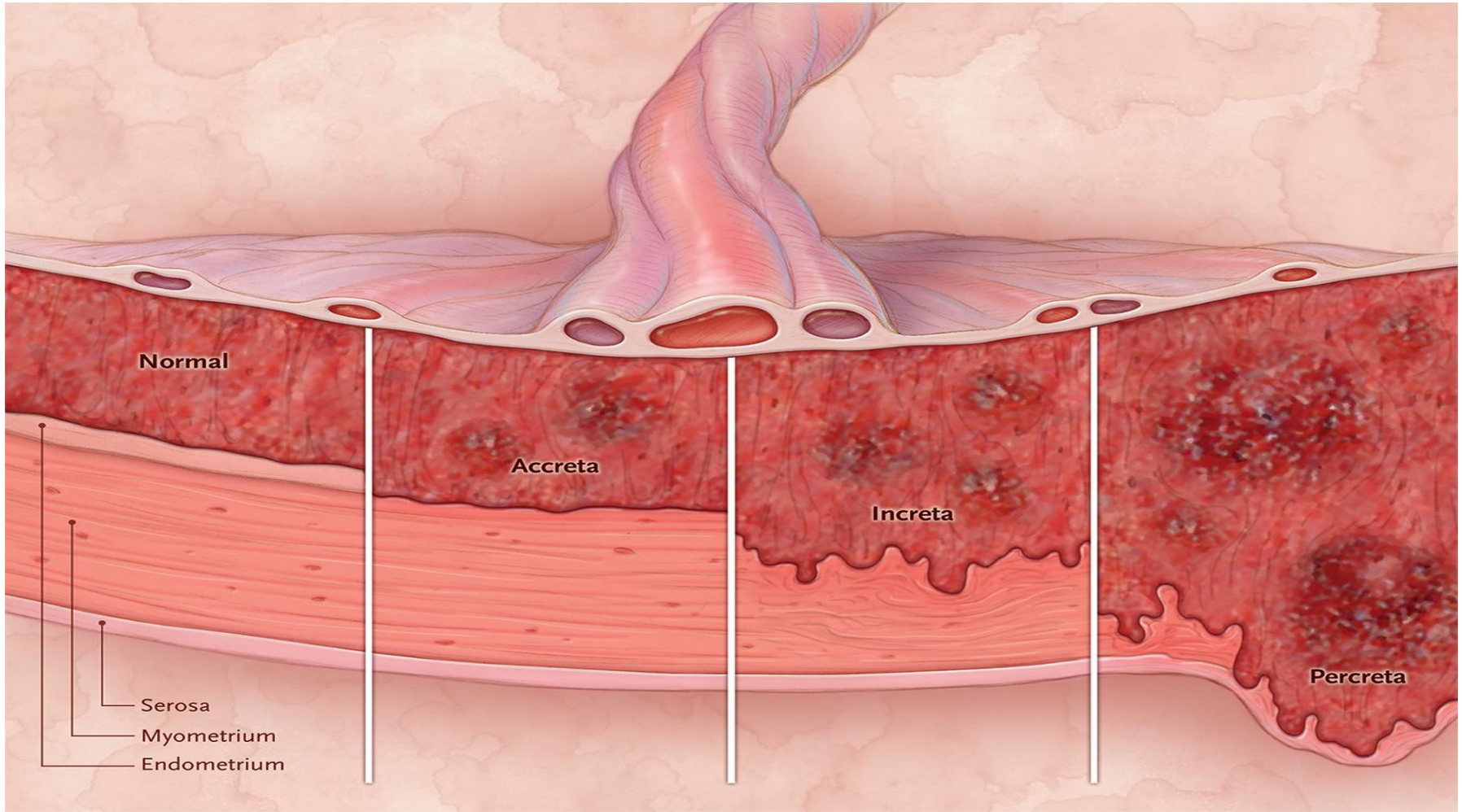
APH ANESTHETIC IMPLICATIONS

- Abruptions can be delivered vaginally under close monitoring
- If labor is allowed, a thorough assessment of coagulation must be done prior to insertion and removal of catheter
- Cesarean coagulation must be assessed if time warrants
- GA with endotracheal tube is best even in hemodynamically stable patients
- High propensity of PPH
- Two large bore IVs
- Invasive monitors, cell salvage and IR should be considered
- Blood in room with rapid infuser
- Alert multidisciplinary team members

INTRAPARTUM

- Most common are abnormal placentation and uterine rupture
- Abnormal placentation is classified as accreta, percreta and increta
  - Previous cesarean or uterine scar
  - Low lying placenta
  - Previa
- Uterine Rupture
  - Rare, but most life threatening
  - High maternal and fetal morbidity and mortality
  - Scar dehiscence or uterine wall

ABNORMAL PLACENTATION



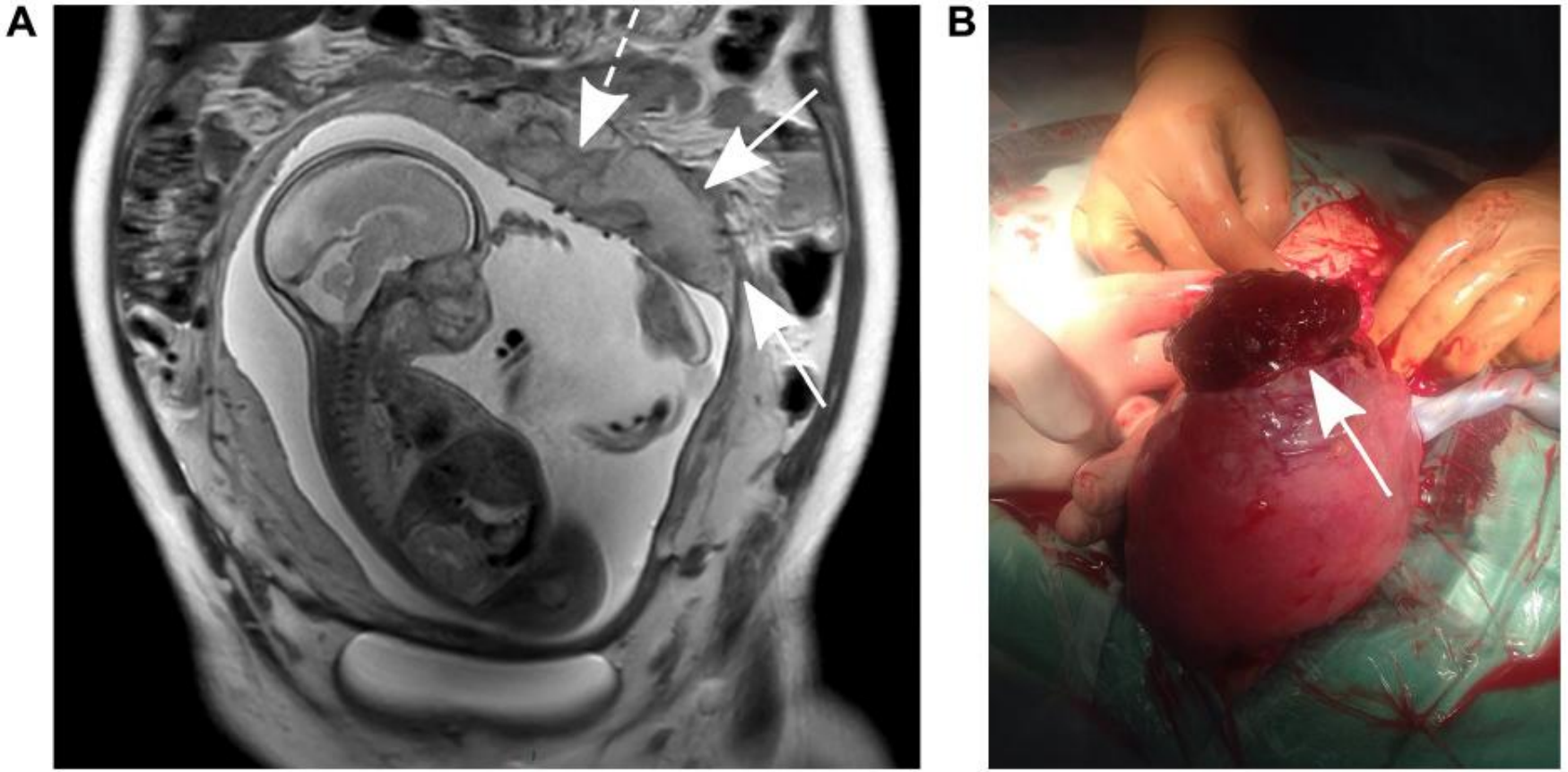
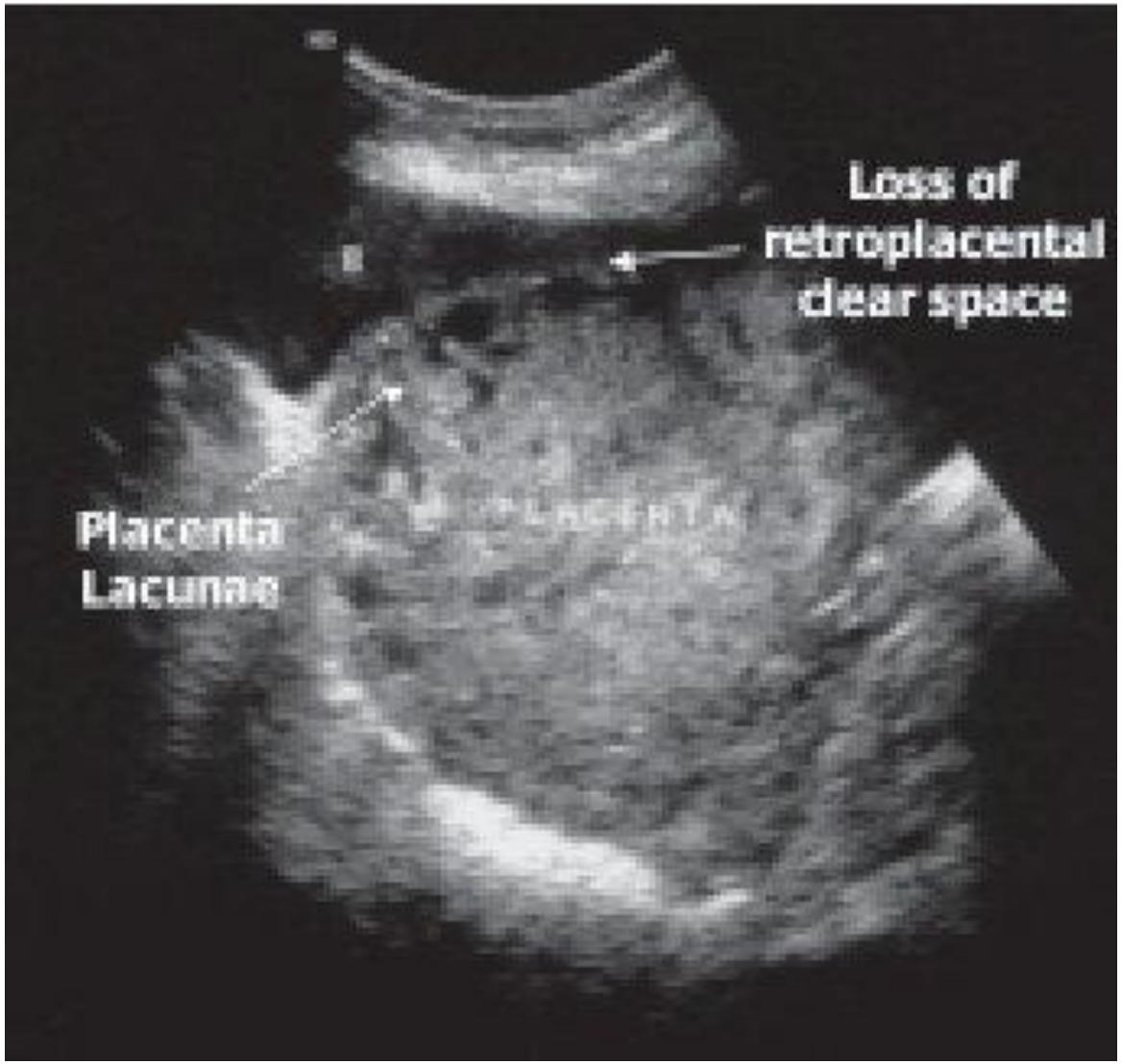


Figure 2 MRI of placenta percreta (fourth pregnancy).
Notes: (**A**) Coronal T2 MRI of the abdomen showing an irregular-looking posterior placenta, thinning of the myometrium, and discontinuity of the posterior uterine wall (arrows) with abnormal vascularity and prior hemorrhages (dashed arrow). (**B**) Placenta penetrating through 5×2 cm uterine wall rupture in the left cornu (arrow), as observed during the surgery.
Abbreviation: MRI, magnetic resonance imaging.


Loss of
retroplacental
clear space
Placenta
Lacunae

ABNORMAL PLACENTATION

- All classifications are associated with PPH
- Risen exponentially over last 50 years
- Antenatal diagnosis is imperative
  - Highly sensitive to USG
- Scheduled for cesarean with multidisciplinary approach
- Massive transfusion planned
- Possible hysterectomy
- Two schools of thought
  - SAB
  - GA

POSTPARTUM HEMORRHAGE (PPH)

- Uterine atony
  - Responsible for 80% of PPH
  - Early uterotonics is paramount
  - Continuous assessment of bleeding
  - Risk factors
    - Induction
    - High and prolonged exposure to oxytocin
    - Prolonged labor
    - Dystocia
    - Chorioamniotis
    - Multiple gestation
    - Polyhydramnios
    - Macrosomia

PPH

- Retained tissue
  - Defined by WHO as lack of expulsion within 30 minutes
  - If stable, observation for additional 30 mins
  - Manual removal and/or dilation and curettage
  - Monitor closely
  - Do not waste time initiating transfusion

PPH

- Trauma
  - Can occur with cesarean or vaginal delivery
  - Varying degrees of injury to cervix, vagina, vulva, and uterus
  - Nulliparity, macrosomia, precipitous delivery, mechanically assisted, and episiotomies
  - Treatment is dependent on cause
  - Uterine version is also classified with trauma
    - Therapy aimed at replacing uterus
    - May require assistance from NTG or even GA

PPH

- Thrombin
  - Consumption
  - Dilutional
  - Hereditary

MANAGEMENT OF MOH

- Anytime there is more than an ordinary blood loss "help" must be called for
- Staff RNs and midwives should be encouraged to call early for help
- Due to atony's role in morbidity and mortality, the 3rd stage of labor must be managed closely
- Uterotonics
  - Ongoing blood loss - Must proceeded quickly to invasive measures if pharm treatment fails
    - Bimanual uterine compression
    - Uterine massage
    - Balloon tamponade
    - Uterine compression sutures
    - Surgical ligation or IR occlusion of iliac or uterine artery
    - Hysterectomy

UTEROTONICS

Medication	Route of Administration	Dose	Side Effects
Oxytocin (Pitocin)	Infusion	20-80 μ/L	Hypotension with bolus or rapid infusion, nausea, emesis, water intoxication
Methylergonovine (Methergine)	Intramuscular	0.2 mg IM q2-4h, up to 1 mg	Hypertension, vasoconstriction, nausea, emesis
15-Methyl prostaglandin $F_{2\alpha}$ (Hemabate)	Intramuscular, intrauterine	250 μg q15–90 min; repeat to total of 1 mg	Bronchospasm, systemic and pulmonary hypertension, nausea, emesis, diarrhea, flushing
Misoprostol (Cytotec)	Rectal, sublingual, oral	600-1000 mg; single dose	Tachycardia, fever

INTERVENTIONAL RADIOLOGY

- Not ideal for emergent situations
- Must consider the logistics of the IR suite
- 2012 ACOG states unclear results
- Recommends individualized plans instead of routine practice
- Shrivastava et al. study revealed no significant difference in blood loss or transfusions
- Has recently become a standard treatment to avoid hysterectomy
  - 80% success with 10% complication rate
- Must be hemodynamically stable and resuscitated

SURGICAL MEASURES

- Hysterectomy
  - May be necessary with uterine rupture, abnormal placentation, or cases where other measures fail
  - Aortic compression may be necessary to allow for resuscitation
  - Two large bore IV's, CVL, rapid infuser, pressure bags, cell saver and invasive monitoring
  - GA versus Regional
  - Anticipated
    - Counseling
    - Multidisciplinary approach
    - Cross matched
    - Optimized coagulation
    - Rare blood types
    - Massive transfusion protocol

UNANTICIPATED MOH

- Must be a five step approach
  - Call for help – multidisciplinary team
  - Restore volume
  - Correct coagulopathies
  - Ongoing assessment of treatment
  - Treatment of underlying cause

VOLUME RESUSCITATION

- Objective is to maintain adequate oxygenation and perfusion
  - Avoid the lethal triad of hypothermia, acidosis, and coagulopathy
- Crystalloid initially is reasonable
- Aggressive crystalloid should be avoided
- High ratio of PRBC to FFP
- Most agree that a Hgb of 7- 8 is goal

VOLUME RESUSCITATION

- Platelets
  - Objectives are not well defined
  - General guidelines suggest a platelet count > 50,000 in obstetric hemorrhage
  - Should trigger at 75,000 to maintain target of 50,000
  - Risk factors were EBL > 4500, pre-E, ITP, abruption, and thrombocytopenia

- FFP
  - Given as a 1:1 ratio
  - Average from non-pregnant donors as 2g/L of fibrinogen
  - In routine replacement of PRBC plasma can dilute VII and vWf

VOLUME RESUSCITATION

- Cryoprecipitate
  - Pooled concentrate plasma product
  - Recommended for acquired hypofibroginemia
  - Also has VIII, vWf and XIII
  - Fibrinogen is approximately 15g/L
  - Raises fibrinogen by 0.5g/L

MANAGING COAGULATION

- Recombinant activated factor VII
  - First used in PPH nearly 20 years ago
  - Franchini et al. found that a median dose of 71 mcg/kg reduced or stopped bleeding in 90% of patients
  - No definitive recommendations
  - Franchini recommend 90 mcg/kg
  - Short half life and may need to be repeated every 30 minutes
  - Evaluation is succession of bleeding
  - Expensive
  - Recommended anytime before hysterectomy

MANAGING COAGULATION

- Fibrinogen concentrate
  - Off label use
  - Stored at room temperature
  - Easy to mix
  - Easy to administer
  - 60mg/kg increases fibrinogen by 1 g/L
  - Ahmed et al. showed that it was as efficacious as cryo
  - No ABO compatibility

CELL SALVAGE

- Should be primed and operated by qualified staff
- Utility and safety is now well established
- Historic concerns were to maternal exposure of fetal squamous cells
- Leukocyte depletion filters remove contaminants to maternal blood levels
- Further measures are waiting until delivery of fetus and placenta
- Rho immune globulin should be administered to Rh negative women

TRANEXAMIC ACID

- Synthetic lysine analogue
- Positive outcomes in trauma and surgery
- Role in PPH is controversial
- Reassuring safety profile in the WOMAN trial
- Should be an adjunctive treatment and not first line
- Stay within established safe dosing limits for obstetrics
  - 1 gm IV and may repeat once in 30 minutes

Adapted from the California Quality Care Collaborative

CONCLUSION

Early recognition of risk factors

Vigilant monitoring of blood loss

Call for help early

Have obstetric specific protocols in place

Timely escalation through management procedures

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QUESTIONS