Obstetrical Hemorrhage 2.0

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Objectives

1. Describe the importance of proper management of obstetrical hemorrhage
2. Describe the key aspects of a hemorrhage protocol
3. Understand basic principles/components of a massive transfusion protocol
4. Explain the concept of delay and denial in cases of maternal death due to obstetrical hemorrhage
Disclosure

- The presenter has no financial disclosures
National OB Safety Focuses

1. Obstetrical Hemorrhage
2. Hypertension
3. VTE
4. Cardiovascular Disease
5. Primary Cesarean Section
AIM: Obstetric Hemorrhage Safety Bundle

Readiness: (every unit)
- Hemorrhage Cart / with Procedural Instructions (balloons, compression stiches)
- 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)

Response: (every hemorrhage)
- Unit-standard, stage-based OB Hemorrhage Emergency Management Plan w/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?

- 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)
Mortality From Hemorrhage: Mostly Avoidable

<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>
<th>Strong/Good</th>
<th>Some</th>
<th>None</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetric hemorrhage</td>
<td></td>
<td>69</td>
<td>25</td>
<td>6</td>
<td>16 (11)</td>
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<tr>
<td>Deep vein thrombosis/pulmonary embolism</td>
<td></td>
<td>53</td>
<td>40</td>
<td>7</td>
<td>15 (10)</td>
</tr>
<tr>
<td>Sepsis/infection</td>
<td></td>
<td>50</td>
<td>40</td>
<td>10</td>
<td>10 (7)</td>
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<tr>
<td>Preeclampsia/eclampsia*</td>
<td></td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>24 (17)</td>
</tr>
<tr>
<td>Cardiomyopathy and other cardiovascular causes*</td>
<td></td>
<td>25</td>
<td>61</td>
<td>14</td>
<td>28 (19)</td>
</tr>
<tr>
<td>Cerebral vascular accident</td>
<td></td>
<td>22</td>
<td>0</td>
<td>78</td>
<td>9 (6)</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td></td>
<td>0</td>
<td>87</td>
<td>13</td>
<td>15 (10)</td>
</tr>
<tr>
<td>All other causes of death</td>
<td></td>
<td>46</td>
<td>46</td>
<td>8</td>
<td>26 (18)</td>
</tr>
<tr>
<td>Total (%)</td>
<td></td>
<td>40</td>
<td>48</td>
<td>13</td>
<td>143*</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.

Maternal Mortality Rate, California Residents; 1970-2010

Maternal Mortality Rates by Race/Ethnicity, California Residents; 1999-2010

Severe Maternal Morbidity with Obstetric Hemorrhage

**Hospital Trend**

- Definition
- Comparisons
- By Payer

**Description**

Severe Maternal Morbidity (SMM) per 100 women with obstetric hemorrhage

**Selected reports:**
- Memorial Systemwide
- Miller Children’s Hospital-Long Beach
- Orange Coast Memorial Medical Center
- CA MDC

**2014 California:** 8.2%

<table>
<thead>
<tr>
<th>Period</th>
<th>Saddleback Memorial Medical Center</th>
<th>Memorial Systemwide Rate</th>
<th>Miller Children’s Hospital-Long Beach Rate</th>
<th>Orange Coast Memorial Medical Center Rate</th>
<th>CA MDC Rate</th>
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</thead>
<tbody>
<tr>
<td>2014</td>
<td>6.7%</td>
<td>6.3%</td>
<td>7.3%</td>
<td>7.9%</td>
<td>8.1%</td>
</tr>
<tr>
<td>2013</td>
<td>6.8%</td>
<td>5.7%</td>
<td>6.2%</td>
<td>5.9%</td>
<td>8.6%</td>
</tr>
<tr>
<td>2012</td>
<td>14.2%</td>
<td>9.6%</td>
<td>6.1%</td>
<td>11.4%</td>
<td>8.7%</td>
</tr>
<tr>
<td>2011</td>
<td>11.6%</td>
<td>6.3%</td>
<td>2.8%</td>
<td>6.7%</td>
<td>7.9%</td>
</tr>
</tbody>
</table>
CA-PAMR: CA-Pregnancy Associated & Pregnancy Related Mortality Review Advisory Committee

- Honoring Women’s Lives
- Honoring the Teams Caring for Women
- Extracting Actionable Lessons

Methodology:
**Composite Case:** 24yo woman, G2 P1 at 38 wks gestation induced for “tired of being pregnant”

1. After 8hr active phase and 2 hr 2\textsuperscript{nd} stage, had a NSVD of an 8lb 6oz infant.

2. 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).

3. The nurses called the physician 30 min later to report more bleeding and further Methergine was ordered.

4. 60min after the call, the physician performed a D&C with minimal return of tissue. More Methergine was given.
Composite Case: 24yo woman, G2 P1 at 38 wks gestation induced for “tired of being pregnant”

5. 45 min later a second D&C was performed, again with minimal returns. EBL now >2,000.

6. Delays in blood transfusion because of inability to find proper tubing.

7. Anesthesia is delayed, but a second IV started for more crystalloid. VS now markedly abnormal, P=144, BP 80/30

8. One further methergine given and patient taken for a 3rd D&C. now has gotten 2u PRBCs

9. After completion, she had a cardiac arrest from hypovolemia /hypoxia and was taken to the ICU when she succumbed 3 hours later.
Another prototypical case

G3P1, post dates induction: cervidil and oxytocin
Vacuum-assisted birth with immediate hemorrhage
- Treatment within 20 minutes of delivery: improvement
  - Massage, Methergine, Hemabate, Curettage
- OB leaves hospital.
- OB returns (35 minutes later) after continued bleeding and hypotension.
  - Above steps repeated twice, plus packing.
- Delay in getting and administering blood and higher level medical attention.
- Patient codes.
- First unit of PRBC given 2½ hours after hemorrhage starts.
- Multiple organ failure, anoxic brain injury, death 14 days PP.
Key 2008 HTF Survey Findings

- 40% of hospitals did not have a hemorrhage protocol
- Inconsistent definitions of hemorrhage
- 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

CMQCC: Transforming Maternity Care
Quality Improvement Opportunities Identified through PAMR & 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” v. PRBCs
- Enhance Teamwork and Communications!
Recommendations Summary

- Quantification of blood loss for all
- Active management of the 3\textsuperscript{rd} 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 cmqcc.org/ob_hemorrhage

CMQCC: Transforming Maternity Care
OB Hemorrhage: How Much is Too Much?

- >500 cc for vaginal delivery and >750 cc for C/S
  - BUT 500 cc for NSVD is the average
  - 750 cc for C/S is average
  - And for most women well tolerated
- WHO defines
  - EBL of >500 cc an “alert line”
  - >1000 cc an “action line”
- ACOG (revITALize)
  - Cumulative EBL >1,000ml for either vaginal or cesarean birth with enhanced surveillance and early interventions, as needed, for 500-1000ml.
- 4-5% of women >1000 cc
  - A clinically significant amount!!
Maternal Physiology: Cool Facts

- **Blood volume**
  - 60 kg gravid women about 6 L by 30 weeks

- **Uterus weight**
  - Pre pregnancy: 40 – 70 grams
  - Third trimester: 1,200 grams

- **Uterus capacity**
  - Pre pregnancy: 10 mls
  - Third trimester: 5,000 mls

- **Blood Flow**
  - Pre pregnancy: 2% cardiac output
  - Third trimester: 17% cardiac output
    - 600 – 800 ml/min
## 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 cc</td>
<td>15%</td>
<td>Orthostatic Tachycardia</td>
</tr>
<tr>
<td>II</td>
<td>&lt;1500 cc</td>
<td>15-25%</td>
<td>Resting tachycardia, orthostatic hypotension</td>
</tr>
<tr>
<td>III</td>
<td>&lt;2,500 cc</td>
<td>25-40%</td>
<td>Resting hypotension, oliguria</td>
</tr>
<tr>
<td>IV</td>
<td>&gt;2,500 cc</td>
<td>&gt;40%</td>
<td>Obtunded, Cardiovascular collapse</td>
</tr>
</tbody>
</table>
Design Goals

- Make it easy to do the right thing
- Hardwire changes into routine practice:
  - via 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>🟢</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>✓</td>
</tr>
</tbody>
</table>
Obstetric Hemorrhage Safety Bundle

**Readiness: (every unit)**
- Hemorrhage Cart / with Procedural Instructions (balloons, compression stitches)
- Rapid access to hemorrhage medications (kit or equivalent)
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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)
  - We recommend QBL
California Obstetric Hemorrhage Guidelines:

**Stage 0** (ie BE PREPARED)
- Risk assessment on admission
- Active management 3\textsuperscript{rd} 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 and 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
Part 2: Risk Factors

- RN to chart patient risk factors
- Hemorrhage Risk Score auto-calculates

### Hemorrhage Risk Factor Evaluation

#### Low (0 points each)
- No previous uterine incision
- Singleton pregnancy
- Less than or equal to 4 previous vaginal births
- No known bleeding disorder
- No history of PPH

#### Medium (1 point each)
- Prior cesarean birth(s) or uterine surgery
- Multiparous gestation
- Greater than four previous vaginal births
- Chorioamnionitis
- History of PPH
- Large uterine fibroids
- Estimated fetal weight greater than 4 kg
- Morbid Obesity (BMI greater than 35)
- Prolonged second stage labor
- Prolonged oxytocin use
- Active Bleeding
- Magnesium sulfate treatment
- Hematocrit less than 30

#### High (2 points each)
- Placenta previa, low lying placenta
- Suspected placenta accreta, percreta, increta
- Platelets less than 100,000
- Active bleeding (greater than show) on admit
- Coagulopathy

Prolonged second stage labor:
- Nulliparous: Greater than 3 hours with anesthesia or greater than 2 hours without anesthesia
- Multiparous: Greater than 2 hours with anesthesia or greater than 1 hour without anesthesia

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Definitions provided for you
<table>
<thead>
<tr>
<th>Age</th>
<th>EGA</th>
<th>G</th>
<th>T</th>
<th>P</th>
<th>A</th>
<th>L</th>
<th>Comment</th>
<th>Freq</th>
<th>ROM</th>
<th>Color</th>
<th>DI</th>
<th>EF</th>
<th>ST</th>
<th>PRES</th>
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<td>17</td>
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<td>0*</td>
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<td>0*</td>
<td>0*</td>
<td>labor, epidural</td>
<td>Continuous*</td>
<td>Intact*</td>
<td>Mecon 10</td>
<td>10</td>
<td>10</td>
<td>C+2</td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>✔️</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>SVD § 6/18 1413, couplet</td>
<td>Continuous*</td>
<td>AROM Clear*</td>
<td>10</td>
<td>10</td>
<td>C+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>✔️</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>SVD 6/17 @ 15:43, couplet; breech, respiratory</td>
<td>Continuous*</td>
<td>AROM</td>
<td>10</td>
<td>10</td>
<td>C+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>✔️</td>
<td>2*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>non-reactive NST, IUGR, breech, repeat BPP in AM,</td>
<td>Continuous*</td>
<td>AROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>31</td>
<td>✔️</td>
<td>1/7</td>
<td>3*</td>
<td>0*</td>
<td>2*</td>
<td>0*</td>
<td>IOL, &quot;Pre-E&quot;, CRB removed 6/19, pit, FSE, IUPC;</td>
<td>Continuous*</td>
<td>AROM Clear*</td>
<td>6*</td>
<td>80*</td>
<td>-1*</td>
<td>Cepha</td>
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<tr>
<td>30</td>
<td>✔️</td>
<td>2/7</td>
<td>2*</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>1*</td>
<td>Txf Comm. East, Pre-E, BMTZ x1 @ 1918, Mag 2 g, u/s 6/19, prior c/s</td>
<td>TID*</td>
<td>Intact*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>✔️</td>
<td>0/7</td>
<td>6*</td>
<td>0*</td>
<td>4*</td>
<td>0*</td>
<td>IDDM, blood sugar control, SOB, cHTN, heart or kidney failure?</td>
<td>TID*</td>
<td>Intact*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>✔️</td>
<td>0/7</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>PPROM 5/31, Fetal TOF, s/p BMTZ x2, U/CH, AFI 7.6, SW involved, Smoker, Wheelchair rides daily. Issues with mom on hourly rounding. Last US 6/18. Echo 6/18</td>
<td>TID*</td>
<td>PPRO Clear*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>✔️</td>
<td>3/7</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>preterm labor- twins</td>
<td>Continuous*</td>
<td></td>
<td>2*</td>
<td>60*</td>
<td>0*</td>
<td></td>
<td></td>
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<tr>
<td>25</td>
<td>✔️</td>
<td>2/7</td>
<td>1*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>IOL, mono-mono twin fetal demise, cytotec #6 @ 0600</td>
<td>Blood*</td>
<td>1*</td>
<td>60*</td>
<td>-1*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Current Controversies: Active Management of Third Stage (AMTSL)

- Benefits vs potential harms – are there unintended consequences?
- Appropriate candidates – do low-risk women benefit?
- Cord clamping – what about delayed clamping?
- Component elements – which aspects are effective?
Cochrane Review 2011
Begley, Gyte, Devane, McGuire, & Weeks, Cochrane Library
11

- 7 studies, 8247 women
- 6 high-income countries, 1 low-income
- 4 studies active vs. expectant
- 3 studies active vs “mixture of managements”
- Primary outcomes:
  - PPH >1000 ml; PPH >2500 ml; maternal death
  - Maternal Hb 9 g/dL 24-72 hours postpartum
- All sample sizes substantially smaller than optimal information size
Active management reduced risk of bleeding, but could be due to uterotonic.

Increased rates of HTN, return to hospital for bleeding in active management group.

Possible decrease in average blood volume of newborns in active management group.

No difference in rate of severe bleeding in low-risk women.

GRADE scores for primary outcomes low.

Additional new studies support these conclusions (e.g. Sheldon et al 2013 and the TRACOR trial).
Conclusions

- We previously recommended a package of interventions:
  - oxytocin infusion, cord clamping and cutting, controlled cord traction, and vigorous fundal massage, commonly referred to as active management of the third stage of labor.

- New data and recent systematic reviews
  - identified significant risk of bias in previous studies and
  - called the efficacy of various components of AMSTL into question.

- Studies evaluating the individual components
  - confirmed only oxytocin administration as effective
  - particularly in high resource settings and in low risk women

- Delayed cord clamping does not increase the risk for hemorrhage
  - AMSTL should not interfere with the practice of delayed cord clamping for newborn benefit.
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
Every hospital will need to customize the protocol—but the point is every hospital needs one.
## Medication Recommendations 2.0

<table>
<thead>
<tr>
<th>Prevention</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytocin or 10-40 international units/500-1000 mL IV infusion titrated to uterine tone OR Oxytocin 10 units IM when no IV access</td>
<td>Rapid infusion of IV oxytocin 10-40 IU/500-1000 mL at ( \geq 500 ) ml/hour, titrated to response</td>
</tr>
</tbody>
</table>

Choose a standard second line agent
- Methergine 0.2 mg IM
- Misoprostol 600 mcg orally or 800 mcg sublingually
- Hemabate 250 mcg IM or intramyometrially
California Ob Hemorrhage Guidelines:

- **Stage 1**: EBL > 500 cc (vaginal) or > 1000 cc (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 urometer
    - Blood bank: T and C 2 units
    - Quantify blood loss
Hemorrhage Medication Kits

OB Hemorrhage Cart: L&D and Postpartum Labor and Delivery Emergency Hysterectomy Tray for L&D OR Suite

Suggested medication and instrument lists available in the CMQCC OB Hemorrhage Toolkit
Long Beach Memorial OB Hemorrhage Cart

- Quick access to emergency supplies
- Refrigerator for meds
- Establish necessary items and par levels
- Label drawers/compartment
- Include checklists
- Develop process for checking and restocking
- Educate nursing and physician staff
Long Beach Memorial Obstetric Hemorrhage Cart: OR

- IV start
  - 16 gauge angiocaths
  - Blood draw tubes
    - Red top, blue top, tiger top
  - IV pressure bags
  - Foley with urometer
  - Sutures for B-lynch and modified B-lynch techniques
    - #1 Vicryl, standard x 2
    - #1 Monocryl, 36” long on curved 90 mm blunt needle
- Laminated 8 x 11” diagram
  - B-Lynch technique
  - Modified B-Lynch technique
- Hunter’s curette
- Right angle retractors
- Eastman vaginal retractors
- Ring forceps x 4
- Short Allis tissue forceps x 2
- Bakri balloon
  - 500 cc fluid for filling
  - Bag for drainage collection
- Kerlex roll
- Vaginal pack
CMQCC OB Hemorrhage Protocol

## 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 or midwife):</strong></td>
<td>Seqequentially advance through procedures and other interventions based on etiology:</td>
</tr>
<tr>
<td>☐ Call obstetrician or midwife to bedside</td>
<td>☐ Additional uterotonic medication: Hemabate 250 mcg IM [if not</td>
<td><strong>Vaginal birth</strong></td>
</tr>
<tr>
<td>☐ Call Anesthesiologist</td>
<td>contraindicated] OR Misoprostol 800 mcg SL</td>
<td>• Visualize and repair</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 retained placenta:</td>
</tr>
<tr>
<td>PHONE #:</td>
<td><strong>Do not delay other interventions</strong> (see right column) while waiting for response to medications</td>
<td><strong>D&amp;C</strong></td>
</tr>
<tr>
<td>☐ Notify blood bank of hemorrhage; order products as directed</td>
<td>☐ Bimanual uterine massage</td>
<td><strong>If uterine atony or lower uterine segment bleeding:</strong></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>• Intrauterine Balloon</td>
</tr>
<tr>
<td>☐ Notify Perinatologist or 2nd OB</td>
<td>☐ Order 2 units PRBCs and bring to the bedside</td>
<td><strong>If above measures unproductive:</strong></td>
</tr>
<tr>
<td>☐ Bring hemorrhage cart to the patient's location</td>
<td>☐ Order labs STAT (CBC/Pts, Chem 12 panel, Coag Panel II, ABG)</td>
<td>• Selective embolization (Interventional Radiology if available &amp; adequate experience)</td>
</tr>
<tr>
<td>☐ Initiate OB Hemorrhage Record</td>
<td><strong>Transfuse PRBCs based on clinical signs</strong> and response, do not wait for lab results</td>
<td><strong>C-section:</strong></td>
</tr>
<tr>
<td>☐ If considering selective embolization, call in Interventional Radiology</td>
<td><strong>Primary nurse:</strong></td>
<td>• B-Lynch Suture</td>
</tr>
<tr>
<td>Team and second anesthesiologist</td>
<td>☐ Establish 2nd large bore IV, at least 18 gauge</td>
<td>• Intrauterine Balloon</td>
</tr>
<tr>
<td>☐ Notify nursing supervisor</td>
<td>☐ Assess and announce Vital Signs and cumulative blood loss q 5-10 minutes</td>
<td><strong>If Uterine Inversion:</strong></td>
</tr>
<tr>
<td>☐ Assign single person to communicate with blood bank</td>
<td>☐ Set up blood administration set and blood warmer for transfusion</td>
<td>• Anesthesia and uterine relaxation drugs for manual reduction</td>
</tr>
<tr>
<td>Assign second attending or clinical nurse specialist as family support person or call medical social worker</td>
<td>☐ Administer meds from the Blood Bank</td>
<td><strong>If Amniotic Fluid Embolism:</strong></td>
</tr>
<tr>
<td></td>
<td>☐ Assist with move to OR (if indicated)</td>
<td>• Maxmally aggressive respiratory, vasopressor and blood product support</td>
</tr>
<tr>
<td></td>
<td><strong>Second nurse (or charge nurse):</strong></td>
<td><strong>If vital signs are worse than estimated or measured blood loss; possible uterine rupture or broad ligament tear with internal bleeding; move to laparotomy</strong></td>
</tr>
<tr>
<td>☐ Place Foley with urimeter (if not already done)</td>
<td>☐ Obtain blood products from the Blood Bank</td>
<td><strong>Once stabilized:</strong></td>
</tr>
<tr>
<td></td>
<td>☐ Obtain portable light and OB procedure tray or Hemorrhage cart</td>
<td>• Modified Postpartum management with increased surveillance</td>
</tr>
<tr>
<td></td>
<td>☐ Assist with move to OR (if indicated)</td>
<td></td>
</tr>
</tbody>
</table>
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>
California Obstetric Hemorrhage Guidelines:

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

  - Massive transfusion protocol
    - Transfuse aggressively
      - Near 1:1 ratio PRBC: FFP
      - 1 PLT pheresis pack per 4-6 units PRBC

  - Invasive surgical techniques

  - Mobilize help
    - Advanced surgeon (gyn, gyn onc, trauma, MFM)
The Lethal Triad
Coagulopathy: Why?

- **Dilutional**
  - Transfusion of crystalloid and packed cells devoid of clotting factors
  - A problem once 1 - ½ total blood volume replaced

- **Hypothermia**
  - Significantly decreases platelet function: even if counts are adequate

- **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!
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
An update on the use of massive transfusion protocols in obstetrics

Luis D. Pacheco, MD; George R. Saade, MD; Maged M. Costantine, MD; Steven L. Clark, MD; Gary D. V. Hankins, MD

Obstetric hemorrhage remains a leading cause of maternal mortality worldwide. New concepts involving the pathophysiology of hemorrhage have been defined. Early activation of both the protein C and fibrinolytic pathways in massive hemorrhage treatment include the use of hemostatic resuscitation. The evidence for the use of the various blood products is still unknown. Protocols involve early utilization of blood products and limit the need for massive crystalloid-based resuscitation. The evidence for resuscitation has changed in the last few years, and debate is ongoing on transfusion strategies. The use of tranexamic acid, fibrinogen coagulation complex concentrates has emerged as new potential strategies with improved safety profiles.

Key words: hemostatic resuscitation, massive transfusion, obstetric hemorrhage

### TABLE

<table>
<thead>
<tr>
<th>Massive transfusion protocol in obstetrics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRBCs</strong></td>
</tr>
<tr>
<td>Round 1</td>
</tr>
<tr>
<td>Round 2</td>
</tr>
<tr>
<td>Round 3</td>
</tr>
<tr>
<td>Round 4</td>
</tr>
</tbody>
</table>

Consider activating the protocol when hemorrhage is expected to be massive (anticipated need to replace 50% or more of blood volume within 2 hours), bleeding continues after the transfusion of 4 U of packed red blood cells within a short period of time (1-2 hours), or systolic blood pressure below 90 mm Hg and heart rate is above 120 beats per minute in the presence of uncontrolled bleeding. Once activated, blood bank personnel will continue preparing blood products until the surgical team inactivates the protocol. After round 4, if not inactivated, the protocol will start again from round 1.

**FFP**, fresh-frozen plasma; **PRBCs**, packed red blood cells. Adapted from Pacheco et al.4

New Choice for Fibrinogen Replacement?

Table I
Cryoprecipitate versus fibrinogen concentrate as fibrinogen replacement therapy.

<table>
<thead>
<tr>
<th>Cryoprecipitate</th>
<th>Fibrinogen concentrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No viral inactivation, potential risk of pathogen transmission</td>
<td>Viral inactivation, minimal risk of pathogen transmission</td>
</tr>
<tr>
<td>Variable fibrinogen levels, accurate dosing not possible</td>
<td>Standardised fibrinogen content, accurate and consistent dosing</td>
</tr>
<tr>
<td>Infusion volume lower than fresh-frozen plasma but higher than fibrinogen concentrate</td>
<td>Low infusion volume</td>
</tr>
<tr>
<td>Must be thawed before infusion, ABO compatibility is required</td>
<td>Rapidity of reconstitution, no cross-matching required</td>
</tr>
</tbody>
</table>

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
CMQCC OB Hemorrhage Protocol

STAGE 3: OB Hemorrhage
Cumulative blood loss >1500ml, >2 units PRBCs given, VS unstable or suspicion for DIC

MOBILIZE
- Nurse or Physician:
  - Activate Massive Hemorrhage Protocol
- PHONE #: [Contact number]
- Charge Nurse or designee:
  - Notify advanced Gyn surgeon (e.g., Gyn Oncologist)
  - Notify adult intensivist
  - Call-in second anesthesiologist
  - Call-in OR staff
  - Ensure hemorrhage cart available at the patient’s location
  - Reassign staff as needed
  - Call-in supervisor, CNS, or manager
- Continue OB Hemorrhage Record (In OR, anesthesiologist will assess and document VS)
- If transfer considered, notify ICU

ACT
- Establish team leadership and assign roles
  - Team leader (OB physician + OB anesthesiologist, anesthesiologist and/or perfusionist and/or intensivist);
  - Order Massive Hemorrhage Pack (RBCs + FFP + 1pheresis pack PLTS—see note in right column)
  - Move to OR if not already there
  - Repeat CBC/PLTS, Coag Panel II STAT and Chem 12 panel q 30-60 min
- Anesthesiologist (as indicated):
  - Arterial blood gases
  - Central hemodynamic monitoring
  - CVP or PA line
  - Arterial line
  - Vasopressor support
  - Intubation
  - Calcium replacement
  - Electrolyte monitoring
- Primary nurse:
  - Announce VS and cumulative measured blood loss q 5-10 minutes
  - Apply upper body warming blanket if feasible
  - Use fluid warmer and/or rapid infuser for fluid & blood product administration
  - Apply sequential compression stockings to lower extremities
  - Circulate in OR
- Second nurse and/or anesthesiologist:
  - Continue to administer meds, blood products and draw labs, as ordered
- Third Nurse (or charge nurse):
  - Recorder

THINK
- Selective Embolization (IR)
- Interventions based on etiology not yet completed
- Prevent hypothermia, acidemia
- Conservative or Definitive Surgery:
  - Uterine Artery Ligation
  - Hysterectomy

For Resuscitation:
Aggressively Transfuse Based on Vital Signs, Blood Loss
After the first 2 units of PRBCs
KEY:
- Near equal FFP and RBC for massive hemorrhage:
  - 4-8 PRBCs: 4 FFP: 1 apheresis Platelets

Unresponsive Coagulopathy:
- Role of rFactor VIII is controversial. After 8-10 units PRBCs and coagulation factor replacement may consider risk/benefit of rFactor VIII in consultation with hematologist or trauma surgeon

Once Stabilized: Modified Postpartum Management with increased surveillance; consider ICU
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
- **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…
QBL

- Goal is NOT a “perfect, precise” number
- Of course inaccuracies will persist
  - Amniotic fluid contamination
  - Urine
  - Clots in the drapes
  - Etc
- QBL increases our knowledge of blood loss and is more accurate than EBL
  - When patient has a hemorrhage, doing QBL is second nature for the team/staff/unit
  - “This is how we do it here....”
  - Allows for earlier recognition of excessive blood loss and improved communication among team members.
  - Avoid delay in management of excessive blood loss
QBL: Vaginal Birth

With kind permission of Bev VanderWal, CNS
QBL: Cesarean Birth

- Two step, quick process 95% of the time
- Need a calculator. Make it easy.
  - Build into EMR
  - Excel spreadsheet or equivalent
- Start with cases of one or two physician champions: small test of change
- Move to all scheduled cases
- Add unscheduled cases
Routine Two Step Quantification of Blood Loss at CS

1  Suctioned blood
   a. Between delivery of infant and placenta;
      i. OB suctions drape of amniotic fluid
      ii. Scrub staff directs Circulator to change suction tubing to
          second canister
      iii. May omit switch to new canister if minimal amniotic fluid
           (patient is post AROM/SROM, in labor)
   b. Circulator records volume in second canister in spreadsheet
      calculator/EPIC calculator
      i. Record before irrigation used OR
      ii. If irrigation used and suctioned, Scrub staff communicates
          amount to Circulator to be subtracted from canister
      iii. Consider omitting irrigation use during routine cesarean
           section

2  Lap sponges
   a. During case, bloody lap sponges passed off scrub table by Scrub staff
   b. Circulator places in hanging lap sleeve bags (5 sponges/sleeve)
   c. Circulator weighs bloody sponges and lap sleeve bags all together
      near end of case (sponges left in sleeves)
   d. Total weight, # sponges weighed, # hanging sleeves weighed, entered
      in spreadsheet calculator/EPIC calculator
EMR: QBL Calculator

QBL Calculator in EMR Deliver Summary

<table>
<thead>
<tr>
<th>CESAREAN SECTION BLOOD LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection Volume (blood volume only)</td>
</tr>
<tr>
<td>Total Weight Laps + Sleeves</td>
</tr>
<tr>
<td>Lap Sleeves Used</td>
</tr>
<tr>
<td># of Laps Used</td>
</tr>
<tr>
<td># of Chux Used</td>
</tr>
<tr>
<td>Additional Source of Blood Loss Volume</td>
</tr>
<tr>
<td>Add &quot;Total Blood Loss Calculated&quot; below to &quot;Total Delivery Blood Loss&quot; section (for I&amp;O)</td>
</tr>
<tr>
<td>TOTAL BLOOD LOSS CALCULATED</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VAGINAL DELIVERY BLOOD LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method Of Quantification</td>
</tr>
<tr>
<td>EBL - Visual estimate only</td>
</tr>
<tr>
<td>QBL - Direct measure</td>
</tr>
<tr>
<td>QBL - Weight of blood soaked items</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL DELIVERY BLOOD LOSS (Vaginal or C/S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL/QLS, During Delivery (mL)</td>
</tr>
</tbody>
</table>

Courtesy of Jennifer McNulty, MD and used with permission
Order Sets
Observations from 4 Systems

- Saddleback Memorial
  - Reduction in hysterectomy with increased use of B-Lynch suture

- California Pacific Medical Center
  - Substantial reductions in blood product usage with protocol

- Dignity Health
  - Substantial reductions in blood product usage with protocol (Shields, et al 2013)

- Indiana University
  - 33% reduction in postpartum hemorrhage over 10 quarters with implementation of protocol
B-Lynch Compression Suture
“Belt and Suspenders”

Used with permission from Christopher B-Lynch
Cesarean Hysterectomies

SMMC
Version 2.0

- Oxytocin primary for AMSTL
- 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
Obstetric Hemorrhage: We Can Do Better

- Most maternal mortalities and near misses due to hemorrhage are preventable
- 1/3 of patients will have no risk factors
  - Must be prepared for every patient
  - QBL every delivery
- Requires reliance not on individuals but on team approach
- 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
OB Hemorrhage Toolkit: www.cmqcc.org/ob_hemorrhage

QUESTIONS?