

Obstetric Hemorrhage Safety Bundle Implementation in a Rural CAH

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Planning for and Responding to Obstetric Hemorrhage

**California Maternal Quality Care Collaborative
Obstetric Hemorrhage Version 2.0 Task Force**

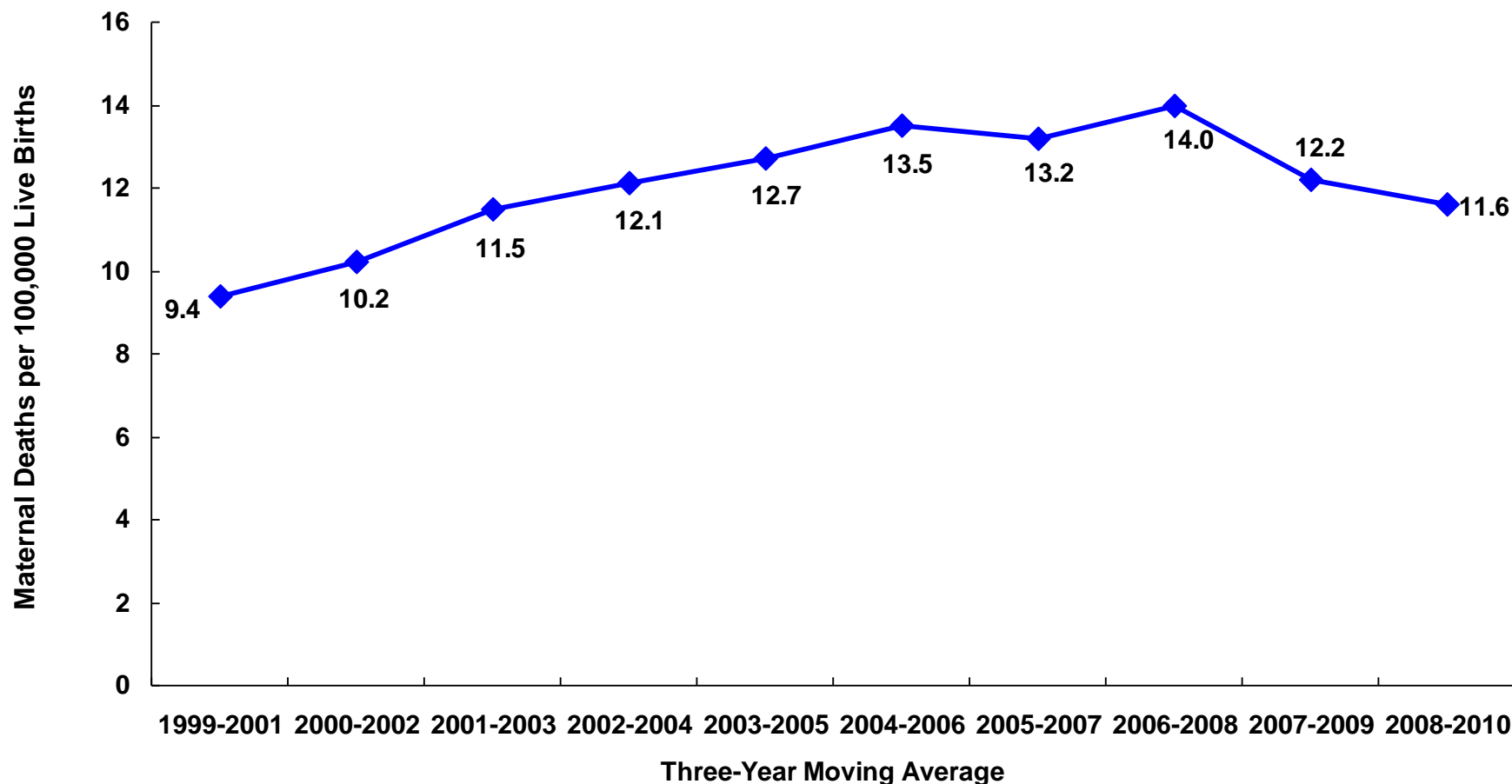
This project was supported by Title V funds received from the California
Department of Public Health; Maternal, Child and Adolescent Health Division



CMQCC

- 💧 California Maternal Quality Care Collaborative
- 💧 Multidisciplinary Task Force
- 💧 Recommendations/ Obstetric Safety Bundle
- 💧 Yellow/Blue Slides

Maternal Mortality Rates, Moving Average, California Residents; 1999-2010




SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2010. Maternal mortality for California (deaths \leq 42 days postpartum) was calculated using ICD-10 cause of death classification (codes A34, O00-O95, O98-O99) for 1999-2010. On average, the mortality rate increased by 2% each year [(95% CI: 1.0%, 4.2%) $p=0.06$. Poisson regression] for a statistically significant increasing trend from 1999-2010 ($p=0.001$ one-sided Cochran-Armitage, based on individual year data). Produced by California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division, December, 2012.

North Carolina: Mortality Mostly Preventable

Cause of Death (n=108)	% of All Deaths	% Preventable
Cardiomyopathy	21%	22%
Hemorrhage	14	93
PIH	10	60
CVA	9	0
Chronic condition	9	89
AFE	7	0
Infection	7	43
Pulmonary embolism	6	17

Berg CJ, Harper MA, Atkinson SM, et al. Preventability of pregnancy-related deaths: results of a state-wide review. *Obstet. Gynecol.* Dec 2005;106(6):1228-1234.



- 
- ◆ Set of evidence based recommendations known to optimize outcome measures
 - ◆ Uses existing guidelines - aid in implementation of guidelines and in order to improve consistency of practice
 - ◆ Standardized multidisciplinary hemorrhage programs have shown improved results and avoid the twin evils of denial and delay

Obstetric Hemorrhage Safety Bundle

- Readiness
- Recognition
- Response
- Reporting /
Systems Learning



Photo courtesy of David Lagrew,
MD and used with permission

National Partnership for Maternal Safety: “Three Bundles, Three Years”

- Multi-stakeholder effort built on consensus
 - Organizations representing public health, clinician providers, facilities, and safety and regulatory interests
 - www.safehealthcareforeverywoman.org
- Safety bundles at all birth facilities
 - Hemorrhage
 - Preeclampsia
 - Venous thromboembolism

Readiness

- ◆ Contents of Hemorrhage cart – standard meds and devices
- ◆ Rapid Response team - hospital specific
- ◆ Interventional radiology, MFM, Gyn Onc
- ◆ General Surgery, blood bank personal, dedicated rapid response team
- ◆ MTP will be different depending on unit capability

Recognition

- 💧 Hemorrhage risk is assessed on all prenatal patients before and after delivery
- 💧 Triage – accreta and previa
- 💧 How do you measure cumulative blood loss
- 💧 Active management of third stage of labor

Obstetric Hemorrhage Safety Bundle

Response: (every hemorrhage)

- Unit-standard, stage-based OB Hemorrhage Emergency Management Plan with checklist
- Support program for patients, families and staff

Reporting / Systems Learning: (every unit)

- Establish a culture of Huddles for high-risk patients and post-event debriefings
- Review all stage 3 hemorrhages for systems issues
- Monitor outcome and process metrics in perinatal QI committee



Why do we need this Toolkit?

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

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

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

* 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.

SOURCE:

The California Pregnancy-Associated Mortality Review, April 2012. © California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division.

Composite Case: 24 y/o woman, G2 P1 at 38 wks gestation induced for “tired of being pregnant”

1. After 8 hr active phase and 2 hr 2nd stage, had a NSVD of an 8 lb. 6 oz. 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 1 am).
3. The nurses called the physician 30 min later to report more bleeding and further methergine was ordered.
4. 60 min after the call, the physician performed a D&C with minimal return of tissue. More methergine was given.

Composite Case: 24 y/o 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 she has received 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.

Delay and Denial

- 💧 Move along- same uterotonic
- 💧 Multiple D and C
- 💧 Some procedures work, D and C with no retained products
- 💧 Bakri etc

Delay and Denial

- 💧 Two things needed to save her life
- 💧 Volume and blood often the problem
- 💧 No protocol or response team makes error more likely
- 💧 Ideal world one person

Transfusion Volume Advice

- ◆ You must do 2 things to save the life of a severe PPH patient
- ◆ Often the error is on the transfusion side
- ◆ In a perfect world
- ◆ Your first drill; how fast can you physically get blood to L and D

Transfusion Volume Advice

- 💧 Paperwork delays, EMR delays
- 💧 Medical student, Rapid Response team
- 💧 In a significant hemorrhage don't wait for vital sign changes
- 💧 All stage 3 hemorrhages need blood
- 💧 How big is your blood bank, does it have 5 units ?
- 💧 It takes time to thaw FFP

Blood Bank Contents

- X o neg units
- X o pos units
- No platelets
- FFP/Cryo

Key 2008 CMQCC Hemorrhage Task Force Survey Findings

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

Note: 173 hospitals responded to the first baseline survey. The response rate is 66.3% based on 173/261 hospitals (2008) with annual delivery volume > 50 births.



Summary of Recommendations

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

Hemorrhage: How Much is too Much?

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

**1/3 of women
with > 1000 ml
NO risk factors**



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
- Uterine cavity capacity
 - Pre pregnancy: 10 mL
 - Third trimester: 5,000 mL
- **Blood Flow**
 - **Pre pregnancy: 2% cardiac output**
 - **Third trimester: 17% cardiac output: 600 – 800 mL/min**




Design Goals for Quality Improvement

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

Lessons from the Field

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

Disciplines & Departments	Needed?
Obstetrics	
Nursing	
Anesthesia	
Blood Bank	
Laboratory	
Operating Room	
Support personnel	
IT/EMR	
Others unique to your setting?	

Selected Areas of Initial Focus for Hemorrhage Protocol

■ ***Likely* Easy Wins**

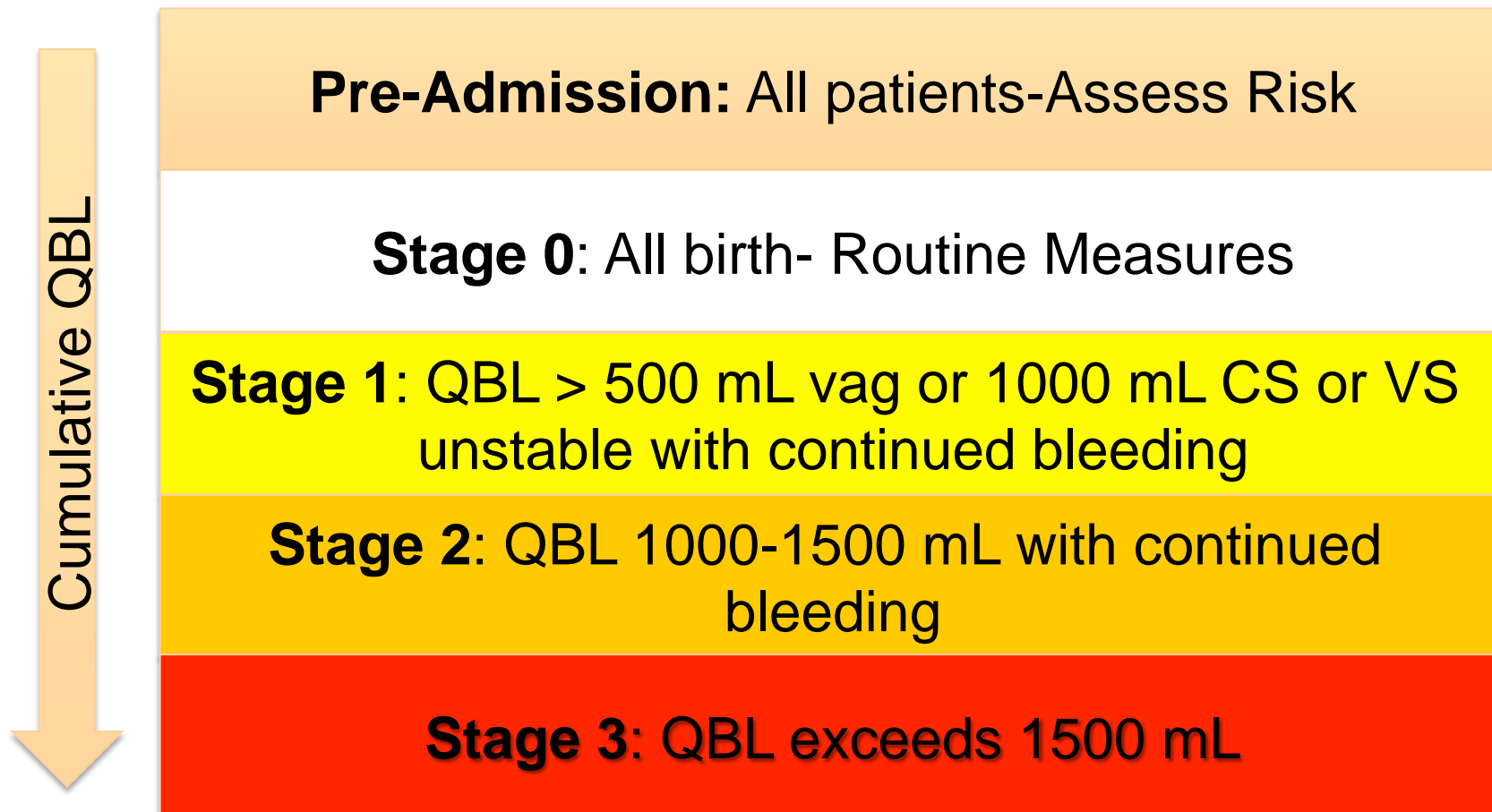
- ☐ Hemorrhage carts
- ☐ Active management (oxytocin at birth)

■ **Essential Elements, may take more time**

- ☐ Risk assessment
- ☐ Massive transfusion protocols
- ☐ Other overall protocol details (e.g. 2nd line meds)
- ☐ Replace EBL with QBL processes



Hemorrhage Guidelines: Staged Responses



CMQCC OB Hemorrhage Emergency Management Plan

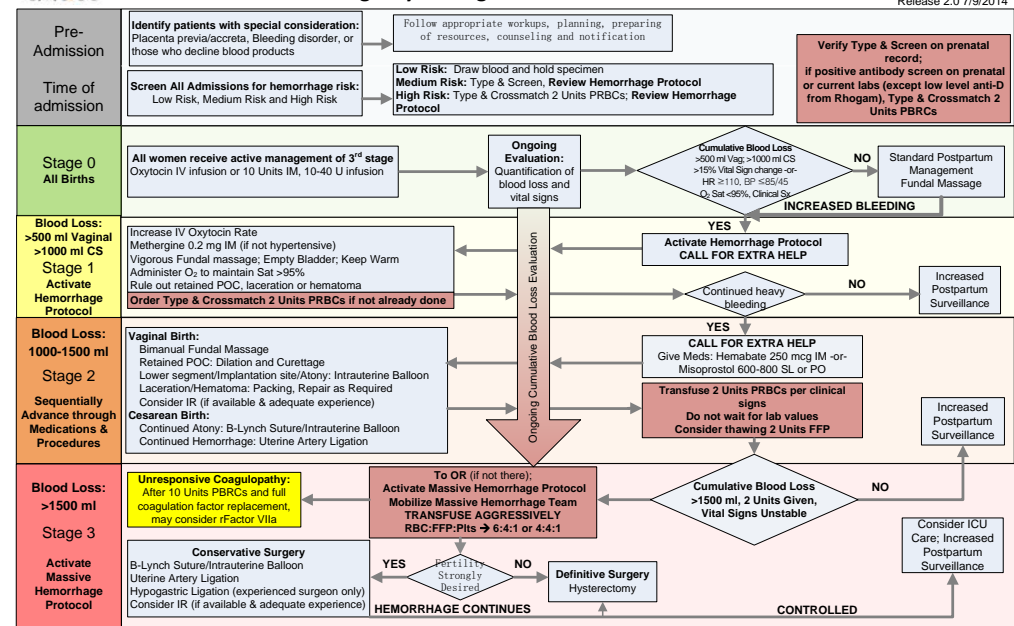
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Obstetric Hemorrhage Emergency Management Plan: Table Chart Format
version 2.0

	Version 2.0	Assessments	Meds/Procedures	Blood Bank
Stage 0	Every woman in labor/giving birth			
<i>Stage 0 focuses on risk assessment and active management of the third stage.</i>	<ul style="list-style-type: none">Assess every woman for risk factors for hemorrhageMeasure cumulative quantitative blood loss on every birth	Active Management 3rd Stage: <ul style="list-style-type: none">Oxytocin IV infusion or 10u10mFundal Massage: vigorous, <u>15 seconds min.</u>	<ul style="list-style-type: none">If Medium Risk: T & ScrIf High Risk: T&C 2 UIf Positive Antibody Screen (prenatal or current, exclude low level anti-D from RhoGam): T&C 2 U	
Stage 1	Blood loss > 500ml vaginal or >1000 ml Cesarean, or VS changes (by >15% or HR >110, BP >85/45, O2 sat <95%)			
<i>Stage 1 is short: activate hemorrhage protocol, initiate preparations and give Methergine IM.</i>	<ul style="list-style-type: none">Activate OB Hemorrhage Protocol and ChecklistNotify Charge nurse, OB/CNM, AnesthesiaVS, O2 Sat <95Record cumulative blood loss q5-15'Weigh bloody materialsCareful inspection <u>with good exposure</u> of vaginal walls, cervix, uterine cavity, placenta	<ul style="list-style-type: none">IV Access: at least 18gaugeIncrease IV fluid (LR) and Oxytocin rate, and repeat fundal massageMethergine 0.2mg IM (if not hypertensive)May repeat if good response to first dose, BUT otherwise move on to 2nd level uterotonic drug (see below)Empty bladder: straight cath or place Foley with urimeter	<ul style="list-style-type: none">T&C 2 Units PRBCs (if not already done)	
Stage 2	Continued bleeding with total blood loss under 1500ml			
<i>Stage 2 is focused on sequentially advancing through medications and procedures, mobilizing help and Blood Bank support, and keeping ahead with volume and blood products.</i>	<p>OB back to bedside (if not already there)</p> <ul style="list-style-type: none">Extra help: 2nd OB, Rapid Response Team (per hospital), assign rolesVS & cumulative blood loss q 5-10 minWeigh bloody materialsComplete evaluation of vaginal wall, cervix, placenta, uterine cavitySend additional labs, including DIC panelIf in Postpartum: Move to L&D/OREvaluate for special cases:<ul style="list-style-type: none">-Uterine Inversion-Amn. Fluid Embolism	<p>2nd Level Uterotonic Drugs:</p> <ul style="list-style-type: none">Hemabate 250 mcg IM <u>or</u>Misoprostol 800 mcg SL <p>2nd IV Access (at least 18 gauge)</p> <p>Bimanual massage</p> <p>Vaginal Birth: (typical order)</p> <ul style="list-style-type: none">Move to ORRepair any tearsD&C: r/o retained placentaPlace intrauterine balloonSelective Embolization (Interventional Radiology) <p>Cesarean Birth: (still intra-op) (typical order)</p> <ul style="list-style-type: none">Inspect broad lig, posterior uterus and retained placentaB-Lynch SuturePlace intrauterine balloon	<ul style="list-style-type: none">Notify Blood Bank of OB HemorrhageBring 2 Units PRBCs to bedside, transfuse per clinical signs – do not wait for lab valuesUse blood warmer for transfusionConsider thawing 2 FFP (takes 35+min), use if transfusing > 2u PRBCsDetermine 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			
<i>Stage 3 is focused on the Massive Transfusion protocol and invasive surgical approaches for control of bleeding.</i>	<ul style="list-style-type: none">Mobilize team<ul style="list-style-type: none">-Advanced GYN surgeon-2nd Anesthesia Provider-OR staff-Adult IntensivistRepeat labs including coags and ABG'sCentral lineSocial Worker/ family support	<ul style="list-style-type: none">Activate Massive Hemorrhage ProtocolLaparotomy;B-Lynch SutureUterine Artery LigationHysterectomyPatient supportFlood warmerUpper body warming deviceSequential compression stockings	<p>Transfuse Aggressively Massive Hemorrhage Pack</p> <ul style="list-style-type: none">Near 1:1 PRBC:FFP1 PLT apheresis pack per 4-6 units PRBCs <p>Unresponsive Coagulopathy: After 8-10 units PRBCs and full coagulation factor replacement: may consult re Factor VIIa risk/benefit</p>	

CMQCC Obstetric Emergency Management Plan: Flow Chart Format

Release 2.0 7/9/2014



California Maternal Quality Care Collaborative (CMQCC), Hemorrhage Taskforce (2009) visit: www.CMQCC.org for details
This project was supported by funds received from the State of California Department of Public Health, Center for Family Health: Maternal, Child and Adolescent Health Division

Every hospital will need to customize the protocol—but the point is every hospital needs one



California OB Hemorrhage Guidelines

■ Stage 0 (BE PREPARED)

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



Admission Risk Assessment & Testing

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

PPH Risk Factors

- 💧 Risk factor assessment is an ongoing process
- 💧 Many hemorrhage patients have no risk factors
- 💧 Be prepared

Task Force Conclusions

- 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
 - **AMTSL should not interfere** with the practice of delayed cord clamping for newborn benefit

Medication Recommendations 2.0

Prevention	Treatment
<p>Oxytocin or 10-40 international units/500-1000 mL IV infusion titrated to uterine tone</p> <p>OR</p> <p>Oxytocin 10 units IM when no IV access</p>	<p>Rapid infusion of IV oxytocin 10-40 IU/500-1000 mL at ≥ 500 mL/hour, titrated to response</p>
	<p><u>Choose a standard second line agent</u></p> <p>Methergine 0.2 mg IM</p> <p>Misoprostol 600 mcg orally or 800 mcg sublingually</p> <p>Hemabate 250 mcg IM or intramyometrially</p>

California OB Hemorrhage Guidelines

- **Stage 1:** EBL > 500 mL (vaginal) or > 1000 mL (C/S) or HR > 110, BP <85/45, O2 sat <95%; **AND STILL BLEEDING**
 - Activate hemorrhage protocol and check list
 - Find cause
 - Use a **standard** second line medication for atony
 - Initiate preparations
 - Get help: BUT primary RN STAY AT BEDSIDE
 - IV 16 gauge and baseline labs
 - Foley with urimeter
 - Blood bank: T and C 2 units
 - Quantify blood loss



Example OB Hemorrhage Cart

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



Example Obstetric Hemorrhage Cart:

Operating Room

- **IV start**
 - 16 gauge angiocaths
 - Blood draw tubes
 - Red top, blue top, tiger top
- IV pressure bags
- Foley with urimeter
- 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

The Importance of IV Gauge

Get 2nd Line In Before Vasoconstriction Develops!

Gauge	Gravity Flow	Flow with Rapid Infuser
20	65 mL/min	
18	140 mL/min	250 mL/min
16	190 mL/min	350 mL/min
14	300 mL/min	500 mL/min

STAGE 2: OB Hemorrhage

Continued bleeding or Vital Sign instability, and < 1500 mL cumulative blood loss

MOBILIZE	ACT	THINK
<p>Primary nurse (or charge nurse):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Call obstetrician or midwife to bedside <input type="checkbox"/> Call Anesthesiologist <input type="checkbox"/> Activate Response Team: PHONE #: _____ <input type="checkbox"/> Notify Blood bank of hemorrhage; order products as directed <p>Charge nurse:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Notify Perinatologist or 2nd OB <input type="checkbox"/> Bring hemorrhage cart to the patient's location <input type="checkbox"/> Initiate OB Hemorrhage Record <input type="checkbox"/> If considering selective embolization, call-in Interventional Radiology Team and second anesthesiologist <input type="checkbox"/> Notify nursing supervisor <input type="checkbox"/> Assign single person to communicate with blood bank <input type="checkbox"/> Assign second attending or clinical nurse specialist as family support person or call medical social worker 	<p>Team leader (OB physician or midwife):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Additional uterotonic medication: Hemabate 250 mcg IM [if not contraindicated] OR Misoprostol 800 mcg SL <ul style="list-style-type: none"> o Can repeat Hemabate up to 3 times every 20 min; (note-75% respond to first dose) <input type="checkbox"/> Continue IV oxytocin and provide additional IV crystalloid solution <p>Do not delay other interventions (see right column) while waiting for response to medications</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bimanual uterine massage <input type="checkbox"/> Move to OR (if on postpartum unit, move to L&D or OR) <input type="checkbox"/> Order 2 units PRBCs and bring to the bedside <input type="checkbox"/> Order labs STAT (CBC/Plts, Chem 12 panel, Coag Panel II, ABG) <input type="checkbox"/> Transfuse PRBCs based on clinical signs and response, do not wait for lab results; consider emergency O-negative transfusion <p>Primary nurse (or designee):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Establish 2nd large bore IV, at least 18 gauge <input type="checkbox"/> Assess and announce Vital Signs and cumulative blood loss q 5-10 minutes <input type="checkbox"/> Set up blood administration set and blood warmer for transfusion <input type="checkbox"/> Administer meds, blood products and draw labs, as ordered <input type="checkbox"/> Keep patient warm <p>Second nurse (or charge nurse):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Place Foley with urimeter (if not already done) <input type="checkbox"/> Obtain portable light and OB procedure tray or Hemorrhage cart <input type="checkbox"/> Obtain blood products from the Blood Bank (or send designee) <input type="checkbox"/> Assist with move to OR (if indicated) <p>Blood Bank:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Determine availability of thawed plasma, fresh frozen plasma, and platelets; initiate delivery of platelets if not present on-site <input type="checkbox"/> Consider thawing 2-4 FFP (takes 30 min), use if transfusing > 2 units PRBCs <input type="checkbox"/> Prepare for possibility of massive hemorrhage 	<p>Sequentially advance through procedures and other interventions based on etiology:</p> <p>Vaginal birth If trauma (vaginal, cervical or uterine):</p> <ul style="list-style-type: none"> • Visualize and repair <p>If retained placenta:</p> <ul style="list-style-type: none"> • D&C <p>If uterine atony or lower uterine segment bleeding:</p> <ul style="list-style-type: none"> • Intrauterine Balloon <p>If above measures unproductive:</p> <ul style="list-style-type: none"> • Selective embolization (Interventional Radiology if available & adequate experience) <p>C-section:</p> <ul style="list-style-type: none"> • B-Lynch Suture • Intrauterine Balloon <p>If Uterine Inversion:</p> <ul style="list-style-type: none"> • Anesthesia and uterine relaxation drugs for manual reduction <p>If Amniotic Fluid Embolism:</p> <ul style="list-style-type: none"> • Maximally aggressive respiratory, vasopressor and blood product support <p>If vital signs are worse than estimated or measured blood loss: possible uterine rupture or broad ligament tear with internal bleeding; move to laparotomy</p> <p>Once stabilized: Modified Postpartum management with increased surveillance</p>

Stage 2 Hemorrhage

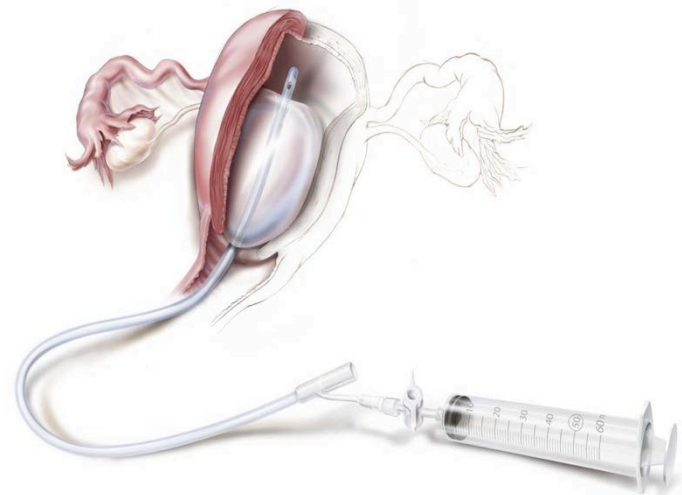
- 💧 You have to do 2 things well
- 💧 Transfusion side
- 💧 Two large bore lines, Foley, recorder for meds, fluids
- 💧 Rapid Response Mobilization , who do you call
- 💧 Draw labs but don't wait
- 💧 Where is the blood

Stage 2 Hemorrhage

- ◆ FFP, products, platelets
- ◆ Hemorrhage cart to bedside
- ◆ How do you stop her bleeding
- ◆ Is it atony?
- ◆ Uterotonics but move along
- ◆ Balloons or surgery

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



Balloon Guidelines

- ◆ Confirm uterus is free of placenta fragments and absence of lacerations
- ◆ Use ultrasound to confirm proper balloon placement
- ◆ Consider ultrasound guided placement and inflation

Balloon Applications

- ◆ Low – lying placental implantation site (especially placenta previa)
- ◆ Uterine atony
- ◆ Poorly contracting lower uterine segment
- ◆ Placenta accreta
- ◆ Sandwich technique

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

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

Issues for Balloons

- There is some user learning—
 - How much to fill? (150-500 mL is a big range)
We recommend estimating the uterine volume bimanually --usually 250-300 mL 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).

Tranexamic acid

- 💧 Trauma drug, antifibrinolytic agent
- 💧 ACOG Practice Bulletin October 2017
- 💧 Given the mortality reduction findings, tranexamic acid should be considered in PPH when initial medical therapy fails
- 💧 Does your pharmacy have this?

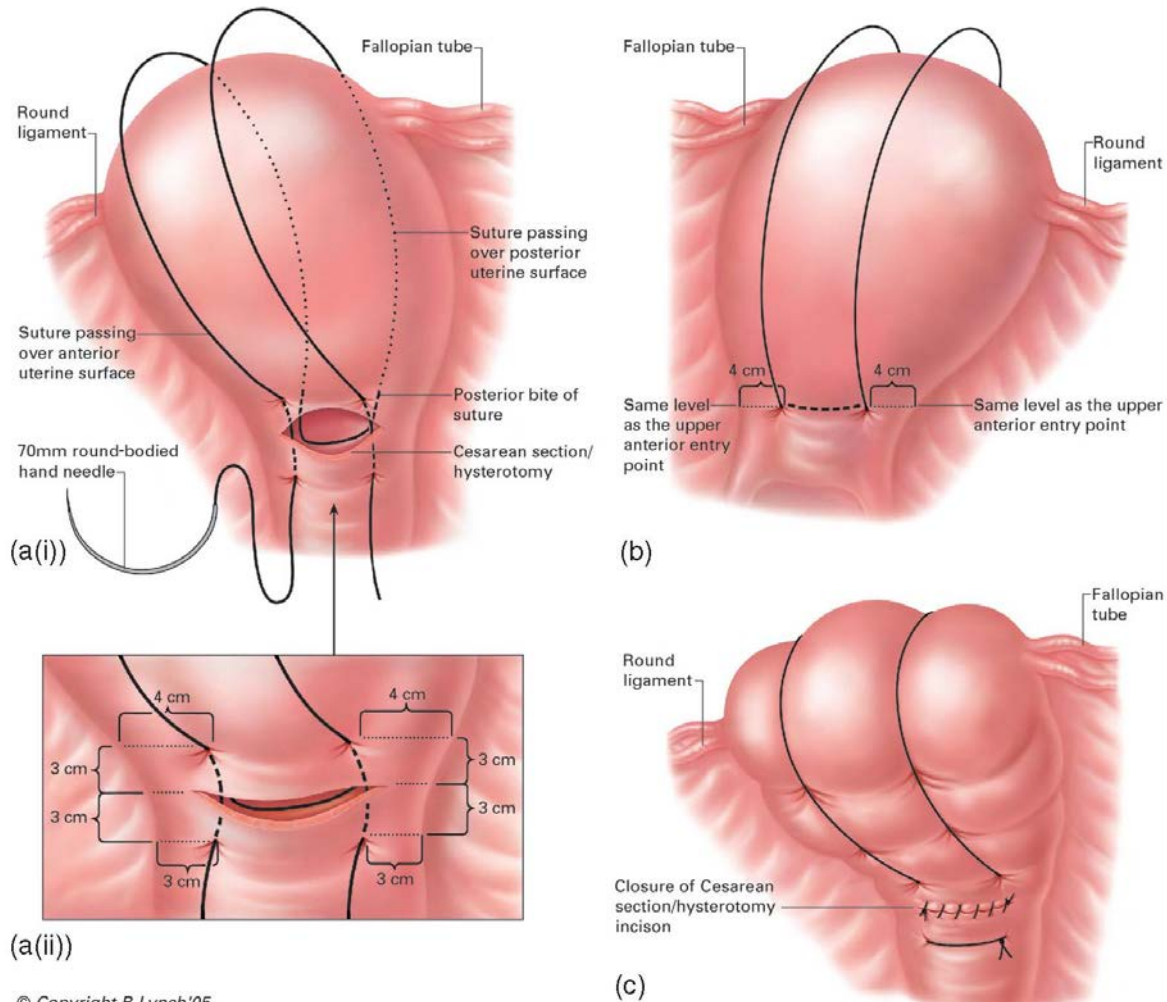
Tranexamic acid

- 💧 Randomized placebo controlled trial – Lancet 2017
- 💧 Max dose 2 g within 24 hours
- 💧 Reduced death from hemorrhage
- 💧 Benefit higher if used within 3 hours from delivery
- 💧 No increased risk of thromboembolic complications as seen at higher doses

Tranexamic acid

- 💧 Dose is 1 gram IV
- 💧 May be repeated once if bleeding persists after 30 minutes or if bleeding abates but recurs within 24 hours
- 💧 Cleared renally
- 💧 Safe during breastfeeding

B-Lynch Compression Suture “Belt and Suspenders”



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Used with permission from
Christopher B-Lynch



B-Lynch Suture completed



Photo courtesy of Elliott Main, MD
and used with permission

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”

Perform B-Lynch within an hour

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

Move along a plan!

Kayem G, Kurinczuk JJ, Alfirevic Z, et al. Uterine compression sutures for the management of severe postpartum hemorrhage. *Obstet Gynecol.* Jan 2011;117(1):14-20.



California OB Hemorrhage Guidelines

- **Stage 3: STILL BLEEDING** and EBL >1500 mL or
> 2 u PRBCs given or VS unstable or suspect coagulopathy
 - **Massive transfusion protocol**
 - Transfuse aggressively
 - **Near 1:1 ratio PRBC: FFP**
 - Rapid use of FFP may be as important as ratio
 - 1 PLT pheresis pack per 4-6 units PRBC
 - Invasive surgical techniques
 - Mobilize help: Advanced surgeon (gyn, gyn onc, trauma, MFM)

Blood products: PRBC

- ◆ 1 unit is 450cc and increases hematocrit by 3%
- ◆ Crossmatch takes time; consider o negative

Fresh Frozen Plasma

- 💧 Takes 45 minutes to thaw
- 💧 Give if labs are abnormal or more than 2 units PRBC given
- 💧 1 unit is about 180cc and increase fibrinogen by 10 mg/dl

Platelets

- ◆ Don't express red cell antigens
- ◆ Regional blood bank wont help in an emergency
- ◆ Priority for women with count less than 50k
- ◆ A six pack (single donor apheresis unit) increases count 40-50k transiently

Cryoprecipitate

- Thaws in 45 minutes
- DIC with low fibrinogen and volume not an issue
- Multiple donors – infection risk
- 10 unit pack raised fibrinogen 80-100 mg/dl

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**

CMQCC Transfusion Guidelines

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

The Lethal Coagulopathy Triad: Dilution, Hypothermia & Acidosis

■ Dilution

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

■ Hypothermia

- Significantly decreases platelet function: even if counts are adequate
- Keep patient warm (Bair Hugger®, fluid warmer)

The Lethal Coagulopathy Triad: Dilution, Hypothermia & Acidosis

■ Acidemia

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



STAGE 3: OB Hemorrhage

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

MOBILIZE

Nurse or Physician:

- ☐ Activate Massive Hemorrhage Protocol

PHONE #: _____

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

Blood Bank:

- ☐ Prepare to issue additional blood products as needed – **stay ahead**

ACT

Establish team leadership and assign roles

Team leader (OB physician + OB anesthesiologist, anesthesiologist and/or perinatologist and/or intensivist):

- ☐ **Order Massive Hemorrhage Pack** (RBCs + FFP + 1 pheresis 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 use
Near equal FFP and RBC for massive
hemorrhage:

4-6 PRBCs: 4 FFP: 1 apheresis Platelets

Unresponsive Coagulopathy:

- Role of rFactor VIIa is very controversial. After 8-10 units PRBCs and coagulation factor replacement with ongoing hemorrhage, may consider risk/benefit of rFactor VIIa in consultation with hematologist or trauma surgeon

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

Quantification of Blood Loss: QBL

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



Routine QBL



- Goal is NOT a “perfect, precise” number
- Of course inaccuracies will persist
 - Amniotic fluid contamination, urine
 - Blood clots/other mixed with fluid in the drapes
- 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

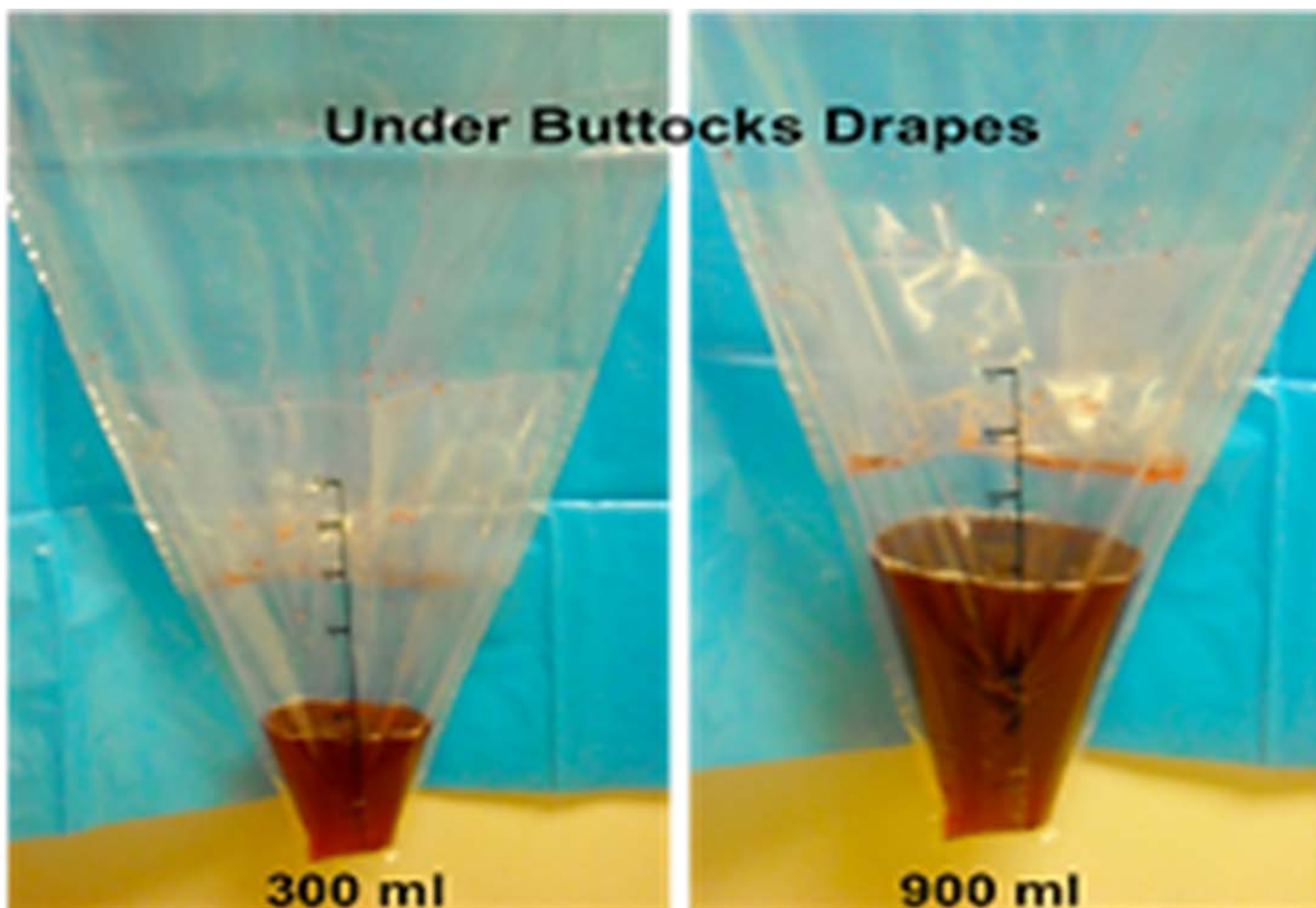


Photo courtesy of Bev VanderWal,
CNS and used with permission



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 suction drains 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. Best to record before irrigation used OR
 - ii. If irrigation used and suctioned, Scrub staff communicates amount to Circulator to be subtracted from canister (but may lead to error if not all irrigation re-aspirated)
 - 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

3 Spreadsheet calculator/EPIC calculator calculates QBL from entered data

Staff trained to account for other large sources of blood loss if indicated and add to QBL (examples: large amount expressed blood from uterus in emesis basin post op, large floor spill of blood, etc.)



Photos courtesy of Jennifer McNulty,
MD and used with permission



Photo courtesy of Jennifer
McNulty, MD and used with
permission

EMR: QBL Calculator

QBL Calculator in EMR Deliver Summary

CESAREAN SECTION BLOOD LOSS	
Cannister Volume (blood volume only)	<input type="text"/>
Total Weight: Laps + Sleeves	<input type="text"/>
Lap Sleeves Used	<input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/> <input type="text" value="6"/> <input type="text" value="7"/> <input type="text" value="8"/> <input type="text" value="9"/> <input type="text" value="10"/>
# of Laps Used	<input type="text"/>
# of Chux Used	<input type="text"/>
Additional Source of Blood Loss Volume	<input type="text"/>
Add "Total Blood Loss Calculated" below to "Total Delivery Blood Loss" section (for I&O)	
TOTAL BLOOD LOSS CALCULATED	<input type="text" value="0"/>
VAGINAL DELIVERY BLOOD LOSS	
Method Of Quantification	<input type="button" value="EBL - Visual estimate only"/> <input type="button" value="QBL - Direct measure"/> <input type="button" value="QBL - Weight of blood soaked items"/>
TOTAL DELIVERY BLOOD LOSS (Vaginal or C/S)	
EBL/QBL During Delivery (mL)	<input type="text"/>

QBL- Vaginal Delivery-GRH

QUANTIFICATION of BLOOD LOSS WEIGHTS

Single Chux 40	Under buttocks drape 125	Washcloth 35	Sm white pad 10
	Paper towel 15	Hand towel 105	Lg white pad 65
10 sponges 35	Dr. Knight towel 55	Bath towel 335	Peach pad 25
1 sponge 0	Abd. Drape 85		Pink pad 25
Vag packing 15			
	Lg red bag 50		Peri cold pack 215
Clots????			

1 GRAM WEIGHT = 1 MILLILITER BLOOD LOSS VOLUME

Wet item weight - Dry item weight = ml of blood in item.

Weigh dampened sponges/lap pads the same as dry.

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.” [used with permission]

Melissa's Story

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

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



Creating a “Team For All Seasons”

- OB Hemorrhage is the prototypic OB emergency
- Many of the system changes are directly applicable to other obstetric emergencies
- Creating the team and systems to implement hemorrhage project makes other OB QI projects easier and more successful

Kaiser—Roseville (Northern California)

“We have learned that through debriefing, we talk about problems, and by talking about problems not only can we find solutions, but we can change outcomes.”

-John Vallee, MD, Perinatal Patient Safety Director, Kaiser Permanente-Northern CA (TPMG) [used with permission]

Salinas Valley Memorial Healthcare System—Salinas

“It's not just hemorrhage that we address here; we are trying to make L&D safer for moms and babies. As a result of processes we put into place, ALL births are safer.”

- Amen Ness, MD, Director of Perinatal Diagnostic Center [used with permission]

National Partnership for Maternal Safety Hemorrhage Outcome Measures

- Used by California, New York, and AWHONN Collaboratives; many HENs
- Goals:
 - Reduce overall and massive transfusions with early recognition and treatment
 - Do not discourage early appropriate transfusion
- Total # blood products per 1000 mothers
- Number of women receiving ≥ 4 units PRBCs

Callaghan WM, Grobman WA, Kilpatrick SJ, Main EK, D'Alton M. Facility-based identification of women with severe maternal morbidity: it is time to start. *Obstetrics and gynecology*. May 2014;123(5):978-981.



Business Case

- Blood products are VERY expensive
- Hemabate is ALSO VERY expensive
- R-Factor VIIa and Uterine Artery Embolization are VERY VERY expensive
- Math: more early interventions
=fewer hemorrhages that reach “massive”
=fewer high level (expensive) interventions

Version 2.0 Change Summary

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

Cytotec Dosage

- 💧 600 mcg orally
- 💧 800 mcg sublingual

OB 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 prior to labor
 - Must be prepared for every patient
 - QBL every delivery so can respond early
- Requires reliance not on individuals but on team approach



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OB Hemorrhage Version 2.0 Toolkit
(www.cmqcc.org/ob_hemorrhage)

