The CMQCC Hemorrhage Collaborative
Clinician Education Tool

Presented by:
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Patient Safety First Collaborative
2011
Obstetric Hemorrhage: New Strategies, New Protocol

This project was supported by Title V funds received from the California Department of Public Health; Maternal, Child and Adolescent Health Division
Objectives:

- Describe the rise of maternal mortality in the state of California
- Discuss the four objectives of the CMQCC OB Hemorrhage Task Force
- Discuss implementation of the CMQCC OB Hemorrhage tools
- Describe the CMQCC OB Hemorrhage Care Guidelines
CMQCC Mission Statement

CMQCC will transform maternity care in California to end preventable death and injury.

To achieve this we will:

- Define and *implement best practices for public health, communities, women with quality, safety, and social justice as the clear priorities of every decision and action.* **Best Practice Guidelines**

- Promote communication and collaboration between all maternity stakeholders.

- *Gather, review, and organize maternity data and statistics into actionable information.* **Refine Data Advocate Policy**

- Build the next generation of maternal health leaders to continue the growth and scope of CMQCC.
Two Arm Approach…

Right Arm: Data -- QI Measures, Research, And Analysis
“If you can’t measure it, you can’t improve it.”

Left Arm: Action
“What good is measuring, if we don’t work on improving it?”

Our Philosophy:
Quality Improvement using a systems approach
“Every change needs leaders.”

CMQCC: Transforming Maternity Care
Every OB’s nightmare…

REQUESTING PERMISSION FOR USE OF IMAGE
Hemorrhage remains a major cause of obstetric morbidity and mortality

- The rate of maternal deaths has nearly tripled from 6 per 100,000 in 1996 to 17 per 100,000 annual births in 2006. (1)
- Alarmingly, the rate for African American women has risen from 28.7 to 54.9 per 100,000 live births between 1999 and 2006. (1)
- The California Pregnancy Related Maternal Mortality Review (CA-PAMR) found that obstetric hemorrhage is one of the leading causes for maternal death and is a major cause of maternal morbidity.
- In 1997, 2.4% of all live births in California were complicated by postpartum hemorrhage. (2)
- Nationwide, blood transfusions increased 92% during delivery hospitalizations between 1997 and 2005. (3)

1. Department of Public Health, Maternal, Child, and Adolescent Health Division Public Released Data available at: www.cmqcc.org
Maternal Mortality Rate, California and United States; 1991-2006

Maternal Mortality Rates by Race/Ethnicity, California Residents; 1999-2006

California Pregnancy-Associated Mortality Review (CA-PAMR)

Honoring Women’s Lives
Honoring the Teams

Extract the lessons
Make changes based on the lessons learned
Leading Causes of Pregnancy-Related Deaths in California

### Diagnosis Categories

<table>
<thead>
<tr>
<th>Category</th>
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<tbody>
<tr>
<td>Hemorrhage</td>
</tr>
<tr>
<td>Preeclampsia/Eclampsia/HELLP</td>
</tr>
<tr>
<td>Amniotic fluid embolism (often with DIC)</td>
</tr>
<tr>
<td>Infections</td>
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<tr>
<td>Venous embolism complications</td>
</tr>
</tbody>
</table>

Preliminary data from 2002-2003 California Pregnancy Associated Maternal Review Committee (CA-PAMR, N=98)
California Pregnancy-related Mortality Review
Composite Case Example: 24yo G2 P1 at 38 wks gestations induced for “tired of being pregnant”:

- After 8hr active phase and 2 hr 2\textsuperscript{nd} stage, had a NSVD of an 8lb 6oz infant.
- After placental delivery, she had an episode of atony that firmed with massage. A second episode responded to IM methergine and the physician went home (now 1am).
- The nurses called the physician 30 min later to report more bleeding and further methergine was ordered.
- 60min after the call, the physician performed a D&C with minimal return of tissue. More methergine was given.
- 45 min later a second D&C was performed, again with minimal returns. EBL now >2,000 ml.
- Delays in blood transfusion because of inability to find proper tubing.
- Anesthesia is delayed, but a second IV started for more crystalloid. VS now markedly abnormal, P=144, BP 80/30.
- One further methergine given and patient taken for a 3\textsuperscript{rd} D&C. Now has gotten 2u PRBCs
- After D&C is complete, she had a cardiac arrest from hypovolemia /hypoxia and was taken to the ICU when she succumbed 3 hours later.
California Pregnancy-related Mortality Review
QI Opportunities and Learning Points from the above composite case: How to reduce Mortality and Morbidity from OB Hemorrhage?

- Need a medical indication for induction
- No documentation of actual blood loss, e.g., what does “more bleeding” mean?
- Only a few treatments tried, e.g., Methergine and D&C, even when they were ineffective
- Underestimation of blood loss
- Delay in administration of blood
- Lack of working equipment
- Delay in response from other team members
- Delays in adequate resuscitation
- Lack of an organized approach
What are the current self-reported maternal hemorrhage processes, structures, and barriers in facilities where women give birth in California?

Methodology:
- Survey participants are L&D clinical leaders
- Survey participants were invited by Regional Perinatal Programs of California (RPPC) Directors to complete the on-line survey
- Survey data collection dates: September 2008-January 2009
- RPPC Directors were provided a list of respondents from their region; 3-4 rounds of email and in person reminders
- Hospitals without respondents received mailed surveys
- On-line survey tool: Survey Monkey
- Analysis software: SAS and Atlas.ti (Berlin 5.2)
- Stanford University IRB approved
Total Number of Hospitals that responded to the Survey
By Hospital Size relative to All California Hospitals
with Birth Facilities >50 births

<table>
<thead>
<tr>
<th>All California Hospitals: # Live Births 2005 (n)</th>
<th>Hospitals that Responded to Survey: n</th>
<th>% by Row: Hospital Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-1000 (76)</td>
<td>39</td>
<td>51%</td>
</tr>
<tr>
<td>1001-3000 (123)</td>
<td>86</td>
<td>70%</td>
</tr>
<tr>
<td>&gt;3000 (62)</td>
<td>48</td>
<td>77%</td>
</tr>
<tr>
<td>Total (261)</td>
<td>173</td>
<td>66%</td>
</tr>
</tbody>
</table>
Summary: Key Survey Findings

- 40% of hospitals DO NOT have a hemorrhage protocol
- Inconsistent definitions
- 70% of hospitals DO NOT perform drills (*MDs are not regularly participating in drills*)
- Most have access to all 4 uterotonics (*More specific data will be released after complete analysis*)
- Many hospital report they do not have access to alternative treatment methods, e.g., Balloons (*More specific data will be released after complete analysis*)
Quality Improvement Opportunities for OB Hemorrhage

- 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” v. PRBCs
- Enhance Teamwork and Communications!
CMQCC Hemorrhage Task Force:

Co-Chairs:
- Audrey Lyndon PhD, RNC, CNS, University of California, San Francisco
- David Lagrew, MD – Saddleback Memorial Hospital

- Leslie Casper, MD – Kaiser, Southern CA, San Diego Medical Center
- Nancy Corbett, BSN, RN – Kaiser, Northern CA
- Maurice Druzin, MD – Stanford University
- Sue Faron, MN, RNC, CNS – Sharp Mary Birch Hospital for Women
- Kim Gregory, MD, MPH – Cedars-Sinai Medical Center
- Andrew Hull, MD, FRCOG, FACOG – University of California, San Diego
- Valerie Huwe, BSN, RNC – Stanford Hospital, El Camino Hospital
- Richard Lee, MD – USC, Women’s and Children’s Hospital
- Holli Mason, MD – Harbor UCLA Medical Center
CMQCC Hemorrhage Task Force:

Hemorrhage Task Force, continued

- Elliott Main, MD – California Pacific Medical Center
- Jennifer McNulty, MD – Long Beach Memorial Medical Center, UC Irvine
- Suellen Miller, PhD, MHA, CNM - University of California, San Francisco
- Connie Mitchell, MD – MCAH, CA Department of Public Health
- Mark Rosen, MD – University of California, San Francisco
- Diana Ramos, MD, MPH – MCAH, County of Los Angeles Public Health
- Larry Shields, MD – Central Coast Maternal Fetal Medicine
- Jean-Claude Veille, MD – Sutter Health, Sacramento
CMQCC Hemorrhage Task Force:

- 5 meetings in 2008-2009
- Developed a Tool Kit for OB services:
  - Care Guidelines: Checklist, Flowchart and Table Chart formats
  - Compendium of Best Practices that includes articles about background, preparation for and management of obstetric hemorrhage
  - Hospital level Implementation Guide that includes Quality Improvement tools and a sample Policy and Procedure

- All resources on-line at: www.cmqcc.org/ob_hemorrhage
- CMQCC is sponsoring an Obstetric Quality Care Collaborative following the IHI QI Model
Four Major Recommendations for California Birth Facilities:

- Improve **readiness** to hemorrhage by implementing standardized protocols (general and massive).

- Improve **recognition** of OB hemorrhage by performing on-going objective quantification of actual blood loss during and after all births.

- Improve **response** to hemorrhage by performing regular on-site multi-professional hemorrhage drills.

- Improve **reporting** of OB hemorrhage by standardizing definitions and consistency in coding and reporting.
What’s New?

- Quantification of blood loss for all births
- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
Formal Quantification of Blood Loss at Birth (QBL)

- How can we improve the clinical measurement of blood loss during vaginal and cesarean birth?
- How can communication of blood loss be improved among caregivers?
Estimation of Blood Loss Before and After Training

Small vol. often over estimated
Large vol. often under estimated
Both improve markedly with training!


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Methods to Estimate Blood Loss

Recommended methods for ongoing quantitative measurement of blood loss:

1. Formally estimate blood loss by recording percent (%) saturation of blood soaked items with the use of visual cues such as pictures/posters to determine blood volume equivalence of saturated/blood soaked pads, chux, etc.

2. Formally measure blood loss by weighing blood soaked pads/chux

3. Formally measure blood loss by collecting blood in graduated measurement containers
Methods to Estimate Blood Loss

Quantifying blood loss by weighing
• Establish dry weights of common items
• Standardize use of pads
• Build weighing of pads into routine practice
• Develop worksheet for calculations

Establish Dry Weights

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight in Grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Bundle (2 lg chux, 1 ice pack peripad, 2 small peripads)</td>
<td>398</td>
</tr>
<tr>
<td>Small Chux (16 in X 24 in)</td>
<td>22</td>
</tr>
<tr>
<td>Large Chux (24 in X 34 in)</td>
<td>98</td>
</tr>
<tr>
<td>Large Peripad (peach backing)</td>
<td>26</td>
</tr>
<tr>
<td>Small Peripad (from OB Pack)</td>
<td>15</td>
</tr>
<tr>
<td>Ice Pack Peripad</td>
<td>172</td>
</tr>
<tr>
<td>Cloth Towel (blue)</td>
<td>88 - 115</td>
</tr>
<tr>
<td>Vag Packing (from OB Pack)</td>
<td>18</td>
</tr>
<tr>
<td>Ray-tec Sponge</td>
<td>4</td>
</tr>
</tbody>
</table>

Posters
Pocket Cards

- Weigh all bloody items in grams
- Subtract dry weights in grams
- Remaining weight in grams = ml blood loss
  1 gram = 1 ml
Methods to Estimate Blood Loss

Quantifying blood loss by measuring
• Use graduated collection containers (C/S and vaginal deliveries)
• Account for other fluids (amniotic fluid, urine, irrigation)

With kind permission of Bev VanderWal, CNS
Methods to Estimate Blood Loss

**Develop Training Tools:** Visual aids displayed in Labor & Delivery and/or Postpartum areas are guides for more accurate visual estimation (visual aids can be displayed discreetly for clinicians)

With kind permission of Bev VanderWal, CNS
Recommendations

- Teach clot size using posters showing known blood quantities on common materials or compared to common volumes (e.g. a Coke can=350ml)
- Weigh wet materials (with known dry weight); this can be done by gathering a group of pads and weighing them all together
- Measure what can be suctioned at CS (less irrigation+AF)
- Use calibrated under-buttock drapes (at vaginal birth, note the volume of amniotic fluid, urine and stool after birth but before the placenta)

What we don’t know: How to estimate the blood loss that we don’t see… (i.e intra-abdominal)
Recommendations

- Many centers will customize their approach to quantification using a combination of approaches for different settings:
  - Vaginal deliveries
  - Cesarean sections
  - Minimal loss
  - Greater than usual loss
  - Massive loss

- The process is intentional—a formal effort!
  - No more vague “Guesstimates”
  - Continues and is cumulative
Who should determine QBL?

- Anesthesia is at the head of the table and often does not see it all
- OB’s aren’t looking at the suction bottles or at the collective sponges
- No one is doing it in a standardized manner—we obstetricians need help! Collaboratively!
- We should be able to answer:
  - How much blood is in the suction bottle (after amniotic fluid)?
  - How much blood is on sponges?
  - How much blood is on the floor/on the table?
  - In a big case, hourly and cumulatively
What’s New?

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- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
What is Active Management of the 3\textsuperscript{rd} Stage?

- Oxytocin (10u) IV or IM with delivery of infant or placenta
- Controlled cord traction
- Cord clamping not delayed beyond 2 min
- Vigorous fundal massage (at least 15 sec) after placenta
Meta Analysis of Active vs. Expectant 3rd Stage Management at vaginal birth: Outcome of postpartum EBL ≥ 500 ml

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment n/N</th>
<th>Control n/N</th>
<th>Relative risk (fixed) 95% CI</th>
<th>Weight (%)</th>
<th>Relative risk (fixed) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abu Dhabi 1997</td>
<td>48/827</td>
<td>90/821</td>
<td>0.53 [0.38, 0.74]</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Bristol 1988</td>
<td>50/846</td>
<td>152/849</td>
<td>0.33 [0.24, 0.45]</td>
<td>35.6</td>
<td></td>
</tr>
<tr>
<td>Dublin 1990</td>
<td>14/705</td>
<td>60/724</td>
<td>0.24 [0.14, 0.42]</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>Hinchingbrooke 1998</td>
<td>51/748</td>
<td>126/764</td>
<td>0.41 [0.30, 0.56]</td>
<td>29.3</td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>3126</strong></td>
<td><strong>3158</strong></td>
<td><strong>0.38 [0.32, 0.46]</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 163 (Treatment), 428 (Control)
Test for heterogeneity chi-square=7.26 df=3 p=0.06 I²=58.7%
Test for overall effect z=10.84 p<0.00001

62% fewer PPH in Active Management group versus Expectant Management

Active Mgmt is not the “Big Issue in CA”: Only points left to debate…

Timing questions--

- No advantage in giving oxytocin (20u) with anterior shoulder but no increased rate of retained placenta either (RCT of 1846 women: Jackson et al AJOG 2001)
- Some advantage to oxytocin after delivery of baby vs. delivery of placenta (RCT of 191 women, Hoffman et al AJOG 2006)
- Conflicting data about early (<30sec) vs later (up to 2min) cord clamping, but both are better than delayed >2min) clamping for maternal blood loss.
What’s New?

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- Vital sign triggers
- “Move along” on uterotonic medications
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
Vital Signs are Often Ignored

Concept of “Triggers”

- Triggers identify patients that need more attention (from on-call physician, in-house physician, or rapid response team (RRT))
- Prevent such patients from being ignored
- Independent of diagnosis, useful for all OB emergencies
- Used in many areas of hospital medicine
- Do not wait for lab results before acting
NHS Trigger Tool for Obstetrics:

graphical display of vital signs: “Contact doctor if one red or two yellows”

With kind permission of Fiona McIlveney, PhD
Recommendations

- Labor and Delivery Policies include specific vital sign and blood loss “triggers”
  - That identify when to call for Physician attendance and evaluation
  - That identify when to call the Rapid Response Team
- The Hemorrhage Protocol/Guideline should have specific thresholds that identify when to call-in more staff and move along a series of interventions
# CMQCC OB Hemorrhage Care Guidelines

## Obstetric Hemorrhage Care Summary: Table Chart Format

<table>
<thead>
<tr>
<th>Stage</th>
<th>Assessments</th>
<th>Meds/Procedures</th>
<th>Blood Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td>Every woman in laboring birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 0 focuses on risk assessment and active management of the third stage.</td>
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<tr>
<td>Active Management</td>
<td></td>
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</tr>
<tr>
<td>Stage 1 Blood loss: &gt;500 ml vaginal or &gt;1000 ml Cesarean, or VS changes (by &gt;15% or HR &gt;110, BP &lt;85/45, O2 sat &lt;95%)</td>
<td></td>
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<tr>
<td>Stage 1 is short: activate hemorrhage protocol to initiate preparations and give Methylene IM</td>
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</tr>
<tr>
<td>1. IV Access at least 18gauge</td>
<td></td>
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<tr>
<td>2. Increase IV fluid (LR) and oxygen rate, and repeat fundal massage</td>
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<tr>
<td>3. Methylene 2mg IM (if not hypertensive)</td>
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<tr>
<td>May repeat if good response to first dose, but otherwise move on to 2nd level uterine drug (see below)</td>
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<tr>
<td>Empty bladder: straight cath or place Foley with unretter</td>
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<tr>
<td>T&amp;C 2 Units PRBCs (if not already done)</td>
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<tr>
<td>Stage 2 Continued bleeding with total blood loss under 1500ml</td>
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<tr>
<td>1. Level Uterotonic Drugs: • Hemabate 200 mcg M or Misoprostol 800-1000 mcg</td>
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</tr>
<tr>
<td>2. IV Access at least 18gauge</td>
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<td></td>
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<tr>
<td>3. Uterine massage</td>
<td></td>
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<tr>
<td>4. Vaginal Birth (typical order): • M + V + C</td>
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<tr>
<td>5. Repair any tears</td>
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<tr>
<td>6. D&amp;C, R/O retained placenta</td>
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<tr>
<td>7. Place intrauterine balloon</td>
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<tr>
<td>8. Selective Embolization (Interventional Radiology)</td>
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<tr>
<td>9. Cesarean Birth (still intra-op) (typical order):</td>
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<tr>
<td>10. Empty bladder: straight cath or place Foley with unretter</td>
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<tr>
<td>11. Uterine massage</td>
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<td></td>
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<tr>
<td>12. Place intrauterine balloon</td>
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<td></td>
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<tr>
<td>13. Methylene 2mg IM (if not hypertensive)</td>
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<tr>
<td>14. Repeat if good response to first dose, but otherwise move on to 2nd level uterine drug (see below)</td>
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<tr>
<td>15. Empty bladder: straight cath or place Foley with unretter</td>
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<td></td>
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<tr>
<td>16. T&amp;C 2 Units PRBCs (if not already done)</td>
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<tr>
<td>Stage 3 Total blood loss over 1500ml, or &gt;2 units PRBCs given or VS unstable or suspicion of DIC</td>
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<tr>
<td>1. Mobilize team</td>
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<tr>
<td>2. Advanced GYN surgeon</td>
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<tr>
<td>3. Anesthesia Provider</td>
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<td>4. Operating Room staff</td>
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<td>5. Adult Intensivist</td>
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<tr>
<td>6. Repeat labs including coags and ABG’s</td>
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<td>7. Central line</td>
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<td>8. Social worker/family support</td>
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<tr>
<td>10. Laparotomy: • B-Lynch Suture</td>
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<tr>
<td>11. Uterine artery ligation</td>
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<tr>
<td>12. Hysterectomy</td>
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<tr>
<td>13. Patient support</td>
<td></td>
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<tr>
<td>14. Fluid warmer</td>
<td></td>
<td></td>
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<tr>
<td>15. Upper body warming device</td>
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<td></td>
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</tr>
<tr>
<td>16. Sequential compression stockings</td>
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<tr>
<td>17. Transfuse aggressively</td>
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<td></td>
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</tr>
<tr>
<td>18. Massive Hemorrhage Pack</td>
<td></td>
<td></td>
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<tr>
<td>19. Near 1:1 PRBC-FFP</td>
<td></td>
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</tr>
<tr>
<td>20. 1 PLT pheresis pack</td>
<td></td>
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</tr>
<tr>
<td>21. Unresponsive Coagulopathy: • After 10 units PRBCs and full coagulation factor replacement, may consider Factor VIII</td>
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<tr>
<td>22. Conservative Surgery</td>
<td></td>
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<tr>
<td>23. B-Lynch Suture/ Intracavitary balloon</td>
<td></td>
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<tr>
<td>24. Uterine artery ligation</td>
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<tr>
<td>25. Hysteroscopy</td>
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</tr>
</tbody>
</table>

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## Obstetric Hemorrhage Care Summary: Flow Chart Format

![Flow Chart]

- **Pre-Admission**
  - Identify patients with special consideration: Placenta previa/anterior, Bleeding disorder, or those who decline blood products
  - Follow appropriate workup, planning, preparing of resources, counseling and notification
- **Time of admission**
  - Screen All Admissions for hemorrhage risk: Low Risk, Medium Risk and High Risk
- **Stage 0**
  - All women receive active management of 3rd stage: Oxytocin IV infusion or 14 U Units M Ergometrine or Fundal massage
  - Consider transfusing 2 FFP, takes 35 minutes
  - If transfusing 2 or more FFPs, determine availability of additional RBGs and other Coag products
- **Stage 1**
  - Hemorrhage 200 mcg M or Misoprostol 800-1000 mcg
  - IV Access at least 18gauge
  - Uterine massage
  - Vaginal Birth (typical order): M + V + C
  - Repair any tears
  - D&C, R/O retained placenta
  - Place intrauterine balloon
  - Selective Embolization (Interventional Radiology)
  - Cesarean Birth (still intra-op)
  - Empty bladder: straight cath or place Foley with unretter
  - T&C 2 Units PRBCs (if not already done)
- **Stage 2**
  - Continue bleeding with total blood loss under 1500 ml
  - Level Uterotonic Drugs: Hemabate 200 mcg M or Misoprostol 800-1000 mcg
  - IV Access at least 18gauge
  - Uterine massage
  - Vaginal Birth (typical order): M + V + C
  - Repair any tears
  - D&C, R/O retained placenta
  - Place intrauterine balloon
  - Selective Embolization (Interventional Radiology)
  - Cesarean Birth (still intra-op)
  - Empty bladder: straight cath or place Foley with unretter
  - T&C 2 Units PRBCs (if not already done)
- **Stage 3**
  - Total blood loss over 1500 ml, or >2 units PRBCs given or VS unstable or suspicion of DIC
  - Mobilize team
  - Advanced GYN surgeon
  - Anesthesia Provider
  - OR staff
  - Adult Intensivist
  - Repeat labs including coags and ABGs
  - Central line
  - Social worker/family support
  - 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
  - Unresponsive Coagulopathy: After 10 units PRBCs and full coagulation factor replacement, may consider Factor VIII
  - Conservative Surgery
  - B-Lynch Suture/ Intracavitary balloon
  - Uterine artery ligation
  - Hysteroscopy

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This project was supported by Title V funds received from the California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division
What’s New?

- Quantification of blood loss for all births
- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
In general, if there has been little/no response to Methergine, do not give the second dose but MOVE ON to the prostaglandin second medication.

Second medication is often Hemabate (carboprost: 15-methyl PGF2α) one amp (0.25mg) IM or intra-myometrial but some centers prefer misoprostol (800-1,000ug PR).

If Hemabate has had little/no effect MOVE ON to non-pharmacologic methods after the 2nd dose, if some effect, may give up to 8 doses, at Q15-20min intervals

Most authors do NOT see value in giving BOTH Hemabate AND misoprostol as the mechanism of action is the same. In that setting, perhaps misoprostol may be given while the non-pharmacologic steps are being set up. MOVE ON.
What’s New?

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What to Do When Medical Treatment Fails: A Systematic Review

Success rates of surgical and radiological measures in the management of PPH

<table>
<thead>
<tr>
<th>Method</th>
<th>No. Cases</th>
<th>Success Rates (%)</th>
<th>95% CI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-Lynch/compression sutures</td>
<td>108</td>
<td>91.7</td>
<td>84.9–95.5</td>
</tr>
<tr>
<td>Arterial embolization</td>
<td>193</td>
<td>90.7</td>
<td>85.7–94.0</td>
</tr>
<tr>
<td>Arterial ligation/pelvic devascularization</td>
<td>501</td>
<td>84.6</td>
<td>81.2–87.5</td>
</tr>
<tr>
<td>Uterine balloon tamponade</td>
<td>162</td>
<td>84.0</td>
<td>77.5–88.8</td>
</tr>
</tbody>
</table>

(9 Case Series with 6-27 patients each)

There was no statistically significant difference between the 4 groups ($P = 0.06$). (Selection bias would suggest that the real success rates will be lower for all of the above methods.)

Cook “Bakri” Intrauterine Balloon

- There are now several balloons, but the most available in the US is the Cook “Bakri” Balloon
  - Specifically designed for this purpose
  - Double lumen (for drainage from above)
  - Silicone (non-latex)
  - Uterine contour shape
  - Good filling capacity (saline)
  - Inexpensive
  - Easy to use
Successful Applications of the Intrauterine Balloon

- Low-lying placental implantation site, esp with placenta previa
- Poorly contracting lower uterine segment
- Uterine atony
- Placenta accreta / percreta
- Cervical implantation
- DIC at term or after 2nd trimester loss
- In combination with Compression Suture at hysterotomy (“Sandwich technique”)
- Vaginal sidewall lacerations

Easily placed when in stirrups for good exam for vaginal or cervical lacerations and for retained placenta.
“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

Dabelea V, Schultze PM, McDuffie RS Am J Perinatol 2007; 24: 359-64
Issues for Balloons

- There are several balloons, but the most available in the US is the Cook “Bakri” Balloon
  - It is the balloon specifically designed for this purpose
  - Double lumen, silicone (non-latex), uterine contour shape, good filling capacity, inexpensive

- There is some user learning—
  - How much to fill? (150-500ml is a big range). We recommend estimating the uterine volume bimanually --usually 250-300ml is sufficient unless the uterus is very “floppy”.
  - There can be “hour-glassing” of the balloon thru the cervix into the vagina. We recommend using vaginal packing if the cervix is more than 1-2cm dilated)
B-Lynch Compression Suture
“Belt and Suspenders”
B-Lynch Suture completed

Photo courtesy of Elliott Main, MD-CPMC
B-Lynch Suture

- Every Obstetrician should know how to do this (diagrams are in each OR)
- Quick (<2 minutes) and easy!
- Ideal at time of Cesarean birth for atony
- Can be combined with an intrauterine balloon for “Sandwich technique”
What’s New?

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- The value of a formal protocol
Lessons from Combat in Iraq

- Lowest losses ever from hemorrhage
- Key: increased FFP:RBC ratio
Iraq Theatre Experience

- Retrospective review of all soldiers with massive transfusion (>10u RBC in 24 hr) Nov 2003-Sept 2005. N=246
- Composition closer to whole blood more effective than 1980’s ratios:
  - Not a RCT!
  - Biased against greatest EBL
  - But results are striking…

Borgman MA. J Trauma. 2007 (Oct);63:805–813.
Change in policy for treatment of ruptured AAA

- **Traditional/Control (pre) protocol**
  - PRBCs on arrival, FFP if INR >1.5, PLTs if <50K

- **New/Intervention (post) protocol**
  - PRBCs on arrival, AND 1:1:1 FFP:RBC:PLT

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Johansson PI. Transfusion 2007; 47:593
“Whole blood” is good for OB hemorrhage

- After 2u PRBCs, start FFP
- Massive transfusion protocol: 1:1 ratio FFP/RBC
  - 6 RBC + 4 FFP + 1Plt pack (Stanford+)
  - 4 RBC + 4 FFP, plts and cryo on request (CPMC)--think ahead!
- Keep up!

Two Stages: Resuscitation and Treatment

- Resuscitation, transfuse per clinical signs
- DIC treatment, transfuse per lab parameters

Supportive measures are critical

- Warm patient (Bair Hugger®, fluid warmer)
- Correct metabolic acidosis
Recommendations: Massive Transfusion Protocol

- Every OB unit needs one!
- Coordinated with Blood Bank, Anesthesia, and ER/ICU
- Ability to deliver large volumes of RBCs and coagulation products
- Principle: Whole blood out = whole blood in
- Guidelines for coagulation product usage
What’s New?

- Quantification of blood loss for all
- Active management of the 3rd stage for all
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- “Move along” on uterotonic medications
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- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
Recombinant Activated Factor VII

REQUESTED PERMISSION: PENDING
Recombinant Activated Factor VII

- Dangerous but potentially Life-Saving
- Can have dramatic effects on DIC; less clear effects on mortality; off-label use appears to have higher risk of thrombosis
- No RCTs, the reported small series are often biased; optimal dosing for obstetrical patients is not known
- Several University/Level III hospital in California have reported some success using rFactor VIIa in massive hemorrhages when all other methods have failed
- But, every University/Level III hospital in California has ALSO experienced thrombotic complications…
- Treatment should be used in consultation with local/regional expert in maternal coagulopathy and/or massive obstetrical hemorrhage
Recombinant Activated Factor VII: Keys for Usage

- Must have near normal pH and near normal body temperature
- Must have received clotting factors (FFP, Cryoprecipitate and platelets) as needs fibrinogen, other factors to work
- Usual setting is after 10-12 units of PRBC transfusion and still no end in sight. Not to be used at the 4-6 unit stage!
- Does **not** stop surgical bleeding, use is for DIC and generalized oozing
- No consensus on dosing for this off-label use:
  - Range is from 30-90ug/kg, with more evidence for the lower end in these otherwise healthy patients. For example for a 80kg woman, 2.4mg to 4.8mg would be given slow IV push.
  - If no clinical response, may repeat in 20-30min if <90ug/kg used
What’s New?

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Why a Protocol for Obstetric Hemorrhage?

- Now a complex series of steps that involve many staff members and departments
- Communications!
- PPH seems to always happen at night or weekends…(when people may be tired or there are less resources)
- We can improve…
Systems Approach to Obstetric Hemorrhage

- Organize your unit and your response

- Recognize Denial and Delay
  - Get help
  - Get exposure to perform thorough exams and identify the source of bleeding
  - Do not get behind

- Process Is Most Important!
DENIAL: “Catch up” phenomenon: Initial manifestations of hemorrhage were VS Δ’s (hypotension and/or tachycardia) NOT frank vaginal bleeding.

DELAY: in delivery of products from the blood bank to the labor and delivery operating room.

DELAY: of administration to patient once products arrived at L+D.

DELAY: Mobilization of equipment.

DELAY: Waiting for cross-matched blood instead of utilizing O negative or type specific blood.

“Underutilization”-- DELAY in administering additional amounts and types of blood products (i.e. FFP, platelets, and cryoprecipitate)
For example,

- Obstetrician and anesthesiologist regarding efficacy of intervention(s) and need to escalate care or change strategy.
- Operating room and blood bank concerning urgency of situation.
- Among support personnel concerning delivery of products and location of specialized equipment (i.e., rapid infusion devices or specialized kits).

Doctors Company Reviews Maternal Arrests Cases (Reprinted with permission from The Doctors Company); APSF NEWSLETTER Summer 2007; page 28; Ann Lofsky, MD.
Systems Approach to OB Hemorrhage

- Department: OB Hemorrhage Protocol with stages
- Hospital: Massive Transfusion Protocol
- Summary Flow algorithm: graphic or tabular
- Nursing checklist by stages
- Documentation forms: OB Hemorrhage Report
- Worksheets to assist with assessment of blood loss
- Hemorrhage cart/kit
- Instruction cards for new procedures in cart or OR
- Drills
STAGE 1: OB Hemorrhage

Cumulative Blood Loss >500ml vaginal birth or >1000ml C/S -OR- Vital signs >15% change or HR ≥110, BP ≥85/45, O2 sat <95% -OR- Increased bleeding during recovery or postpartum

MOBILIZE

Primary nurse, Physician or Midwife to:
- Activate OB Hemorrhage Protocol and Checklist

Primary nurse to:
- Notify obstetrician (in-house and attending)
- Notify charge nurse
- Notify anesthesiologist

ACT

Primary nurse:
- Establish IV access if not present, at least 18 gauge
- Increase IV Oxytocin rate, 500 mL/hour of 10-40 units/1000mL solution; Titrate infusion rate to uterine tone
- Continue vigorous fundal massage
- Administer Methergine 0.2 mg IM per protocol (if not hypertensive); give once, if no response, move to alternate agent; if good response, may give additional doses q 2 hr
- Vital Signs, including O2 sat & level of consciousness (LOC) q 5 minutes
- Weigh materials, calculate and record cumulative blood loss q 5-15 minutes
- Administer oxygen to maintain O2 sat at >95%
- Empty bladder: straight cath or place Foley with urimeter
- Type and Crossmatch for 2 units Red Blood Cells STAT (if not already done)
- Keep patient warm

Physician or midwife:
- Rule out retained Products of Conception, laceration, hematoma

Surgeon (If cesarean birth and still open)
- Inspect for uncontrolled bleeding at all levels, esp. broad ligament, posterior uterus, and retained placenta

THINK

Consider potential etiology:
- Uterine atony
- Trauma/Laceration
- Retained placenta
- Amniotic Fluid Embolism
- Uterine Inversion
- Coagulopathy
- Placenta Accreta

Once stabilized: Modified Postpartum management with increased surveillance

If: Continued bleeding or Continued Vital Sign instability, and <1500 mL cumulative blood loss proceed to STAGE 2

UTEROTONIC AGENTS for POSTPARTUM HEMORRHAGE

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Route</th>
<th>Frequency</th>
<th>Side Effects</th>
<th>Contraindications</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitocin® (Oxytocin)</td>
<td>10-40 units per 1000mL rate titrated to uterine tone</td>
<td>IV infusion</td>
<td>Continuous</td>
<td>Usually none Nausea, vomiting, hypotension (water intoxication) with prolonged IV admin. ↓ BP and ↓ HR with high doses, esp IV push</td>
<td>Hypersensitivity to drug</td>
<td>Room temp</td>
</tr>
<tr>
<td>Methergine® (Methylergonovine)</td>
<td>0.2mg/ml</td>
<td>IM (not given IV)</td>
<td>q 2-4 hours</td>
<td>- if no response after first dose, it is unlikely that additional doses will be of benefit</td>
<td>Hypertension, PIH, Heart disease Hypersensitivity to drug Caution if multiple doses of ephedrine have been used, may exaggerate hypertensive response w/possible cerebral hemorrhage</td>
<td>Refrigerate Protect from light</td>
</tr>
<tr>
<td>Hemabate® (15-methyl PG F2a)</td>
<td>250 mcg</td>
<td>IM or intra-myometrial (not given IV)</td>
<td>q 15-90 min</td>
<td>- if no response after several doses, it is unlikely that additional doses will be of benefit</td>
<td>Nausea, vomiting, Diarrhea Fever (transient), Headache Chills, shivering Hypertension Bronchospasm</td>
<td>Caution in women with hepatic disease, asthma, hypertension, active cardiac or pulmonary disease Hypersensitivity to drug</td>
</tr>
<tr>
<td>Cytotec® (Misoprostol)</td>
<td>800-1000mcg</td>
<td>Per rectum (PR)</td>
<td>One time</td>
<td>Nausea, vomiting, diarrhea Shivering, Fever (transient) Headache</td>
<td>Rare Known allergy to prostaglandin Hypersensitivity to drug</td>
<td>Room temp</td>
</tr>
</tbody>
</table>
## 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>
<tbody>
<tr>
<td><strong>Primary nurse (or charge nurse):</strong></td>
<td><strong>Team leader (OB physician):</strong></td>
<td><strong>Sequentially advance through procedures and other interventions based on etiology:</strong></td>
</tr>
<tr>
<td>- Call obstetrician to bedside</td>
<td>- Additional uterotonic medication: Hemabate 250 mcg IM [if not contraindicated] <strong>OR</strong> Misoprostol 800-1000 mg PR</td>
<td>- Vaginal birth</td>
</tr>
<tr>
<td>- Call Anesthesiologist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Activate Response Team.</td>
<td>- Can repeat Hemabate up to 3 times every 20 min; (note-75% respond to first dose)</td>
<td>- If trauma (vaginal, cervical or uterine):</td>
</tr>
<tr>
<td><strong>PHONE #:</strong></td>
<td><strong>Do not delay other interventions</strong> (see right column) while waiting for response to medications</td>
<td></td>
</tr>
<tr>
<td>- Notify Blood bank of hemorrhage; order products as directed</td>
<td>- Bimanual uterine massage</td>
<td>- Visualize and repair</td>
</tr>
<tr>
<td><strong>Charge nurse:</strong></td>
<td>- Move to OR (if on postpartum unit, move to L&amp;D or OR)</td>
<td>- If retained placenta:</td>
</tr>
<tr>
<td>- Notify Perinatologist or 2nd OB</td>
<td>- Order 2 units PRBCs and bring to the bedside</td>
<td></td>
</tr>
<tr>
<td>- Initiate OB Hemorrhage Record</td>
<td>- Order labs STAT (CBC/Pfts, Chem 12 panel, Coag Panel II, ABG)</td>
<td>- D&amp;C</td>
</tr>
<tr>
<td>- If selective embolization, call-in Interventional Radiology Team and second anesthesiologist</td>
<td><strong>Transfuse PRBCs based on clinical signs</strong> and response, <strong>do not wait</strong> for lab results</td>
<td>- If uterine atony or lower uterine segment bleeding:</td>
</tr>
<tr>
<td>- Notify nursing supervisor</td>
<td>Primary nurse:</td>
<td></td>
</tr>
<tr>
<td>- Assign single person to communicate with blood bank</td>
<td>- Establish 2nd large bore IV, at least 18 gauge</td>
<td>- Intrauterine Balloon</td>
</tr>
<tr>
<td>- Call medical social worker or assign other family support person</td>
<td>- Assess and annoucne Vital Signs and cumulative blood loss q 5-10 minutes</td>
<td><strong>If above measures unproductive:</strong></td>
</tr>
<tr>
<td></td>
<td>- Set up blood administration set and blood warmer for transfusion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Administer meds, blood products and draw labs, as ordered</td>
<td>- Selective embolization (Interventional Radiology if available &amp; adequate experience)</td>
</tr>
<tr>
<td></td>
<td>- Keep patient warm</td>
<td><strong>C-section:</strong></td>
</tr>
<tr>
<td><strong>Second nurse</strong> (or charge nurse):</td>
<td><strong>Blood Bank:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Place Foley with urimeter (if not already done)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obtain portable light and OB procedure tray or Hemorrhage cart</td>
<td><strong>If Uterine Inversion:</strong></td>
</tr>
<tr>
<td></td>
<td>Obtain blood products from the Blood Bank</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assist with move to OR (if indicated)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determine availability of thawed plasma, fresh frozen plasma, and platelets; initiate delivery of platelets if not present on-site</td>
<td><strong>If Amniotic Fluid Embolism:</strong></td>
</tr>
<tr>
<td></td>
<td>Consider thawing 2 FFP (takes 30 min), use if transfusing &gt;2 units PRBCs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prepare for possibility of massive hemorrhage</td>
<td></td>
</tr>
</tbody>
</table>

- **Re-Evaluate Bleeding and Vital Signs**
  - If cumulative blood loss >1500ml, >2 units PRBCs given, VS unstable or suspicion for DIC, proceed to STAGE 3
  - Once stabilized: Modified Postpartum management with increased surveillance

California Maternal Quality Care Collaborative (CMQCC): Hemorrhage Taskforce (2009) visit: www.CMQCC.org
“Medicine is the last high-risk industry that expects people to perform perfectly in complex, rare emergencies but does not support them with high-quality training and practice throughout their careers.”

“Certain individual and team skills require regular practice that cannot ethically occur in routine care.”
Can we lower the frequency and morbidity/mortality of OB Hemorrhage?

- **Lower the incidence:**
  - Reduce the cesarean birth rate (both primary and repeat)
  - Reduce chorioamnionitis
  - Fewer multiple gestations
  - Reduce long inductions of labor
  - Reduce long second stages

- **Respond rapidly to OB hemorrhage:**
  - Use the new techniques and respond in an organized, well-executed, timely fashion
  - Keep a small hemorrhage from evolving into a massive hemorrhage
CMQCC Hemorrhage Task Force
Best Practice Documents:

Hemorrhage Background and Preparation

- Definitions, Early Recognition and Response Triggers
- Congenital Coagulation Disorders
- OB Care for Pregnant Women who Decline Transfusion
  - Checklist for OB Care for Jehovah’s Witness
  - Informed Consent for Blood Products Jehovah’s Witness
  - Protocol for IV Iron Sucrose
- Placenta Accreta and Percreta: Risks, Dx and Tx
- Hemorrhage Kits, Carts and Trays
- Simulations and Drills-Scenarios and Worksheets
- Lessons Learned from New York and Washington State Taskforces

www.cmqcc.org/ob_hemorrhage
CMQCC Hemorrhage Task Force

Best Practice Documents:

Hemorrhage Management

- Active Management of 3rd Stage Labor
- Blood Loss: Clinical Techniques for Ongoing Quantitative Measurement
- Blood Product Replacement
  - Massive Transfusion Protocol
  - Intrauterine Balloons (coming Soon)
- Surgery: B-Lynch Sutures, Uterine Artery Occlusion
- Utertonic Agent Summary Sheet
- Anti-Shock Garments
- Family Support

www.cmqcc.org/ob_hemorrhage
What’s New--Summary

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- Active management of the 3rd stage for all
- Vital sign triggers
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- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol
Any Questions?

Become a CMQCC member and keep up-to-date:

www.cmqcc.org