POSTPARTUM HEMORRHAGE

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No financial disclosure

Dr. Montgomery discloses that he has no significant financial ties to commercial interests that might bias the information given in his presentation today.
LEARNING OBJECTIVES

- Identify the admission hemorrhage RISK class appropriately
- Implement non-surgical AND surgical interventions in an appropriate escalation sequence (e.g. uterotonics, UTERINE COMPRESSION SUTURES, HYSTERECTOMY)
- Prevent DIC with appropriate fluid and blood product resuscitation
WHEN SHOULD A PATIENT WITH PPH BE MOVED TO THE OR?

1. Pulse is still rising > 120 bpm despite 2 liters of crystalloids infused and utertonics are not resulting in uterine tone.
2. Pulse is still rising > 120 bpm despite 2 liters of crystalloids infused with no obvious vaginal bleeding; however abdominal ultrasound reveals ~ 1000ml of blood in the peritoneal cavity.
3. Retained products of conception are noted in the uterine cavity.
4. Interventional Radiology has a wait time of more than 30 minutes and the patient is not responding to 2 liters of infused crystalloids with pulse still rising > 120 bpm.
5. All of the above scenarios are indicative of ATLS CLASS 2 HEMORRGAE MOVING TO CLASSS 3
6. All of the above scenarios indicate it is time to move to the or
WHEN SHOULD THE OB HEMORRHAGE PROTOCOL BE ACTIVATED?

1. Estimated 10-15 minutes or more away from Bleeding Control.
2. 2 liters of crystalloids infused and pulse is not declining <115 bpm and/or BP is not responding
3. etiology of bleeding is not obvious and the patient is not responding to 2 liters crystalloids.
4. The patient is bleeding from phlebotomy sites and surgical pedicles.
5. When the patient is being moved to the OR
6. All of the above
What is the most common cause of PPH?

1. Uterine or cervical lacerations.
2. Uterine inversion
3. Retained products of conception.
4. Placenta accreta
5. Uterine atony
FOCUS ON

- RECOGNIZING PPH & the ETIOLOGY

- IDENTIFY CLASS OF HEMORRHAGE

- MANAGE INITIAL FLUID RESUSCITATION, THERAPEUTIC RESPONSE & COORDINATE TEAM RESPONSE

- IMPLEMENT DECISIVE THERAPEUTIC ESCALATION based on the patients RESPONSE TO FLUID RESUSCITATION & THERAPY

- DECISIVELY TREAT THE CAUSE OF HYPOVOLEMIA (ETIOLOGY)

- APPROPRIATE ESCALATION (Hem Prot & surgical response)

- PREVENT HYPOTHERMIA & HYPOXIA

- PREVENT HEMORRHAGIC SHOCK
Obstetric Hemorrhage

- Consistently one of the top 5 causes of maternal mortality in the US
- Major cause of serious morbidity in the US
- Due to the complexity of the coordinated team response required to effect a good outcome AND relative infrequent incidence
- Post Partum Hemorrhage “practice drills” are recommended by JCAHO

www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_30.htm
Coordinated / Orchestrated Team Effort

- Obstetrical Doctors / CNM’s
- Anesthesia Doctors / CRNA’s
- Obstetrical Nurses / Rapid Response Team
- Scrub Techs
- Unit Secretary
- Respiratory Therapy
- Blood Bank & Lab
- Hematology
LEARNINGS FROM CET
OB DOCTOR SHOULD ACTIVELY COMMUNICATE WITH THE TEAM USING EYE CONTACT AND ADDRESS PROVIDERS BY NAME

The obstetrical provider should initiate a SEQUENCE of medical and/or operative interventions for control of bleeding and rapidly evaluate the success or failure of each treatment. DIRECT & SBAR THE TEAM

If an intervention does not succeed, the next treatment in the sequence must be RAPIDLY instituted. DIRECT & SBAR THE TEAM

Indecisiveness delays therapy and results in excessive hemorrhage which causes: Severe Hypovolemia, Tissue Hypoxia, Coagulopathy, Hypothermia, Acidosis & Hemorrhagic Shock
LEARNINGS FROM CET  
ROLE OF THE NURSING TEAM

- **CIRCULATOR NURSE**  
  USE THE NURSES NAME eg. CHRISTINE  
  DIRECT THE EFFORT to actually acquire or delegate acquisition of all supplies (Hemorrhage kit, Warmed crystalloids, Blood Warmer & tubing, Behr hugger, Blood products, Medications, IV tubing, more providers on request of leader)

- **SCRIBE NURSE**  
  CALL THE NURSE BY NAME (eg. Tessa)  
  Informs the team what has been done & what may be needed in concert with the Physician. DOCUMENTING & providing real time feedback to the team regarding:  
  Serial Vital Signs, Medications given, Fluids, Blood products.  
  Moves to “head of the bed” with Anesthesia if the patient goes to the OR

- **PRIMARY NURSE**  
  CALL THE NURSE BY NAME (eg. Kelley) hands on patient care  
  (starting IV’s, hanging blood products, obtaining and validating Vital signs)
LEARNINGS FROM CET
ROLE OF THE NURSING TEAM

Primary Nurse Kelley recognizes the PPH and seeks help from the circulator CHRISTINE. Help I need the Hemorrhage Cart & Anesthesia & OB Team.

Primary nurse Kelly places O2 MASK ON, Starts IV & Draws labs simultaneously, Hangs fluids, Performs VS, administer medications. Remains in communication with scribe nurse regarding needs of patient and stays at bedside for direct patient care.

SCRIBE Nurse - Bring the hemorrhage cart and documents on Hemorrhage record (in binder top of hemorrhage cart) DIRECTS THE EFFORT & DELEGATES -- (Hemorrhage cart, Blood Warmer & Tubing, Behr hugger, Blood products, Medications, IV tubing, more providers on request of OB Dr)

Reviews checklist on hemorrhage record and Informs the team what has been done & what may be needed in concert with the Physician. Documents on hemorrhage record and provides real time feedback.
WHAT IS SHOCK?

An abnormality of the circulatory system that results in INADEQUATE organ PERFUSION and tissue OXYGENATION.

Lack of oxygen results in production of Lactic Acid.

Shock has many causes: HR \times SV = CO

- restriction of blood flow (PE, decreased cardiac function)
- redistribution of blood flow (anaphylaxis, sepsis, neurogenic)

However in OB the most common etiology is Hemorrhagic. (Loss of volume)
How Does the Body Fight Shock?

- Adrenalin released
- Increased heart rate
- Shunts blood away from the muscles and skin to the brain, heart, & kidneys
- Patient has pale skin that is cool & clammy
- BP may still be normal; PULSE is classically FIRST elevated
- Lactic Acid is already being produced
How Does the Body Fight shock?

\[ \text{HR} \times \text{SV} = \text{CO} \]

Maintain BP or just see a change in pulse pressure represented by a slight decrease in systolic BP OF ~ 20 % or less

120/80 VS 115/80
Post Partum Hemorrhage (PPH)

- In general defined as > 500 ml EBL NSVD
- In general defined as > 1000 ml EBL C/S
- Recurrence risk is ~ 10 – 15 %

**Hemorrhage risk score in H&P** directs the initial empiric ordering of Type & Crossmatch vs Type & Screen vs Hold Clot.

If a patient required a previous blood transfusion for increased blood loss after delivery OR has multiple high risk factors; Risk for PPH is significant enough that (T&C) should be ordered and TWO large bore IV’s placed (16-18 gauge)
ADMISSION HEMORRHAGE RISK FACTOR EVALUATION

Historical risk factors for hemorrhage facilitate level of preparation FOR TRANSFUSION AND POSSIBLE SURGICAL INTERVENTION.

What is the most common risk factor for placenta accreta/percreta?

What is the most common indication for emergency peripartum hysterectomy?
HEMORRHAGE RISK

Hemorrhage risk score assigned on ADMISSION H&P
- Low (Clot only)
- Medium (Type & Screen)
- High (Type & Crossmatch)

CONSIDERATION for hemorrhage RISK UPGRADE
- Likely risk for delivery by C/S
- Prolonged Oxytocin induction >/= to 12 hours
- Magnesium Sulfate
- Prolonged second stage
- Chorioamnionitis (Mandatory minimum Type & Screen)

MANDATORY TYPE & CROSSMATCH
- HCT < 30 OR Plt < 100,000
HEMORRHAGE RISK
Low Risk (Clot only)

- No previous uterine incision
- Singleton pregnancy
- 4 or fewer previous vaginal births
- No known bleeding disorder
- No history of PPH

Suggested Obstetric Hemorrhage Care
Low Risk Guidelines:
Send Clot to Blood Bank
HEMORRHAGE RISK

Medium Risk *(Type and Screen)*

- Prior cesarean birth(s) or uterine surgery
- Multiple gestation
- Greater than 4 previous vaginal births
- Chorioamnionitis
- History of previous PPH
- Large uterine fibroids

Suggested Obstetric Hemorrhage Care Medium Risk Guidelines
Order Type & Screen
HEMORRHAGE RISK

High Risk (Type and Crossmatch)

- Placenta previa, low lying placenta
- Suspected Placenta accreta or percreta
- Hematocrit less than 30 AND other risk factors
- Platelets less than 100,000
- Active bleeding (greater than show) on admit

CONSIDERATION for hemorrhage RISK UPGRADE

- Likely risk for delivery by C/S
- Prolonged Oxytocin induction >= to 12 hours
- Magnesium Sulfate
- Prolonged second stage
- Chorioamnionitis
Previous C/S with Placenta Previa
Risk for Accreta

- 1 previous C/S and Previa  15% Accreta
- 2 previous C/S and Previa  24% Accreta
- 3 previous C/S and Previa  30% Accreta
- 4 previous C/S and previa  33% Accreta
- 5 previous C/S and previa  50% Accreta
- 0 previous C/S and previa  2% Accreta

AJOG 2005;193:1045
Accreta/Percreta and Associated Risk

- ACCRETA/PERCRETA Leading Cause of CESAREAN HYSTERECTOMY
  - Maternal death 8%
  - > 10 units PRBC 40%
  - Pelvic Infection 30%
  - Ureteral Ligation 5%
  - Fistula Formation 5%

Am J Obstet Gynecol 1993;168:1443-8
Am J Obstet Gynecol 1996;175:1632-8
Previous uterine surgery Second Most Common Risk factor for Accreta

- Previous uterine surgery
  PRIOR C/S with NO Previa: risk of accreta increases with # of C/S
  1-3 C/S ~ 0.5%  4-5 C/S ~ 2%  6 C/S ~7%

- Maternal age > 35
  Independent risk factor for Accreta

- Previous Myomectomy

Obstet Gynecol 2006;107:1226
Ultrasound diagnosis for Accreta

- Normal Retro placental Hypo Echoic Clear space is thin or absent
- Normal Hyper echoic uterine serosa-bladder wall complex is thin, has a focal disruption or is hyper vascular.
- Disruption of the placental uterine wall interface or the presence of vessels crossing this interface
- Placental lacunae +/- lucanar flow
Grade 1-4 Lacunae Screening Test for Accreta

- **Grade 1**  
  Sensitivity 87%  PPV 77%

- **Grade 2 or >**  
  Sensitivity 100%  PPV 93%
Normal No Previa vs Previa / Accreta
Placental Lacunae with Abnormal Interface
Percreta
No clear bladder wall
Hyper vascular bladder wall
Number 1 cause (80%) of PPH
Uterine Atony

- Over distention of the uterus
- multiple gestation
- polyhydramnios
- macrosomia

- Chorioamnionitis

- **Drugs** (EPHEDRINE, Brethine, General anesthesia)

- "Uterine fatigue" after a prolonged labor

- Bladder Distension with > 500 ml
Risk factors
FOR UTERINE ATONY

Number 1 cause of PPH Uterine Atony

- Over distention (multiple gestation, polyhydramnios, macrosomia)
- Chorioamnionitis
- Drugs (uterine relaxants with General Anesthesia)
- "Uterine fatigue" after a prolonged or induced labor
Oxytocin infusion after delivery

- The standard premixed oxytocin consist of 30 units oxytocin /500 ml NS. Bag 1: After delivery of the infant, infuse first 500 mL at 500 mL/hr. If bleeding is scant after first 500 mL is infused, discontinue oxytocin Bag 2 order. If bleeding is moderate, proceed with oxytocin Bag 2 order. If bleeding is heavy, call physician or Certified Nurse Midwife. If bleeding is heavy, call physician or Certified Nurse Midwife.

- HOWEVER; infuse Bag 2: If bleeding is moderate after oxytocin Bag 1, infuse second 500 mL at 125 mL/hr. If bleeding is heavy, call physician or Certified Nurse Midwife (CNM)..
PROACTIVE MANAGEMENT OF 3\textsuperscript{RD} STAGE

Two large studies showed that the time from delivery of the baby until delivery of the placenta was

- Average five to six minutes,
- 90 percent within 15 minutes (Consider manual removal after 15 minutes)
- 97 percent within 30 minutes of birth

BE PROACTIVE & PREPARED FOR PATIENTS @ RISK FOR ATONY WITH APPROPRAITE DRUGS IMMEDIATELY AVAILABLE AND A VERY LOW THRESHOLD FOR UTILIZATION OF MULTIPLE DRUGS (PITOCIN @ 40-60 UNITS/LITER AND : CYTOTEC OR METHERGINE) IN THE DELIVERY ROOM

Am J Obstet Gynecol 1995 Apr;172(4 Pt 1):1279-84
Initial Evaluation AND Medications

- Place Foley or at least rule out bladder atony
- Fundal massage and removal of uterine clots distending the uterus. If Bakri is in “place” check to make sure it has not prolapsed into vagina.

- Oxytocin 40-60 U in 1 liter of intravenously. Run in WIDE OPEN for 1 liter while giving 2nd line agent simultaneously.
  
  Total < 80 U /24 Hr

- Methergine 0.2 mg IM (2nd Dose in 2 hrs)
- CYTOTEC 800 mcg rectal
- CYTOTEC: 400 mcg SUBLINGUAL
  
  PLUS 200 mcg oral
  
  +/- 200 mcg rectally

- HEMABATE (Carboprost) (PGF2alpha) 250 mcg intramuscularly (directly into the myometrium if vasoconstricted) every 15 minutes, as needed (Max total dose of 2 mg)
PREVENT DELAYED PPH
PROPHYLACTIC TREATMENT
PO Cytotec 100-200 PO q 4-6 hrs X 24 hrs

- RECOMMEND PROPHYLAXIS for:
  - Patients who initially require treatment for atony immediately after delivery
  - Patients on Magnesium Sulfate for seizure prophylaxis
  - Patients with chorioamnionitis

- CONSIDER PROPHYLAXIS for patients with:
  - Long labor
  - Prolonged second stage
  - Macrosomic baby
  - Grand Multiparity
Graduated drapes to facilitate QBL for vaginal delivery from the time the baby is delivered until the patient is returned to supine position.

Quantitative blood loss will continue for 2 hours after delivery by weight (1mg = 1ml) of “standardized pad bundles” tailored specifically for C/S patients or vaginal delivery patients.

SBAR and documentation reported in QBL not EBL.
Ethnic risk factor for mortality
( CLC slide) The Black-White disparity in pregnancy-related mortality from 5 conditions: differences in prevalence and case-fatality rates.

The CDC sought to determine whether differences in the prevalences of 5 specific pregnancy complications or differences in case fatality rates for those complications explained the disproportionate risk of pregnancy-related mortality for Black women compared with White women in the United States.

National Hospital Discharge Survey (NHDS) was utilized to estimate the number of women with each selected pregnancy condition during a 10 year study period. The US National Vital Statistics System data was utilized to calculate the prevalence and case-fatality rates among Black and White women for preeclampsia, eclampsia, abruptio placenta, placenta previa, and postpartum hemorrhage for the years 1988 to 1999. Black women did not have significantly greater prevalence rates than White women. However, Black women with these conditions were 2 to 3 times more likely to die from them than were White women.

PPH Differential Diagnosis

THE FOUR T’S

**TONE**
- Soft, “boggy” uterus
- Fundus above Umbilicus
- Rusk factors present

**TISSUE**
- Placenta retained
- Accessory Lobe
- Inversion of uterus

**TRAUMA**
- Genital tract laceration
- Hematoma

**THROMBIN**
- Blood not clotting
- Bleeding from IV/Phlebotomy sites
- Risk for DIC most likely present
  (Abruptio, IUFD, HELLP, Sepsis, Hemorrhagic Shock, AFLP, AFE)
The Consortium on Safe Labor collected electronic medical records from 19 hospitals within 12 institutions (228,668 deliveries from 2002 to 2008).

- Third- or fourth-degree lacerations occurred in 2,516 women [5.8%]
- Cervical lacerations occurred in 536 women [1.1%],
- Risks for third- or fourth-degree lacerations included nulliparity (7.2-fold risk) being Asian or Pacific Islander increasing birth weight, operative vaginal delivery, episiotomy, and longer second stage of labor
- Cerclage increases the risk for cervical lacerations

(Obstet Gynecol. 2011 Mar;117(3):627-35)
Variables found to be statistically significant independent risk factors: Asian ethnicity (odds ratio [OR], 8.9), primiparity (OR, 2.4), persistent occiput posterior, vacuum delivery (OR, 2.7).

*(Am J Obstet Gynecol. 2011 Apr;204(4):347.e1)*
PPH after Vaginal Delivery

Anesthesia / Lighting / Instruments / Assist

- Is this Uterine Atony? Most common cause of PPH is atony! Risk factors from admission and labor should facilitate diagnosis
- Foley catheter placed or straight cath to empty bladder
- R/O Retained Placenta (manual exploration of uterus)
- Lacerations: Cervix / Vaginal sidewall
- Broad ligament palpation
- Rectal exam
- IF NO CLEAR ETIOLOGY Consider Sono for retained POC, Hematomas, INTRAPERITONEAL Free fluid
MANAGEMENT OF POSTPARTUM HEMORRHAGE
CALL MD

Hemorrhagic Class 1-2
1. Pulse rising ≥ 110
2. Decreased Pulse Pressure
3. Systolic BP < 90 or
   Systolic Decreased by 20 %
   Or
   VS as above w/ No Visible
   blood loss
   THINK OF
   RetroPeritoneal Hematoma
   Broad ligament Hematoma
   Splenic Artery Aneurysm
   DX with bedside Sono

Differential Diagnosis THE FOUR T’s

To L&D OR
Hemabate 250mcg IM q15min
If Vasoconstricted IM to Uterus
With 1st dose of Hemabate
place Bakri Balloon

To L&D OR
Suture Lacerations,
Drain & Pack Hematomas
or Replace inverted uterus

To L&D OR
Manual remove tissue
OR D & C

To L&D OR / ICU
Fresh Frozen Plasma
Platelet transfusion
PRBC’S transfusion
Dx & Tx Cause

Resuscitation
1. Oxygen by mask
2. 2 large-bore IV needles
   (18 g and try 16G)
   Consider ART line/ Central Line
3. Stat Labs :
   CBC, Type and Cross / FFP/Plt
   PTT/INR/Pltts / fibrinogen
4. Replace EBL 3:1
   with warmed crystalloids
   until PRBC’s arrive or
   Pulse < 100
   TWO Liter rapid infusion can be Diagnostic & Therapeutic
5. Bair Hugger/IV fluid warmer
6. Record Q 5 min :BP, pulse,
   SaO2, RR, CNS Sx
7. Record Urine output Q

Consider Interventional Radiology
For Uterine Artery embolization
(ONLY if Hemodynamically stable, but persistent slow bleeding)

Estimated 10-15 mins or more away from Bleeding Control

Class 2 Pulse 100-120, Pulse pressure decreased, RR > 20, Anxious
Class 3 Pulse 120-140, Systolic BP < 90, RR > 30, Anxious & Confused
Class 4 Pulse > 140 , Systolic BP < 90 RR > 35, Confused & Lethargic

ACTIVATE HEMORRHAGE PROTOCOL

Transfuse: 4 PRBC’s / 4 FFP / 1 pheresis Platelet product

Surgical Intervention: Uterine Artery Ligation / Compression Sutures / Hysterectomy
Consider recombinant Factor VIIa 60-120 mcg/Kg for refractory DIC
Volume Replacement / Transfusion

How serious is all of this blood loss?

What Blood Products do I do Order?
ATLS Classes of OB Hemorrhage

Class I  EBL 15%  ( 900 ml )  
Pulse < 100 / BP nml / RR nml / Slightly Anxious

Class II  EBL 15-30% (900 - 1800 ml)  
Pulse 100- 120 / Pulse Press / RR 20-30 / Mildly Anxious

Class III  EBL 30-40% (1800 - 2400 ml)  
Pulse 120-140/ Systolic pressure 20% from baseline OR Systolic < 90 / RR 30-40 / Anxious & Confused

Class IV  EBL > 40% ( > 2400 ml )  
Pulse >140 / Systolic < 90 / RR > 35 / Confused & Lethargic
**Stage 1** is short: activate hemorrhage protocol, initiate preparations and give Methergine IM.
- Tocolytics
- Notify Charge nurse, Anesthesia Provider
- VS, O2 Sat q5'
- Calculate cumulative blood loss q5-15'
- Weigh bloody materials
- Careful inspection with good exposure of vaginal walls, cervix, uterine cavity, placenta
- Gently palpate fundus, and repeat fundal massage
- Methergine 0.2mg IM (if not hypertensive)
- May repeat if good response to first dose, BUT otherwise move on to 2nd level uterotonic drug (see below)
- Empty bladder: straight cath or place foley with urimeter

**Stage 2** Continued bleeding with total blood loss under 1500ml

<table>
<thead>
<tr>
<th>Stage 2 is focused on sequentially advancing through medications and procedures, mobilizing help and Blood Bank support, and keeping ahead with volume and blood products.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OB back to bedside (if not already there)</td>
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<tr>
<td>Extra help: 2nd OB, Rapid Response Team (per hospital), assign roles</td>
</tr>
<tr>
<td>VS &amp; cumulative blood loss q 5-10 min</td>
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<tr>
<td>Weigh bloody materials</td>
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<tr>
<td>Complete evaluation of vaginal wall, cervix, placenta, uterine cavity</td>
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<tr>
<td>Send additional labs, including DIC panel</td>
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<tr>
<td>If in Postpartum: Move to L&amp;D/OR</td>
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<tr>
<td>Evaluate for special cases:</td>
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<tr>
<td>- Uterine Inversion</td>
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<tr>
<td>- Amn. Fluid Embolism</td>
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2nd Level Uterotonic Drugs:
- Hemabate 250 mcg IM or
- Misoprostol 800-1000 mcg PR

2nd IV Access (at least 18gauge)
- Bimanual massage
- Vaginal Birth: (typical order)
  - Move to OR
  - Repair any tears
  - D&C: r/o retained placenta
  - Place intrauterine balloon
- Cesarean Birth: (still intra-op) (typical order)
  - Inspect broad lig, posterior uterus and retained placenta
  - B-Lynch Suture
  - Place intrauterine balloon

- Notify Blood Bank of OB Hemorrhage
- Bring 2 Units PRBCs to bedside, transfuse per clinical signs – do not wait for lab values
- Use blood warmer for transfusion
- Consider thawing 2 FFP (takes 35+min), use if transfusing >2u PRBCs
- Determine availability of additional RBCs and other Coag products

**Stage 3**

<table>
<thead>
<tr>
<th>Total blood loss over 1500ml, or &gt;2 units PRBCs given or VS unstable or suspicion of DIC</th>
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<tbody>
<tr>
<td>Stage 3 is focused on the Massive Transfusion protocol and invasive surgical approaches for control of bleeding.</td>
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<tr>
<td>Mobilize team</td>
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<tr>
<td>Advanced GYN surgeon</td>
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<tr>
<td>2nd Anesthesia Provider</td>
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<tr>
<td>OR staff</td>
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<tr>
<td>Adult Intensivist</td>
</tr>
<tr>
<td>Repeat labs including coags and ABG's</td>
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<tr>
<td>Central line</td>
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<tr>
<td>Social Worker/ family support</td>
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</tbody>
</table>

| Activate Massive Hemorrhage Protocol     |
| Laparotomy:                              |
| B-Lynch Suture                           |
| Uterine Artery Ligation                  |
| Hysterectomy                             |
| Patient support                          |
| Fluid warmer                             |
| Upper body warming device                |
| Sequential compression stockings          |

Transfuse Aggressively Massive Hemorrhage Pack
- Near 1:1 PRBC:FFP
- 1 PLT pheresis pack per 6 units PRBCs

Unresponsive Coagulopathy:
After 10 units PRBCs and full coagulation factor replacement: may consider rFactor VIIa

California Maternal Quality Care Collaborative (CMQCC): Hemorrhage Taskforce (2009) visit: www.CMQCC.org for details
This Project was supported by funds received from the State of California, Department of Public Health, Center for Family Health; Maternal, Child and Adolescent Health Division
Stage 1
Blood loss: >500 ml vaginal or >1000 ml Cesarean, or
VS changes (by >15% or HR ≥110, BP ≤85/45, O2 sat <95%)

Stage 2 Continued bleeding with total blood loss under 1500ml

Stage 3 Total blood loss over 1500ml, or >2 units PRBCs given or VS unstable or suspicion of DIC
MANAGEMENT OF POSTPARTUM HEMORRHAGE
CALL MD

Hemorrhagic Class 1-2
1. Pulse rising \( \geq 110 \)
2. Decreased Pulse Pressure
3. Systolic BP \( <90 \) or
   Systolic Decreased by 20 %
   Or
   VS as above w/ No Visible
   blood loss
THINK OF
RetroPeritoneal Hematoma
Broad ligament Hematoma
Splenic Artery Aneurysm
DX with bedside Sono

UNRESPONSIVE to 1st line Tx
Or
Hem Class 2 Not in Control

Resuscitation
1. Oxygen by mask
2. 2 large-bore IV needles
   (18 g and try 16G)
   Consider ART line/ Central Line
3. Stat Labs :
   CBC, Type and Cross / FFP/Plt
   PTT/INR/Pltssl /fibrinogen
   4. Replace EBL 3:1
   with
   warmed crystalloids
   until PRBC’s arrive or
   Pulse < 100
   TWO Liter rapid infusion can be Diagnostic & Therapeutic
5. Bair Hugger/IV fluid warmer
6. Record Q 5 min :BP, pulse, SaO2, RR, CNS Sx
7. Record Urine output Q

DIFFERENTIAL DIAGNOSIS THE FOUR T’s

TONE
Soft, “boggy” uterus
Fundus above Umbilicus
1Foley
(note initial output)
2. Fundal massage
3. Oxytocin
60 units per liter
Wide open
4. Methergine 0.2 mg IM x1
   (may repeat in 2 hrs x1)
   or
   Cytotec 400 sublingual & 200
   by mouth

TRAuma
Genital tract tear
Hematoma
Inversion of uterus
Inspect Perineum
For
Bleeding
Lacerations and Hematomas
OR
Mass of tissue @ Introitus ?

TISSUE
Placenta retained
Accessory Lobe
Was the Placenta intact
MD may explore
uterus and do
bimanual fundal
message

THROMBIN
Blood not clotting
Bleeding from
IV/Phlebotomy sites
Risk for DIC
(Abruption, IUFD,
HELLP, Sepsis,
Hemorrhagic Shock,
AFLP, AFE)
STAT LABS: Fibrinogen
FDP, CBC, PTT, INR,
TYPE & CROSS,LFT’s,
Lytes, Creatinine,LDH

To L&D OR
Hemabate 250mcg IM q15min
If Vasoconstricted IM to Uterus
With 1st dose of Hemabate
place Bakri Balloon

To L&D OR
Suture Lacerations,
Drain & Pack
Hematomas
or
Replace inverted
uterus

To L&D OR
Manual remove tissue
OR
D & C

To L&D OR / ICU
Fresh Frozen Plasma
Platelet transfusion
PRBC’S transfusion
Dx & Tx Cause

ACTIVATE HEMORRHAGE PROTOCOL
Transfuse: 4 PRBC’s / 4 FFP / 1 pheresis Platelet product
Surgical Intervention : Uterine Artery Ligation / Compression Sutures / Hysterectomy
Consider recombinant Factor VIIa 60-120 mcg/Kg for refractory DIC

UNRESPONSIVE TO 2 L
OR UNCONTROLLED
CLASS 2
ATLS Classes of OB Hemorrhage

**Class I**
- EBL 15%  ( 900 ml )
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- EBL 15-30% (900 - 1800 ml)
- Pulse 100-120 / Pulse Press / RR 20-30 / Mildly Anxious

**Class III**
- EBL 30-40% (1800 - 2400 ml)
- Pulse 120-140/ Systolic pressure ↓20% from baseline OR **Systolic < 90** / RR 30-40 / Anxious & Confused

**Class IV**
- EBL > 40% ( > 2400 ml )
- Pulse >140 / Systolic < 90 / RR > 35 / Confused & Lethargic
PPH after Vaginal Delivery
Anesthesia / Lighting / Instruments / Assist

- Is this Uterine Atony?
- Foley catheter placed or straight cath to empty bladder
- Retained Placenta (manual exploration of uterus)
- Lacerations: Cervix / Vaginal sidewall
- Broad ligament palpation
- Rectal exam
- IF NOT CLEAR ETIOLOGY Consider Sono for retained POC, Hematomas, INTRAPERITONEAL Free fluid
The majority of PPH is and will remain Class 2 with appropriate medical treatment & fluid resuscitation.

What is the most common cause of PPH? UTERINE ATONY!!

Class II  EBL 15-30% (900 - 1800 ml)

Pulse 100-120 / Pulse Press SLIGHT CHANGE / RR 20-30 / Mildly Anxious
ATLS Classes of OB Hemorrhage

**Class I**
- EBL 15% (900 ml)
- Pulse < 100 / BP nml / RR nml / Slightly Anxious

**Class II**
- EBL 15-30% (900 - 1800 ml)
- Pulse 100-120 / Pulse Press / RR 20-30 / Mildly Anxious

**Class III**
- EBL 30-40% (1800 - 2400 ml)
- Pulse 120-140 / Systolic pressure 20% from baseline OR **Systolic < 90** / RR 30-40 / Anxious & Confused

**Class IV**
- EBL > 40% (> 2400 ml)
- Pulse >140 / Systolic < 90 / RR > 35 / Confused & Lethargic
ATLS Fluid resuscitation
For Class II Hemorrhage or worse

- **HEMORRHAGE CART**
- **Oxygen** / 2 large bore IVs
- **INITIAL 2 LITERS** of Normal Saline
- **Temperature control**
- **Labs** Drawn with IV’s
  - CBC/ PT/ PTT / T&C /Fibrinogen / ABG
- Record BP/Pulse/SaO2/RR/CNS Q 5min
- Foley INITIAL & Q 30 minutes urine recorded
Resuscitation

1. Oxygen by mask
2. 2 large-bore IV needles (18 g or even better if 16G)
3. DRAW STAT labs when starting the second IV:
   CBC
   Type and Cross,
   PTT/INR/PtLts/Fib/
4. Replace EBL 3:1 with **warmed** crystalloids until PRBC’s arrive
   **TWO Liter rapid infusion can be Diagnostic & Therapeutic**
5. Keep patient warm: Bair Hugger/ IV fluid warmer
6. Record Q 5 min: BP, pulse, SaO2, RR, CNS Sx
7. Record Urine output Q 30min
   **UNRESPONSIVE TO 2 L OR UNCONTROLLED CLASS 2**
Class II Bleeding Under Control

- **Class II (<120/<1800)** should improve with crystalloids alone if bleeding is controlled. If BP/Pulse are restored to normal, H/H should determine transfusion.

- If BP/Pulse fail to improve after the administration of 2 liters of crystalloid the patient may be at risk for hemorrhagic shock.

- **Estimated time to control the bleeding dictates clinical response.** Is the hemorrhage under control? Are you heading to class III?
Crystalloid Infusion
Initial 2 liters then 3:1

Correction of the deficit in blood volume with crystalloid will generally maintain hemodynamic stability, while transfusion of red cells is used to improve and maintain tissue oxygenation.

Fluid infusion should be at a rapid rate as long as class II symptoms are present. If the patient does not respond to the initial infusion of 2 liters of NS fluid infusion, continuation @ 3:1 replacement until Blood arrives or resolution of VS to normal.

Clinical signs including blood pressure, pulse, mental status, urine output, and peripheral perfusion are often adequate to guide initial resuscitation. 3:1 crystalloid replacement until these normalize.
Drugs to Contract the Uterus

- Oxytocin 40-60 U in 1 liter of intravenously
  Total < 80 U /24 Hr

- Methergine 0.2 mg IM (2\textsuperscript{nd} Dose in 2 hrs)

- CYTOTEC 1000 mcg rectally

- Or CYTOTEC: 200 mcg orally plus 400 mcg
  sublingually plus 400 mcg rectally

- HEMABATE (Carboprost) (PGF2alpha) 250 mcg
  intramuscularly (directly into the myometrium if
  vasoconstricted) every 15 minutes, as
  needed (Max total dose of 2 mg)
Misoprostol levels over time with oral versus vaginal administration

BAKRI BALLOON

- **FOLEY CATHETER PLACED in bladder**
- **500 ML MAX INFLATION with NS or LR** (POUR 500 ML IN CONTAINER)
- Sono guided placement past the internal os of the uterus and
- Vaginal packing
- 24 hour max
- Empiric Cytotec 200 micrograms PO q 6 hours

CI: arterial bleeding, DIC, purulent infection
Bakri Balloon for Uterine Atony WITH 1ST Dose of HEMABATE
Initial fluid resuscitation & meds

DIAGNOSTIC & THERAPEUTIC

- VITALS SIGNS STABILIZE WITH NO ESCALATION OF PULSE AND/OR PULSE DECREASES & BP STABILIZES &/Or Systolic elevates

- RESPONDED TO FLUID BOLUS

- RESPONDED TO MEDICATIONS

- RESPONDED TO BAKRI BALLOON
THERAPEUTIC & DIAGNOSTIC

- VITALS SIGNS STABILIZE (Therapeutic)
  - RESPONDED TO 2 Liter NS FLUID BOLUS
  - RESPONDED TO MEDICATION
  - RESPONDED TO BAKRI Balloon

- IF NO “ADEQUATE RESPONSE” TO Treatment
  - ie 1ST LINE TREATMENT FAILS)

(Diagnostic indication to escalate)

- ACTIVATE HEMORRHAGE PROTOCOL, MOVE TO OR & GET HELP !!
Interventional Radiology

BEST CANDIDATES are stable patients with mild persistent bleeding under control with Medications, & Stable Vital Signs, wand without coagulopathy

The patient should be monitored closely in the angiography suite at the time of the procedure and be ready to proceed to surgical intervention if the patient becomes hemodynamically unstable.
Hypogastric Artery Occlusion
Complications of UAE for PPH

- Postembolization fever is the most common complication;
- Less common complications include buttock ischemia, vascular perforation, and uterine necrosis and infection requiring hysterectomy.
- Ovulation / menses generally resume and fertility is preserved as long as the uterus and ovaries are intact.

Obstet Gynecol 2003 Nov;102(5 Pt 1):904-10
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EBL 30-40% (1800 - 2400 ml)  
Pulse 120-140 / Systolic pressure 20% from baseline OR Systolic < 90 / RR 30-40 / Anxious & Confused

**Class IV**  
EBL > 40% ( > 2400 ml)  
Pulse > 140 / Systolic < 90 / RR > 35 / Confused & Lethargic
**Hemorrhagic Class 1-2**
1. Pulse rising > 110
2. Decreased Pulse Pressure
3. Systolic BP < 90 or
   Systolic Decreased by 20 %
   Or
   VS as above w/ No Visible
   blood loss
   THINK OF
   RetroPeritoneal Hematoma
   Broad ligament Hematoma
   Splenic Artery Aneurysm
   DX with bedside Sono

**Differential Diagnosis: The Four T’s**

**TONE**
Soft, “boggy” uterus
Fundus above Umbilicus

**TRAUMA**
Genital tract tear
Hematoma
Inversion of uterus

**TISSUE**
Was the Placenta intact
MD may explore
uterus and do
bimanual fundal
message

**THROMBIN**
Blood not clotting

Bleeding from
IV/Phlebotomy sites
**Risk for DIC**
(Abruption, IUFD, HELLP, Sepsis, Hemorrhagic Shock, AFLP, AFE)

**STAT LABS:** Fibrinogen
FDP, CBC, PTT, INR,
TYPE & CROSS, LFT’s,
Lytes, Creatinine, LDH

**Resuscitation**
1. Oxygen by mask
2. 2 large-bore IV needles
   (18 g and try 16G)
   Consider ART line/ Central Line
3. Stat Labs:
   CBC, Type and Cross / FFP/Plt
   PTT/INR/Pltts / fibrinogen
   4. Replace EBL 3:1
   with
   warmed crystalloids
   until PRBC’s arrive or
   Pulse < 100
   TWO Liter rapid infusion can be Diagnostic & Therapeutic
5. Bair Hugger/ IV fluid warmer
6. Record Q 5 min : BP, pulse,
   SaO2, RR, CNS Sx
7. Record Urine output Q

**UNRESPONSIVE to 1st line Tx**
Or
Hem Class 2 Not in Control

**To L&D OR**
Hemabate 250mcg IM q15min
If Vasoconstricted IM to Uterus
With 1st dose of Hemabate
place
Bakri Balloon

**To L&D OR**
Suture Lacerations, Drain & Pack
Hematomas
or
Replace inverted uterus

**To L&D OR**
Manual remove tissue
OR
D & C

**To L&D OR / ICU**
Fresh Frozen Plasma
Platelet transfusion
PRBC’S transfusion
Dx & Tx Cause

**ACTIVATE HEMORRHAGE PROTOCOL**

Transfuse: 4 PRBC’s / 4 FFP / 1 pheresis Platelet product

**Surgical Intervention:**
Uterine Artery Ligation / Compression Sutures / Hysterectomy
Consider recombinant Factor VIIa 60-120 mcg/Kg for refractory DIC

**UNRESPONSIVE TO 2 L OR UNCONTROLLED CLASS 2**

**Consider Interventional Radiology**
For Uterine Artery embolization
(ONLY IF Hemodynamically stable,
but persistent slow bleeding)

**Estimated 10-15 mins or more away from Bleeding Control**

Class 2 Pulse 100-120, Pulse pressure decreased, RR >20, Anxious
EBL 900-1800

Class 3 Pulse 120-140, Systolic BP <90, RR>30, Anxious & Confused
EBL 1800-2400

Class 4 Pulse >140, Systolic BP <90 RR>35, Confused & Lethargic
EBL > 2400
HEMORRHAGE PROTOCOL

- Failure of 1st line Treatment (2L NS /Drugs/ Bakri)
- Definitive Surgical treatment > 15 minutes
- Activate Hemorrhage Protocol Now
- Move to OR NOW & GET HELP

Hemorrhage Protocol

4 PRBC / 4 FFP / 1 PLT pheresis

2 units 0 neg PRBC < 10 MINUTES
4 units thawed plasma within 30 minutes
Platelets as soon as available.
Previous transfusion protocols relied on LAB TEST which may not be available or be unreliable

- INR > 1.5 OR PTT > 2 times normal
  - 4 units of FFP to be transfused

- Platelet Count < 50K
  - 1 platelet pheresis product to be transfused

- Fibrinogen < 100 mg/dl
  - 10 units cryoprecipitate to be transfused
246 soldiers who received a massive transfusion (≥10 units of RBCs in 24 hours) from November 2003 to September 2005.

Three groups of patients were constructed according to the plasma to RBC ratio transfused during massive transfusion. Trauma requiring massive transfusion, a high 1:1.4 plasma to RBC ratio is independently associated with improved survival to hospital discharge, primarily by decreasing death from hemorrhage.

For practical purposes, massive transfusion protocols should utilize a 1:1 ratio of plasma to RBCs for all patients.

Stanford OB Massive Transfusion Protocol

Transfusion. 2007 Sep;47(9):1564-72.

- **6** units of PRBC  (type specific or O neg)
- **4** units of FFP  (2:3 Ratio FFP : PRBC)
- **1** Platelet pack
- **Factor VIIa** if Coagulopathy after FFP/Plt/Cryo

KAISER OB HEMORRHAGE
PROTOCOL

- Activated for patient not responding to initial crystalloid infusion and/or conservative therapy AND Definitive treatment > 15 minutes away.

- Aggressive transfusion

- START WITH 4 PRBC / 4FFP / 1 PLT

- Move to OR NOW AND GET HELP
Class II (< 120 < 1800 ml) without control
Progressing to Class III

Class III

(>120 / > 1800 ) Systolic decreased but may be >90 mm/Hg)

Crystalloids continue @ 3:1 ratio and BLOOD PRODUCTS ARRIVE

If bleeding is severe, clinicians cannot wait for laboratory values to guide transfusion of clotting factors. Furthermore, PT/PTT/Fibrinogen may change quickly with ongoing massive hemorrhage.
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Pulse 120-140/ Systolic pressure 20% from baseline OR Systolic < 90 / RR 30-40 / Anxious & Confused

Class IV  
EBL > 40% ( > 2400 ml )  
Pulse >140 / Systolic < 90 / RR > 35 / Confused & Lethargic
Surgical Management of Bleeding

- Uterine artery ligation  O’ leary stitch
- Uterine compression sutures  
  Always use chromic
- Hypogastric artery ligation
- Hysterectomy
TRANSFUSION OF BLOOD PRODUCTS

- Talk with (sbar) your Anesthesia & Nursing team
- Tell them your concerns, EBL, and how long you think it will be to control the hemorrhage
- If intravascular volume is maintained with crystalloids, oxygen delivery will theoretically be adequate until the hematocrit falls below 10 percent.
Uterine Artery Ligation
For Lacerations
Hayman Stitch
LARGE NEEDLE # 2 CHROMIC
Pereira Stitch
B-Lynch
EMERGENCY PERIPARTUM HYSTERECTOMY (EPH)

Among 16,182 deliveries, 15 EPH were performed (0.92 per 1,000 deliveries). Indication was uncontrollable hemorrhage due to

- PLACENTA ACCRETA (73.3%)
- UTERINE ATONY (26.6%).

Morbidity rate was 46.6%.

One (6.6%) mother died because of pulmonary embolism.
EMERGENCY PERIPARTUM HYSTERECTOMY (EPH)

- 33 EPH among 38,998 births, a rate of 0.85 per 1000 births.
- Indications for EPH were:
  - PLACENTA ACCRETA (54.8%),
  - PLACENTA PREVIA (19.4%),
  - UTERINE ATONY (12.9%)
  - and uterine rupture or cervical laceration (9.7%).
- A significant association between previous caesarean section (CS) and abnormal placentation was confirmed (P=0.011), especially for PLACENTA ACCRETA (P=0.004).
- There was one maternal death.
- Maternal morbidity was significant, with disseminated intravascular coagulation and urinary tract injury among the most common complications.

HYSTERECTOMY

UNLESS YOU HAVE EXTENSIVE RETROPERITONEAL DISSECTION EXPERIENCE DO NOT ATTEMPT TO LIGATE THE INTERNAL ILIAC ARTERY

MOVE DIRECTLY TO TAH

IF LIGATION OF THE EXTERNAL ILAIC ARTERY instead of the internal iliac artery loss of the ipsilateral lower limb will occur if not promptly corrected.

The large, dilated, fragile internal iliac vein lies just behind and slightly medial to the artery and is often not visualized during isolation of the artery. Laceration of this vein can lead to rapid exsanguination.
Anesthesia Monitoring

- **Vital Signs** (Arterial Line accurate BP with Vasoconstriction)
- Temp < 35 c (Warmer / Bair Hugger)
- Acidosis Ph < 7.1 (Arterial line)
- Coag Profiles Q 30 min
- XS Citrate infusion (after 9-10 units of PRBC)
  - Hypocalcemia / Metabolic Alkalosis/
  - Hyperkalemia
Class III (< 140 < 2400) without control
Progression to Class IV

Class IV
(> 140 / > 2400 / Systolic < 90 / Mental status change)

AORTA COMPRESSION OR CROSS CLAMP
AORTA IN SURGERY

CALL FOR SURGICAL HELP STAT
Gyn Oncology / Vascular surgery /

Typed and cross-matched blood should eventually arrive
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REFRACTORY DIC
Recombinant Factor VIIa

Not currently FDA approved for PPH; however multiple case reports and reviews exist.

Inability to control bleeding with surgery or embolization AND documented or strongly suspected Coagulopathy despite FFP/Plt transfusion. Last resort for Coagulopathy.

Ob/Gyn dose 60 -120 Ug/Kg
Effective in 30 minutes or less in >80% cases
Thrombotic complications in 2-10%

rFVIIa initiates clotting locally at the “site of injury” via 2 effects:
- Combines with Tissue Factor and promotes thrombin formation
- Binds with activated platelets present @ site of injured tissue
Your Patient Survived! HOWEVER...SUDDENLY Profound Hypoxia Develops

Transfusion Related Acute Lung Injury (TRALI)
Transfusion of anti-granulocyte antibodies contained with red cell products or FFP can lead to agglutination and activation of leukocytes with resultant acute lung injury and noncardiogenic pulmonary edema. Clinical findings range from mild increases in oxygen requirements to severe acute respiratory distress syndrome (ARDS). The full extent of pulmonary dysfunction may not manifest for several hours to days after transfusions have been administered.

Treatment is analogous to Tx for ARDS. After pulmonary edema is ruled out diuretics no longer recommended.
MANAGEMENT OF POSTPARTUM HEMORRHAGE
CALL MD

**DIFFERENTIAL DIAGNOSIS THE FOUR T’s**

**TONE**
- Soft, “boggy” uterus
- Fundus above Umbilicus

**TRAUMA**
- Genital tract tear
- Hematoma
- Inversion of uterus

**TISSUE**
- Placenta retained
- Accessory Lobe

**THROMBIN**
- Blood not clotting

**UNRESPONSIVE to 1st line Tx**

- Or
- Hem Class 2 Not in Control

**Hemorrhagic Class 1-2**
1. Pulse rising > 110
2. Decreased Pulse Pressure
3. Systolic BP <90 or
   Systolic Decreased by 20 %
   Or
   VS as above w/ No Visible blood loss
   THINK OF
   RetroPeritoneal Hematoma
   Broad ligament Hematoma
   Splenic Artery Aneurysm
   DX with bedside Sono

**Resuscitation**
1. Oxygen by mask
2. 2 large-bore IV needles
   (18 g and try 16G)
   Consider ART line/ Central Line
3. Stat Labs :
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4. Replace EBL 3:1
   with
   warmed crystalloids
   until PRBC’s arrive or
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5. Two liter rapid infusion can be Diagnostic & Therapeutic
6. Bair Hugger/IV fluid warmer
7. Record Q 5 min : BP, pulse, SaO2, RR, CNS Sx
   
**To L&D OR**
- Hemabate 250mcg IM q15min
- If Vasoconstricted IM to Uterus
  With 1st dose of Hemabate
  place
  Bakri Balloon

**To L&D OR**
- Suture Lacerations, Drain & Pack
  Hematomas
  OR
  Replace inverted uterus

**To L&D OR**
- Manual remove tissue
  OR
  D & C

**Consider Interventional Radiology**
For Uterine Artery embolization
(ONLY if Hemodynamically stable, but persistent slow bleeding)

**ACTIVATE HEMORRHAGE PROTOCOL**

- Transfuse: 4 PRBC’s / 4 FFP / 1 pheresis Platelet product

**Surgical Intervention**
: Uterine Artery Ligation / Compression Sutures / Hysterectomy
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**To L&D OR / ICU**
- Fresh Frozen Plasma
- Platelet transfusion
- PRBC’S transfusion
- Dx & Tx Cause

**Bleeding from IV/Phlebotomy sites**
**Risk for DIC**
(Abruption, IUFD, HELLP, Sepsis, Hemorrhagic Shock, AFLP, AFE)
STAT LABS: Fibrinogen, FDP, CBC, PTT, INR, TYPE & CROSS, LFT’s, Lytes, Creatinine, LDH

**Inspect Perineum**
For
Lacerations and Hematomas
OR
Mass of tissue @ Introitus ?

**MANAGEMENT OF POSTPARTUM HEMORRHAGE**
CALL MD

**To L&D OR**
- Manual remove tissue
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