Massive Transfusion in the Obstetric Setting: Obstetric Hemorrhage Toolkit 2.0

Holli M. Mason, MD
Associate Director, Transfusion Medicine
Associate Professor of Pathology
Planning for and Responding to Obstetric Hemorrhage

California Maternal Quality Care Collaborative Obstetric Hemorrhage Version 2.0 Task Force

This project was supported by Title V funds received from the California Department of Public Health; Maternal, Child and Adolescent Health Division
Maternal Mortality Rates by Race/Ethnicity, California Residents; 1999-2010

Maternal Mortality Rates by Age Group, California Residents; 1999-2010

Obstetric Hemorrhage Safety Bundle

- Readiness
- Recognition
- Response
- Reporting / Systems Learning

Photo courtesy of David Lagrew, MD and used with permission
Obstetric Hemorrhage Safety Bundle

Readiness: (every unit)
- Hemorrhage Cart / with Procedural Instructions (balloons, compression stitches)
- Rapid access to hemorrhage medications (kit or equivalent)
- Establish a response team: multiple partnerships // unit education, drills, debriefs
- Establish MTP and 0-neg/uncrossmatched transfusion protocols

Recognition: (every patient)
- Assessment of hemorrhage risk (prenatal, on admission, ongoing in labor & PP)
- Measurement of CUMMULATIVE blood loss
- Active Management of 3rd Stage (oxytocin after birth)
Obstetric Hemorrhage Safety Bundle

Response: (every hemorrhage)
- Unit-standard, stage-based OB Hemorrhage Emergency Management Plan with checklist
- Support program for patients, families and staff

Reporting / Systems Learning: (every unit)
- Establish a culture of Huddles for high-risk patients and post-event debriefings
- Review all stage 3 hemorrhages for systems issues
- Monitor outcome and process metrics in perinatal QI committee
Why do we need this Toolkit?

- Incidence of obstetric hemorrhage is increasing
- Hemorrhage deaths reviewed generally have high "preventability" assessment
- Reviews indicate breakdowns at multiple points at least somewhat under our control: provider & facilities issues (vs. patient characteristics)
## North Carolina: Mortality Mostly Preventable

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>% of All Deaths</th>
<th>% Preventable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiomyopathy</td>
<td>21%</td>
<td>22%</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td><strong>14</strong></td>
<td><strong>93</strong></td>
</tr>
<tr>
<td>PIH</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>CVA</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Chronic condition</td>
<td>9</td>
<td>89</td>
</tr>
<tr>
<td>AFE</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Infection</td>
<td>7</td>
<td>43</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>6</td>
<td>17</td>
</tr>
</tbody>
</table>

CA-PAMR Pregnancy-Related Deaths, Chance to Alter Outcome by Grouped Cause of Death; 2002-2004 (N=143)

<table>
<thead>
<tr>
<th>Clinical Cause of Death</th>
<th>Chance to Alter Outcome (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strong/Good</td>
</tr>
<tr>
<td>Obstetric hemorrhage</td>
<td>69</td>
</tr>
<tr>
<td>Deep vein thrombosis/pulmonary embolism</td>
<td>53</td>
</tr>
<tr>
<td>Sepsis/infection</td>
<td>50</td>
</tr>
<tr>
<td>Preeclampsia/eclampsia*</td>
<td>50</td>
</tr>
<tr>
<td>Cardiomyopathy and other cardiovascular causes*</td>
<td>25</td>
</tr>
<tr>
<td>Cerebral vascular accident</td>
<td>22</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>0</td>
</tr>
<tr>
<td>All other causes of death</td>
<td>46</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td>40</td>
</tr>
</tbody>
</table>

Two deaths lacked sufficient records to make determination (one from each cause of death).

**INTERPRETATION:** The CA-PAMR Committee judged that there was a strong-to-good chance to have altered the fatal outcome in 40% of the pregnancy-related deaths in California in 2002 to 2004. Some pregnancy-related deaths may have had a better chance of being prevented, for example deaths from obstetric hemorrhage, compared to others, such as amniotic fluid embolism.

Key 2008 CMQCC Hemorrhage Task Force Survey Findings

- 40% of hospitals did not have a hemorrhage protocol
- Inconsistent definitions of hemorrhage were used among responding hospitals
- 70% of hospitals were not performing drills
  - MDs were not regularly participating in drills in hospitals that were doing them
- Most had access to all 4 uterotonics
- Many hospital reported they did not have access to alternative treatment methods, e.g., Balloons

Note: 173 hospitals responded to the first baseline survey. The response rate is 66.3% based on 173/261 hospitals (2008) with annual delivery volume > 50 births.
Quality Improvement Opportunities Identified through CA-PAMR & CMQCC HTF

- Reduce risks of hemorrhage
- Perform admission risk assessments
- Reduce Denial, Delay...
- Quantify blood loss
- Follow a step-by-step plan
- Increase use of non-pharmacologic treatments
- Improve treatments with blood products
  - “Too little, too late”—Resuscitation v. Treatment
  - “Old wine in new bottles”—“Whole blood” vs. PRBCs
- Enhance Teamwork and Communications!
Summary of Recommendations

- Quantification of blood loss for all
- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Intrauterine balloon/B-Lynch suture
- A new approach to blood products
- The value of a formal protocol
- Toolkit at www.cmqccc.org/ob_hemorrhage
Hemorrhage: How Much is too Much?

- > 500 mL for vaginal delivery and > 750 mL for C/S
  - BUT 500 mL for NSVD is the average
  - 750 mL for C/S is average
  - And for most women well tolerated

- WHO defines
  - EBL of > 500 mL an “alert line”
  - > 1000 mL an “action line”

- ACOG (reVITALize)
  - Cumulative EBL > 1,000 mL for either vaginal or cesarean birth with enhanced surveillance and early interventions, as needed, for 500-1000 mL

- 4-5% of women > 1000 mL - A clinically significant amount!!
# Trauma Assessment of Blood Loss

<table>
<thead>
<tr>
<th>Class</th>
<th>Blood Loss Volume</th>
<th>Total Deficit</th>
<th>Signs/Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt;1000 mL</td>
<td>15%</td>
<td>Orthostatic Tachycardia</td>
</tr>
<tr>
<td>II</td>
<td>&lt;1500 mL</td>
<td>15-25%</td>
<td>Resting tachycardia, orthostatic hypotension</td>
</tr>
<tr>
<td>III</td>
<td>&lt;2,500 mL</td>
<td>25-40%</td>
<td>Resting hypotension, oliguria</td>
</tr>
<tr>
<td>IV</td>
<td>&gt;2,500 mL</td>
<td>&gt;40%</td>
<td>Obtunded, Cardiovascular collapse</td>
</tr>
</tbody>
</table>
Design Goals for Quality Improvement

- Make it easy to do the right thing
- Hardwire changes into routine practice:
  - Education, training, order sets, protocols, the environment
- All improvement is change, not all change is improvement.
- We must know the difference:
  - Build measurement into the process
Lessons from the Field

- It takes a broad team
- Easy wins matter
- Goals and timelines are very useful
- It takes time and persistence to get the systems running smoothly
- Must have champions

<table>
<thead>
<tr>
<th>Disciplines &amp; Departments</th>
<th>Needed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrics</td>
<td>Yes</td>
</tr>
<tr>
<td>Nursing</td>
<td></td>
</tr>
<tr>
<td>Anesthesia</td>
<td></td>
</tr>
<tr>
<td>Blood Bank</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
</tr>
<tr>
<td>Operating Room</td>
<td></td>
</tr>
<tr>
<td>Support personnel</td>
<td></td>
</tr>
<tr>
<td>IT/EMR</td>
<td></td>
</tr>
<tr>
<td>Others unique to your setting?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Selected Areas of Initial Focus for Hemorrhage Protocol

*Likely* Easy Wins
- Hemorrhage carts
- Active management (oxytocin at birth)

Essential Elements, may take more time
- Risk assessment
- Massive transfusion protocols
- Other overall protocol details (e.g. 2nd line meds)
- Replace EBL with QBL processes
Hemorrhage Guidelines: Staged Responses

Pre-Admission: All patients-Assess Risk

Stage 0: All birth- Routine Measures

Stage 1: QBL > 500 mL vag or 1000 mL CS or VS unstable with continued bleeding

Stage 2: QBL 1000-1500 mL with continued bleeding

Stage 3: QBL exceeds 1500 mL
## CMQCC OB Hemorrhage Emergency Management Plan

Every hospital will need to customize the protocol—but the point is every hospital needs one.
California OB Hemorrhage Guidelines

**Stage 0** (BE PREPARED)

- Risk assessment on admission
- Active management 3rd stage of labor
- Antepartum care and counseling
  - Previa, accreta, Jehovah’s witness, iron deficiency anemia
- Appropriate blood bank specimens on admission
- **Quantify** blood loss for all births
## Admission Risk Assessment & Testing

<table>
<thead>
<tr>
<th>Low (Clot only)</th>
<th>Medium (Type and Screen)</th>
<th>High (Type &amp; Crossmatch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
<td>Prior cesarean birth(s) or uterine surgery</td>
<td>Placenta previa, low lying placenta</td>
</tr>
<tr>
<td>Singleton pregnancy</td>
<td>Multiple gestation</td>
<td>Suspected placenta accreta, percreta, increta</td>
</tr>
<tr>
<td>≤4 previous vaginal births</td>
<td>&gt;4 previous vaginal births</td>
<td>Hematocrit &lt;30 AND other risk factors</td>
</tr>
<tr>
<td>No known bleeding disorder</td>
<td>Chorioamnionitis</td>
<td>Platelets &lt;100,000</td>
</tr>
<tr>
<td>No history of PPH</td>
<td>History of previous PPH</td>
<td>Active bleeding (greater than show) on admit</td>
</tr>
<tr>
<td>Large uterine fibroids</td>
<td>Known coagulopathy</td>
<td></td>
</tr>
</tbody>
</table>

*Pre-transfusion testing strategy should be standardized to facility conditions depending on blood bank resources, speed of testing, and availability of blood products.*
Ongoing Risk Assessment: At least q shift and at every handoff

During Labor
- Prolonged second stage
- Prolonged oxytocin use
- Active bleeding
- Chorioamnionitis
- Magnesium Sulfate treatment

Birth/Postpartum
- Vacuum- or forceps-assisted birth
- Cesarean birth (especially urgent/emergent cesarean)
- Retained placenta
California OB Hemorrhage Guidelines

Stage 1: EBL > 500 mL (vaginal) or > 1000 mL (C/S) or HR > 110, BP <85/45, O2 sat <95%; AND STILL BLEEDING

- Activate hemorrhage protocol and check list
- Find cause
  - Use a standard second line medication for atony
- Initiate preparations
  - Get help: BUT primary RN STAY AT BEDSIDE
  - IV 16 gauge and baseline labs
  - Foley with urimeter
  - Blood bank: T and C 2 units
  - Quantify blood loss
Example OB Hemorrhage Cart

- Quick access to emergency supplies
- Refrigerator for meds
- Establish necessary items and par levels
- Label drawers/ compartments
- Include checklists
- Develop process for checking and restocking
- Educate nursing and physician staff

Photo courtesy of Jennifer McNulty, MD and used with permission
### STAGE 2: OB Hemorrhage
Continued bleeding or Vital Sign instability, and < 1500 mL cumulative blood loss

<table>
<thead>
<tr>
<th>MOBILIZE</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
</table>
| **Primary nurse (or charge nurse):**  
- Call obstetrician or midwife to bedside  
- Call Anesthesiologist  
- Activate Response Team: PHONE #:__________  
- Notify Blood bank of hemorrhage; order products as directed | **Team leader (OB physician or midwife):**  
- Additional uterotonic medication: Hemabate 250 mcg IM [if not contraindicated] OR Misporgost 800 mcg SL  
  - Can repeat Hemabate up to 3 times every 20 min;  
  - (note-75% respond to first dose)  
- Continue IV oxytocin and provide additional IV crystalloid solution  
- **Do not delay other interventions** (see right column) while waiting for response to medications  
  - Bimanual uterine massage  
  - Move to OR (if on postpartum unit, move to L&D or OR)  
  - Order 2 units PRBCs and bring to the bedside  
  - Order labs STAT (CBC/Pits, Chem 12 panel, Coag Panel II, ABG)  
  - **Transfuse PRBCs based on clinical signs and response. do not wait for lab results; consider emergency O-negative transfusion** | **Sequentially advance through procedures and other interventions based on etiology:**  
- Vaginal birth  
  - If trauma (vaginal, cervical or uterine):  
    - Visualize and repair  
  - If retained placenta:  
    - D&C  
  - If uterine atony or lower uterine segment bleeding:  
    - Intrauterine Balloon  
  - If above measures unproductive:  
    - Selective embolization (Interventional Radiology if available & adequate experience)  
| **Charge nurse:**  
- Notify Perinatologist or 2nd OB  
- Bring hemorrhage cart to the patient’s location  
- Initiate OB Hemorrhage Record  
- If considering selective embolization, call-in Interventional Radiology Team and second anesthesiologist  
- Notify nursing supervisor  
- Assign single person to communicate with blood bank  
- Assign second attending or clinical nurse specialist as family support person or call medical social worker | **Primary nurse (or designee):**  
- Establish 2nd large bore IV, at least 18 gauge  
- Assess and announce Vital Signs and cumulative blood loss q 5-10 minutes  
- Set up blood administration set and blood warmer for transfusion  
- Administer meds, blood products and draw labs, as ordered  
- Keep patient warm  
- **Second nurse (or charge nurse):**  
  - Place Foley with urimeter (if not already done)  
  - Obtain portable light and OB procedure tray or Hemorrhage cart  
  - Obtain blood products from the Blood Bank (or send designee)  
  - Assist with move to OR (if indicated)  
  - Blood Bank:  
    - Determine availability of thawed plasma, fresh frozen plasma, and platelets; initiate delivery of platelets if not present on-site  
    - Consider thawing 2-4 FFP (takes 30 min), use if transfusing > 2 units PRBCs  
    - Prepare for possibility of massive hemorrhage | **C-section:**  
  - B-Lynch Suture  
  - Intrauterine Balloon  
| **If Uterine Inversion:**  
  - Anesthesia and uterine relaxation drugs for manual reduction  
| **If Amniotic Fluid Embolism:**  
  - Maximal blood support; consider emergency C-section or Life-Saving Surgery | **If vital signs are worse than estimated or measured blood loss:**  
  - Possible uterine rupture or broad ligament tear with internal bleeding; move to laparotomy  
| **Once stabilized:** Modified Postpartum management with increased surveillance |
# The Importance of IV Gauge

Get 2\textsuperscript{nd} Line In Before Vasoconstriction Develops!

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Gravity Flow</th>
<th>Flow with Rapid Infuser</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>65 mL/min</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>140 mL/min</td>
<td>250 mL/min</td>
</tr>
<tr>
<td>16</td>
<td>190 mL/min</td>
<td>350 mL/min</td>
</tr>
<tr>
<td>14</td>
<td>300 mL/min</td>
<td>500 mL/min</td>
</tr>
</tbody>
</table>
Intrauterine Balloon Should be First Step after Failure of Medical Therapy

- High success rate not different than other approaches
- Low-tech, fast, inexpensive, easy to utilize on any L&D Unit
- Least morbidity of any “next step”
- Can be used as “Tamponade Test” to temporize, determine needs and mobilize other resources
Perform B-Lynch within an hour

- Among 211 women treated with B-Lynch sutures
- Hysterectomy rate was 16% if done within an hour of delivery
- Hysterectomy rate was 42% with a delay of 2-6 hours

Move along a plan!

California OB Hemorrhage Guidelines

Stage 3: STILL BLEEDING and EBL > 1500 mL or
> 2 u PRBCs given or VS unstable or suspect coagulopathy

- Massive transfusion protocol
  - Transfuse aggressively
  - Near 1:1 ratio PRBC: FFP
  - Rapid use of FFP may be as important as ratio
  - 1 PLT pheresis pack per 4-6 units PRBC
- Invasive surgical techniques
- Mobilize help: Advanced surgeon (gyn, gyn onc, trauma, MFM)
Tip of the Spear: Lessons from Iraq and Afghanistan

Lowest losses ever from hemorrhage

Key: Increased FFP:RBC ratio
Forward units: carry PRBCs and FFP even without operating units

US Army Photo by Sgt. Dallas Walker and used with permission
Cooler with 6 ONEG
6 units of Plasma if ABO is Known (current blood type)
2 AB Plasma if ABO is not Known (No current Blood Type)
Platelets (room Temperature)
CMQCC Transfusion Guidelines

- For massive ongoing hemorrhage
- Resuscitation transfusion not based on labs but clinical
- Seeks to AVOID coagulopathy
- Transfuse with uncrossed PRBCs until crossed blood available
- Goal near equal ratio of PRBC:FFP after first 2U
- One unit platelets (single platelet pheresis pack) given for every 4-6 units PRBCs
- Guidelines consistent with practice guidelines of the American Society of Anesthesiologists
The Lethal Coagulopathy Triad: Dilution, Hypothermia & Acidosis

- **Dilution**
  - Transfusion of crystalloid and packed cells devoid of clotting factors
  - A problem once $1 - \frac{1}{2}$ total blood volume replaced

- **Hypothermia**
  - Significantly decreases platelet function: even if counts are adequate
  - Keep patient warm (Bair Hugger®, fluid warmer)
The Lethal Coagulopathy Triad: Dilution, Hypothermia & Acidosis

- Acidemia
  - Occurs with massive hemorrhage due to hypovolemia, peripheral tissue hypoxia
  - As hydrogen ion concentration increases, enzyme functions involved in coagulation pathway stop functioning
  - VERY DIFFICULT TO REVERSE!
  - Work to prevent metabolic acidosis
# STAGE 3: OB Hemorrhage

Cumulative blood loss > 1500ml, > 2 units PRBCs given, VS unstable or suspicion for DIC

<table>
<thead>
<tr>
<th>MOBILIZE</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse or Physician:</td>
<td>Establish team leadership and assign roles</td>
<td>Selective Embolization (IR)</td>
</tr>
<tr>
<td>□ Activate Massive Hemorrhage Protocol</td>
<td>Team leader (OB physician + OB anesthesiologist, anesthesiologist and/or perinatologist and/or intensivist):</td>
<td>Interventions based on etiology not yet completed</td>
</tr>
<tr>
<td>PHONE #:</td>
<td>□ Order Massive Hemorrhage Pack</td>
<td>Prevent hypothermia, academia</td>
</tr>
<tr>
<td>Charge Nurse or designee:</td>
<td>(RBCs + FFP + 1 pheresis pack PLTS—see note in right column</td>
<td>Conservative or Definitive Surgery:</td>
</tr>
<tr>
<td>□ Notify advanced Gyn surgeon (e.g. Gyn Oncologist)</td>
<td>□ Move to OR if not already there</td>
<td>• Uterine Artery Ligation</td>
</tr>
<tr>
<td>□ Notify adult intensivist</td>
<td>□ Repeat CBC/PLTS, Coag Panel II STAT and Chem 12 panel q 30-60 min</td>
<td>• Hysterectomy</td>
</tr>
<tr>
<td>□ Call-in second anesthesiologist</td>
<td>Anesthesiologist (as indicated):</td>
<td>For Resuscitation:</td>
</tr>
<tr>
<td>□ Call-in OR staff</td>
<td>□ Arterial blood gases</td>
<td>Aggressively Transfuse</td>
</tr>
<tr>
<td>□ Ensure hemorrhage cart available at the patient’s location</td>
<td>□ Central hemodynamic monitoring</td>
<td>Based on Vital Signs, Blood Loss</td>
</tr>
<tr>
<td>□ Reassign staff as needed</td>
<td>□ CVP or PA line</td>
<td>After the first 2 units of PRBCs use</td>
</tr>
<tr>
<td>□ Call-in supervisor, CNS, or manager</td>
<td>□ Arterial line</td>
<td>Near equal FFP and RBC for massive hemorrhage:</td>
</tr>
<tr>
<td>□ Continue OB Hemorrhage Record (In OR, anesthesiologist will assess and document VS)</td>
<td>□ Vasopressor support</td>
<td>4-6 PRBCs: 4 FFP: 1 apheresis Platelets</td>
</tr>
<tr>
<td>□ If transfer considered, notify ICU</td>
<td>□ Intubation</td>
<td>Unresponsive Coagulopathy:</td>
</tr>
<tr>
<td>Blood Bank:</td>
<td>□ Calcium replacement</td>
<td>• Role of rFactor VIIa is very controversial.</td>
</tr>
<tr>
<td>□ Prepare to issue additional blood products as needed – stay ahead</td>
<td>□ Electrolyte monitoring</td>
<td>After 8-10 units PRBCs and coagulation factor replacement with ongoing hemorrhage, may consider risk/benefit of rFactor VIIa in consultation with hematologist or trauma surgeon</td>
</tr>
<tr>
<td></td>
<td>Primary nurse:</td>
<td>Once Stabilized: Modified Postpartum</td>
</tr>
<tr>
<td></td>
<td>□ Announce VS and cumulative measured blood loss q 5-10 minutes</td>
<td>Management with increased surveillance; consider ICU</td>
</tr>
<tr>
<td></td>
<td>□ Apply upper body warming blanket if feasible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Use fluid warmer and/or rapid infuser for fluid &amp; blood product administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Apply sequential compression stockings to lower extremities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Circulate in OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second nurse and/or anesthesiologist:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Continue to administer meds, blood products and draw labs, as ordered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Third Nurse (or charge nurse):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Recorder</td>
<td></td>
</tr>
</tbody>
</table>
Quantification of Blood Loss: QBL

CMQCC Standard Recommendation
- All studies: We are VERY POOR at estimating blood loss with large volumes:
  - Consistently underestimate
- Every case review of maternal death in CA from hemorrhage, blood loss underestimated initially
  - Studies show we can get better with training but that gains are partially lost over time and we are still poor at large volumes.
  - Not related to experience of provider
Quantification of Blood Loss: QBL

- DENIAL leads to DELAY
- If its not routine standard, we don’t know how to do it when we need it. And we don’t recognize WHEN we need it until late in the game...
Melissa’s Story

- Melissa Price had a late postpartum hemorrhage.
  - Melissa recalls asking the nurses how they could tell how much blood she was losing – the nurses never weighed the blood, and dumped it from a bed pan into a portable toilet.
- Melissa tells of feeling sheer panic when the bleeding started up again
  - “enormous clots…I screamed and I will never forget the look on the nurse’s face when she lifted up that blanket. …. I just kept thinking, ‘God give them more time. They need more time to save me.’”
- Melissa ended up with a hysterectomy and about 12 units of blood transfused.

Melissa Price is a patient representative on the OB Hemorrhage Task Force and has given her permission to use her real name and story.
Business Case

- Blood products are VERY expensive
- Hemabate is ALSO VERY expensive
- R-Factor VIIa and Uterine Artery Embolization are VERY VERY expensive

- Math: more early interventions = fewer hemorrhages that reach “massive” = fewer high level (expensive) interventions
Version 2.0 Change Summary

- Oxytocin primary for AMTSL
- Dosage/route differences for misoprostol
- Minor modifications to blood product guidance
  - “Near equal” vs. Fixed 1:1 ratio PRBCs:FFP
  - Consider calcium, electrolytes
- Expanded resources for maternal and family support
- Resources for staff support
OB Hemorrhage: We Can Do Better

- Preparation key
  - What resources are available
  - What resources need to be developed
  - Do all team members know what they are and how to deploy/utilize these resources

- Early recognition of triggers: empowering any team member to activate protocol and call for help

- Sequential utilization of patient monitoring, evaluation, medications, and procedures
  - Aggressive early therapy including transfusion when bleeding continues
Obstetric Hemorrhage Version 2.0 Task Force

**Co-Chairs**
Audrey Lyndon, PhD, RN & David Lagrew, MD

**Members**
Julie Arafeh, MS, RN
Mary Campbell Bliss, MS, RN
Leslie Casper, MD
Brenda Chagolla, MSN, RN, CNS
Kristi Gabel, MSN, RNC-OB, CNS
Jed Gorlin, MD
Richard Lee, MD
Olga Libova, MS, CNM, RN
Elliott Main, MD
Holli Mason, MD
Jennifer McNulty, MD
Suellen Miller, PhD, CNM, MHA
Christine Morton, PhD
Barbara Murphy, MSN, RN
Nancy Peterson, MSN, RNC, PNNP, IBCLC
Melissa Price, AuD
Mark Rollins, MD
Laurence Shields, MD
Bev VanderWal, MS, RN

**Additional contributors**
Maurice Druzin, MD
Kimberly Gregory, MD
Andrew Hull, MD
Valerie Huwe, MS, RNC-OB, CNS