Obstetric Hemorrhage: New Strategies, New Protocol
Hemorrhage remains the major cause of obstetric morbidity and mortality

- Hemorrhage >500ml (vaginal birth) = ~5-8%
- Transfusion (vaginal birth) = ~0.5%
- Transfusion (cesarean birth) = ~2%
- Severe (massive) hemorrhage (>4 units, >1500ml) = ~2/1,000 births

- 50-60% of severe morbidity in obstetrics
- >60% of all postpartum maternal ICU admissions
- The rate of severe hemorrhage is increasing, nearly doubling over the last decade
- The greatest cause of maternal mortality by far, world-wide
FIGURE 2
Annual rates of postpartum hemorrhage caused by atony, by mode of delivery, and by induction status (United States, 1994–2006)

California Pregnancy Associated Mortality Review: Years 2002-4
Improvement Opportunities Identified
(in addition to those noted by Doctors Company…)

- **DENIAL**: amount of blood loss underestimated/ ignored until patient very unstable
- **DENIAL**: expecting the bleeding “to stop soon”
- **DELAY**: hard to get the obstetrician back to the bedside for evaluation
- **DELAY**: repetitive use of the same procedure or medication (eg D&C, methergine) rather than moving up the protocol (“scratched record”)
- Not using non-invasive procedures such as intrauterine balloons or B-Lynch sutures

Elliott Main, MD, Chair, California Pregnancy Associated Mortality Review Committee: personal communication (January 2009)
Issues with Hemorrhage Response in Obstetrics (from case reviews)

- Denial, Delay…
- Poor quantification of blood loss
- Lack of step-wise progression
- Underutilization of non-pharmacologic approaches
- Poor utilization of blood products
  - “Too little, too late”—Resuscitation v. Treatment
  - “Old wine in new bottles”—“Whole blood” v. PRBCs
- Communications!
Step 1

Survey the state
OB Hemorrhage Survey Results: September, 2008

- Total Individual Respondents n = 240
- Total Hospitals n = 153
  53% of All CA hospitals with birth facilities >50 births (n=264)
- Respondent Type: RN 74% (n = 178)
  MD 21% (n = 52)
  Other 4% (n = 10)
## Frequency of Delays in obtaining blood products when needed
### By Individual Respondents n (% by row)

<table>
<thead>
<tr>
<th>Hospital Size: # Live Births (2005)</th>
<th>No Delay</th>
<th>No Blood Bank on-site</th>
<th>Lack of Prenatal Record</th>
<th>Blood Bank hesitancy to release O-</th>
<th>Blood bank closed/off hours</th>
<th>Blood Bank is busy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000 (33)</td>
<td>24 (73)</td>
<td>2 (6)</td>
<td>0 (0)</td>
<td>2 (6)</td>
<td>0 (0)</td>
<td>3 (9)</td>
<td>31 (94)</td>
</tr>
<tr>
<td>1001-3000 (121)</td>
<td>59 (49)</td>
<td>6 (5)</td>
<td>9 (7)</td>
<td>15 (12)</td>
<td>0 (0)</td>
<td>13 (11)</td>
<td>102 (84)</td>
</tr>
<tr>
<td>&gt;3000 (86)</td>
<td>47 (55)</td>
<td>2 (2)</td>
<td>5 (6)</td>
<td>13 (15)</td>
<td>0 (0)</td>
<td>12 (14)</td>
<td>79 (92)</td>
</tr>
<tr>
<td><strong>Total (240)</strong></td>
<td><strong>130 (54)</strong></td>
<td><strong>10 (4)</strong></td>
<td><strong>14 (6)</strong></td>
<td><strong>30 (12)</strong></td>
<td><strong>0 (0)</strong></td>
<td><strong>28 (12)</strong></td>
<td><em><em>212</em> (88)</em>*</td>
</tr>
</tbody>
</table>

*n=28 Missing responses*
Step 2

Hemorrhage Taskforce: Develop a Protocol/Method
Objectives

1. Define the scope and of the problem with maternal hemorrhage in California:
   - Gather and review statistics regarding maternal hemorrhage
   - Standardize definitions for OB hemorrhage
   - Outline the current state of each California hospital’s ability to respond effectively to OB hemorrhage.

2. Conduct gap analysis to identify opportunities for improving:
   - hemorrhage prevention efforts
   - hemorrhage response efforts
Objectives

3. Develop strategies for improvement based on analysis. Improvement strategies are likely to include:
   - CMQCC endorsed general hemorrhage protocol
   - CMQCC endorsed massive hemorrhage protocol
   - Provider education regarding hemorrhage in pregnancy
   - Risk-screening tools or strategies
   - Hemorrhage resource center on CMQCC website.

4. Develop strategies for wide spread application of selected improvement solutions
   - Role of collaboratives

CMQCC Hemorrhage Task Force
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 (scenarios provided)
Availability of Invasive Treatments as Reported by Hospital

Response shown is % Yes; alternative responses: No, Unknown, and Missing are not shown

Of All Responding Hospitals with births >50

- Intrauterine Balloon (%): 52%
- Uterine Artery Ligation (%): 62%
- B-Lynch Suturing (%): 40%
- Uterine Artery Embolization (%): 42%
- Hysterectomy (%): 89%

Types of Hospitals:
- <1000 births
- 1001-3000 births
- >3000 births
CMQCC OB Hemorrhage Care Guidelines

<table>
<thead>
<tr>
<th>Stage 0 Assessments</th>
<th>Meds/Procedures</th>
<th>Blood Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every woman in laboring birth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 0 focuses on risk assessment and active management of the third stage.**
- Assess every woman for risk factors for hemorrhage
- Ongoing quantitative evaluation of blood loss on every birth
- Active Management
  - 3rd Stage:
    - Oxygen IV infusion or 10u IM
    - Fudal Massage vigorous, 15 minutes min.
  - If Medium Risk: T65S
  - If High Risk: T&C 2 U
  - If Positive Antibody Screen (prenatal or current, exclude low level anti-D from RhoGAM: T&C 2 U)

**Stage 1 Blood loss: >500 ml vaginal or >1000 ml Cesarean, or VS changes (by >15% or HR >110, BP >85/45, O2 sat <95%)**

- Activate OB Hemorrhage Protocol and Checklist
- Notify Charge nurse, Anesthesia Provider
- VS, O2 Sat O2
- Calculate cumulative blood loss 0-15
- Weigh bloody materials
- Careful inspection with good surgical suture of vaginal wall, cervix, uterine cavity, placenta
- 4th IV access: at least 15gaug
- Increase Oxytocin rate, and repeat fundal massage
- Methylene 0.2mg IM (if not hypertensive)
- May repeat if good response to first dose, BUT otherwise move on to 2nd level uterine drug (see below)
- Empty bladder: straight cath or place Foley with urinometer
- T&C 2 Units PRBCs (if not already done)

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

- OB back to bedside (if not already there)
- Extra help: 2nd OB, Rapid Response Team (per hospital), assign roles
- VS & cumulative blood loss 0-5 min
- Weigh bloody materials
- Complete evaluation of vaginal wall, cervix, placenta, uterine cavity
- Send additional labs, including DIC panel
- If in Postpartum: Move to L&D/ OR
- Evaluate for special cases
- Uterine Inversion
- AMNH Fluid Embolism

- 2nd Line Uterotonic Drugs:
  - Methylergonovine 0.2mg IM or Mino 0.1mg IV
  - IV Access at least 15gaug
  - Vaginal Birth: (typical order)
    - Move to CR
    - Repair any tears
    - D&C: if retained placenta
    - Place intravenous balloon
    - Selective Embolization (Interventional Radiology)
    - Cesarean Birth: (all intra-op)
    - Intraoperative broad lig, posterior ureters and retained placenta
    - B-Lynch Suture
    - Place intravenous balloon

- Notify Blood Bank of OB Hemorrhage
- Bring 2 Units PRBCs to bedside: transfuse per clinical signs
- Do not wait for lab values
- Use warm blood for transfusion
- Consider continuing 2 FFP (max 35mm), use if transfusing >2 units PRBCs
- Determine availability of additional RBCs and other Coag products

**Stage 3 Total blood loss over 1500ml, or >2 units PRBCs given or VS unstable or suspicion of DIC**

- Mobilize team
  - Advanced GYN surgeon
  - Anesthesia Provider
  - CR staff
  - Adult Intensivist
  - Repeat labs including coags and ABO’s
  - Central line
  - Social Worker/ family support

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

- Transfuse Aggressively
  - Massive Hemorrhage Pack
  - N 1:1 PRBC:FFP
  - 1 PRBC per 5 units PRBC

- Unresponsive Coagulopathy
  - After 10 units PRBCs and full coagulation factor replacement
  - May consider factor VIIa

**Obstetric Hemorrhage Care Guidelines: Flow Chart Format**

<table>
<thead>
<tr>
<th>Pre-Admission</th>
<th>Time of Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify patients with special consideration: Placenta previa/posterior, bleeding disorder, patients who decline blood products</td>
<td>Follow appropriate workup, planning, preparing of resources, counseling and notification</td>
</tr>
</tbody>
</table>

**Screen All Admissions for hemorrhage risk: Low Risk, Medium Risk, High Risk**
- Low Risk: Hold clot
- Medium Risk: Type & Screen
- High Risk: Type & Crossmatch 2 Units PRBCs
- Review Hemorrhage Protocol

<table>
<thead>
<tr>
<th>Stage 0 All Births</th>
<th>Blood Loss: &gt;1000-1500 ml</th>
</tr>
</thead>
</table>
| All women receive active management of 1st stage | Oxytocin IV infusion of 10 Units IM
| Vaginal massage: for 15 minutes minimum |
| **Stage 1 Activate Hemorrhage Protocol** | **Stage 2** |
| Blood Loss: >500 ml vaginal or >1000 ml Cesarean | Blood Loss: >1500 ml |
| **Stage 3** | |
|COUMOCC OB Hemorrhage Care Guidelines|

**CMQCC**


Programs funded by grants from the California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division

CMQCC OB Hemorrhage Care Guidelines

CMQCC OB Hemorrhage Care Guidelines

CMQCC OB Hemorrhage Care Guidelines
OB Hemorrhage Algorithm/Checklist

**ALL OB PATIENTS**

**Pre-Admission Planning & Admission Assessment**
- Verify Type & Antibody Screen (T&S) available on prenatal record
- If not available, order T & S (lab will notify if 2nd clot needed for confirmation)
- If antibody screen positive, type/crossmatch x 2 units RBCs on admission
- All other patients, send specimen (clot) to blood bank

**Ongoing Risk Assessment**
- Evaluate for development of risk factors in labor
- Rapid labor
- Prolonged 2nd stage/Prolonged oxytocin use
- Active bleeding
- Chorioamnionitis
- Magnesium sulfate treatment
- Convert to T&S or Type & Cross per risk level (see Addendum A)

**STAGE 0**

**BIRTH & POSTPARTUM**

**Active Management of Third Stage:**
- Oxytocin bolus x 10-15 minutes (20units/oxytocin1000ml) or 10units IM
- Vigorous fundal massage for at least 15 seconds

**Ongoing Quantitative Evaluation of Blood Loss:**
- Use formal methodology (e.g., graduated containers, visual comparisons and weigh blood soaked materials
- 1gm weight = 1ml fluid/blood

**Ongoing Evaluation of Vital Signs**
- CUMULATIVE BLOOD LOSS > 500ml vag birth, >1000ml C/S birth -OR-
- VITAL SIGNS >15% change or HR ≥ 110, BP ≤ 85/45, O2 sat < 95% -OR-
- INCREASED BLEEDING, RECOVERY OR POSTPARTUM

**STAGE 1**

**MOBILIZE**
- Primary nurse to:
  - Notify obstetrician (in-house and attending)
  - Notify charge nurse
  - Notify anesthesiologist
  - Initiate OB Hemorrhage Record

**ACT**
- Primary nurse:
  - Establish IV access if not present
  - Increase IV Oxytocin rate to 500ml/hr
  - Continue vigorous fundal massage
  - Administer Methergine x 1 if not contraindicated (alternative Hemabate, Misoprostol)
  - Assess VS, including O2 sat q 5 minutes
  - Weigh materials and calculate cumulative blood loss q 5-15 minutes
  - Administer oxygen @ 10 L via face mask to maintain O2 sats at > 95%
  - Empty bladder: straight cath or place Foley with urimeter
  - Type and Crossmatch x 2units PRBCs (if not already done)

**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

**THINK**
- Consider potential etiology:
  - Uterine atony
  - Trauma/Laceration
  - Retained placenta
  - Amniotic fluid embolism
  - Uterine inversion
  - Coagulopathy
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!
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
What’s New--Summary

- Active management of the 3rd stage for all
- Formal assessment of blood loss
- 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
Importance of Drills / Simulations
Safety and QI Leader: Paul Preston, MD

“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.”
Step 3

Spread the word:
Hemorrhage Collaboratives
All Participating Hospitals:

n=24

COLLABORATIVE #1 (2 Years), n=15
- Alta Bates*
- California Pacific Medical Center*
- Cedars Sinai
- Doctors Medical Center of Modesto*
- Kaiser Roseville*
- Kaiser Santa Clara*
- Kaiser Panorama City*
- Kaiser San Diego*
- Kaiser West LA*
- Kern Medical Center*
- Long Beach Memorial*
- Maricopa Medical Center (AZ)*
- Marin General*
- Sutter Lakeside
- UC San Diego*

COLLABORATIVE #2 (1 Year), n=9
- Contra Costa Regional Med Center*
- John Muir Med Center*
- Kaiser Hayward*
- Kaiser Oakland*
- Kaiser San Jose*
- Kaweah Delta Medical Center*
- Lucile Packard Children’s
- Orange Coast Memorial*
- Saddleback Memorial

*Data is included in analyses presented in subsequent slides
CMQCC OB Hemorrhage Collaborative

COLLABORATIVE AIMS:

- Reduce the number of massive hemorrhages and the number of major complications from massive hemorrhage, including transfusions and hysterectomies, for all birthing women in participating hospitals by 50% by December 31, 2011
- All collaborative participants develop and implement a multidisciplinary team response to every massive obstetric hemorrhage by December 31, 2011

COLLABORATIVE CONTENT:

- Collaborative #1: Three in-person Learning Sessions
- Collaborative #2: Two in-person Learning Sessions
- Monthly All-Collaborative Conference Calls
- IHI Extranet Data Entry Portal
- Access to Expert Panel or Strategizing, Advising, Planning
The Results

- We felt collecting data for continuous feedback was important part of the collaborative
- Results were mixed with some hospitals showing little change and some showing dramatic
9-month baseline mean cost, PRBCs: $77,450

9-month follow-up mean cost*, PRBCs: $61,225

*Example: Figures represent amounts Red Cross charges Harbor UCLA for blood products:
$250/unit PRBCs; $440/unit Platelets (pheresis), $31/unit Plasma, $40/unit Cryo
Mx C: Number of women who had a hysterectomy during the birth admission
From 24 (out of 30) Hospitals with Data to June 2010

Baseline:
Rate per 1000 births: 0.63

Follow-up:
Rate per 1000 births: 0.67

Baseline:
Rate per 1000 births: 0.53

Follow-up:
Rate per 1000 births: 0.45
Measure A1: % Women Transfused Run Chart for CPMC
### Mx A2: Units of Blood Product Transfused per 1000 births

**At CPMC**

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Mean PRBCs</th>
<th>Mean Platelets</th>
<th>Mean Plasma/FFP</th>
<th>Mean Cryo</th>
<th>Mean-All Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: 1/09-9/09</td>
<td>82.684</td>
<td>11.3958</td>
<td>56.0977</td>
<td>15.2905</td>
<td>165.468</td>
</tr>
<tr>
<td>Year 1: 10/09-10/10</td>
<td>32.5229</td>
<td>5.1276</td>
<td>7.9851</td>
<td>6.8074</td>
<td>52.443</td>
</tr>
<tr>
<td>Year 2: 11/10-12/11</td>
<td>23.7254</td>
<td>3.0362</td>
<td>12.3962</td>
<td>1.6728</td>
<td>40.831</td>
</tr>
</tbody>
</table>
General QI Conclusions

- Achieving results can take much than expected
- Observing data trends is critical to monitor progress and modify strategies
- Following the PDSA: Plan, Do, Study, Act Cycle is key for QI Efforts

OB Hemorrhage QI Conclusions

- Obtaining under-buttock drapes took 6-9 months during Collaborative #1
- At larger facilities: training ~200 RNs can take time
- Expect Year 1: get process in place; Year 2: observe in improvement
- Observed an acceleration of improvement from Year 1 to Year 2
- At most sites: we observed increase in women transfused and blood products used; may indicate increase recognition and response to hemorrhage
- Longer term data collection will allow for study of trends for reducing morbidity associated with OB Hemorrhage
- Efforts to sustain the gains: add to PDSA cycle
We demonstrated that a state-wide multidisciplinary approach to guideline development can yield a well accepted approach to a clinical problem.
The “collaborative” approach can be used to distribute and foster adoption.
The rate of adoption varies with institution and requires local leadership.
Diverse system change projects are possible but change and obvious clinical results requires significant patience.