FLORIDA
OBSTETRIC HEMORRHAGE INITIATIVE (OHI)
TOOL KIT

A QUALITY IMPROVEMENT INITIATIVE FOR OBSTETRIC HEMORRHAGE MANAGEMENT

Updated
Version 10/2015

Florida Perinatal Quality Collaborative
AT THE LAWTON AND RHEA CHILES CENTER FOR HEALTHY MOTHERS AND BABIES

Partnering to Improve Health Care Quality for Mothers and Babies

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Suggested Citation:
Florida Perinatal Quality Collaborative (2015) Florida Obstetric Hemorrhage Initiative Toolkit: A Quality Improvement Initiative for Obstetric Hemorrhage Management.

Acknowledgements:
The FPQC gratefully acknowledges and thanks our partner organizations, including ACOG District XII, the Florida Chapter of AWHONN, the Florida Council of Nurse Midwives, the Florida Hospital Association, and the Florida Department of Health.

The creation of this toolkit would not have been possible without the volunteer members of our Maternal Health Committee, including the members of the Obstetric Hemorrhage Advisory Team listed on page three of this toolkit, Washington Hill, MD and Karla Olson, as well as Kris-Tena Albers and Rhonda Brown from the Florida Department of Health.

The FPQC would also like to thank the California Maternal Quality Care Collaborative, ACOG District II, and the Illinois Department of Public Health for sharing their materials, expertise, and time to assist the FPQC in the development of this Quality Improvement (QI) Initiative.

This toolkit has been adapted and modeled from the California Improving Healthcare Response to Obstetric Hemorrhage Toolkit:
The California Toolkit, IMPROVING HEALTHCARE RESPONSE TO OBSTETRICAL HEMORRHAGE, was developed through the California Maternal Quality Care Collaborative with leadership from the California Department of Public Health, Maternal Child and Adolescent Health (CDPH-MCAH), and is available through the California Maternal Quality Care Collaborative website: www.cmqcc.org/ob_hemorrhage.

Funding for the development of the California toolkit was provided by:
Federal Maternal & Child Health Title V block grant funding from the California Department of Public Health; Maternal, Child and Adolescent Health Division and Stanford University.

Lyndon A, Lagrew D, Shields L, Melsop K, Bingham B, Main E (Eds). Improving Health Care Response to Obstetric Hemorrhage. (California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care) Developed under contract #08-85012 with the California Department of Public Health; Maternal, Child and Adolescent Health Division; Published by the California Maternal Quality Care Collaborative, July 2010.

Dedication:
The Florida OHI Toolkit is dedicated to the individual members of the OHI Advisory Team and the OHI partners who have provided their leadership, resources, expert feedback and time to customize the toolkit for Florida hospitals. These efforts made it possible to launch the Florida initiative in a very short period of time with the most recently available information.

Funding:
This QI initiative is funded in part by the Florida Department of Health with funds from the Title V Maternal and Child Health Block Grant from the U.S. Health Resources and Services Administration.

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TABLE OF CONTENTS

INTRODUCTION

This document is a working draft that reflects a review of clinical, scientific and patient safety recommendations. The information presented here should not be used as a standard of care. Rather, it is a collection of resources that may be adapted by local institutions in order to develop standardized protocols for obstetric hemorrhage. We acknowledge the California Maternal Quality Care Collaborative (CMQCC) and the comprehensive work that they have completed in this area. With permission, we have reprinted, revised and updated portions of the California toolkit to reflect contemporary practices.

Scope of the Problem

Postpartum hemorrhage (PPH) is a leading cause of pregnancy-related mortality in Florida and the remainder of the United States.[1] While deaths due to PPH have declined in developed countries because hospitals have easier access to blood products, the incidence of PPH has doubled in the recent decade. [2] Early identifications and intervention are key components in the management and the ability to prevent postpartum hemorrhage as well as to decrease related severe morbidity.

The overall goals of the Obstetric Hemorrhage Initiative Tool Kit are:

1. To decrease short- and long-term morbidity and mortality related to obstetric hemorrhage in women who give birth in Florida

2. To guide and support maternity care providers and hospitals in implementing a multidisciplinary team for obstetric hemorrhage prevention and management.

This toolkit will provide obstetric care providers, hospital personnel and the collaborating services with the resources to locally develop their own obstetric hemorrhage policies and protocols.

Every US birthing facility should implement a policy to address Obstetric Hemorrhage events that is specific to the resources and needs of the individual institution. The policy will need to address the multidisciplinary care required for these patients because the root causes of severe maternal morbidity and mortality are often multifactorial involving standards of care, communication, collaboration, and coordination of care. Administration, nursing, obstetrics providers, blood bank staff, and anesthesiology are all critical partners in the multidisciplinary team approach necessary to quality improvement. Development and implementation of a standardized emergency response package (protocols) involving these critical partners is a key component of the Obstetric Hemorrhage policy. The policy should also include protocols and resources to support patients, families and staff. Ideally, there should be a reporting mechanism to identify systems improvement opportunities that may prevent the next case of serious morbidity/mortality. For this reason, some of the expected implementation components of the OHI initiative are related to policy and there will be measures to determine currency in this area.

Another important element is having multi-disciplinary teams in place who know their skill sets and roles in responding to and preventing obstetric hemorrhage. These teams need to train together and practice together in order to maintain and gain new competencies. Because each hospital and care team has differing resource sets, it is important to develop individualized protocols for each facility. A quality improvement

team composed of a core set of team members from the involved disciplines must review current policies and data, determine the priorities for improvement, and develop a work plan to address their needs.

This tool kit is intended to improve:

1. Readiness to address hemorrhage by implementing standardized protocols (general and massive).
2. Recognition of OB hemorrhage by performing ongoing objective quantification of actual blood loss during and after all births.
3. Response to hemorrhage by performing regular on-site multi-professional hemorrhage drills.
4. Reporting of OB hemorrhage by standardizing definitions and consistency in coding and reporting.

PATIENT SAFETY BUNDLES

In recent years several national partners including ACOG, AWHONN, SMFM, CDC, HRSA and others came together as the National Partnership for Maternal Safety and have worked with the Council on Patient Safety in Women's Health to create several "bundles" of recommendations to improve the outcomes and safety of pregnant women.

The first bundle to be released focused on Obstetric Hemorrhage because hemorrhage is the leading cause of maternal mortality. It will be followed by other "bundles" for other high impact, high volume health and safety issues such as hypertension.

Bundles are a collection of succinct evidence-based components that when implemented together should have a positive impact on outcomes and safety for pregnant women. The bundles have four domains, Readiness, Recognition and Prevention, Response, and Reporting and Systems Learning. The bundles provide the core elements that every hospital can implement for every woman, every time. Birth facilities are encouraged to expand on the core component by developing policies, protocols and standardized practices that best meet local needs and are evidence based.

The Florida Perinatal Quality Collaborative includes a representative, Dr. Karen Harris, who participated in the development of the bundles as an ACOG representative and thus helped to guide the Collaborative in development of the Florida Obstetric Hemorrhage Toolkit. This toolkit follows the recommendations of the bundle and offers an expanded sample protocol and guidance for the four domains. It is expected that the local providers and birth facilities will adapt the toolkit within the evidence-based samples to have a localized set of practice expectations that will be followed by local providers.

The Obstetric Hemorrhage Safety Bundle is shown below.

COUNCIL ON PATIENT SAFETY IN WOMEN'S HEALTH CARE
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PATIENT SAFETY BUNDLE

Obstetric Hemorrhage

READINESS

Every unit

- Hemorrhage cart with supplies, checklist, and instruction cards for intrauterine balloons and compressions stitches
- Immediate access to hemorrhage medications (kit or equivalent)
- Establish a response team - who to call when help is needed (blood bank, advanced gynecologic surgery, other support and tertiary services)
- Establish massive and emergency release transfusion protocols (type-O negative/uncrossmatched)
- Unit education on protocols, unit-based drills (with post-drill debriefs)

RECOGNITION & PREVENTION

Every patient

- Assessment of hemorrhage risk (prenatal, on admission, and at other appropriate times)
- Measurement of cumulative blood loss (formal, as quantitative as possible)
- Active management of the 3rd stage of labor (department-wide protocol)

RESPONSE

Every hemorrhage

- Unit-standard, stage-based, obstetric hemorrhage emergency management plan with checklists
- Support program for patients, families, and staff for all significant hemorrhages

REPORTING/SYSTEMS LEARNING

Every unit

- Establish a culture of huddles for high risk patients and post-event debriefs to identify successes and opportunities
- Multidisciplinary review of serious hemorrhages for systems issues
- Monitor outcomes and process metrics in perinatal quality improvement (QI) committee

Standardization of health care processes and reduced variation has been shown to improve outcomes and quality of care. The Council on Patient Safety in Women's Health Care disseminates patient safety bundles to help facilitate the standardization process. This bundle reflects emerging clinical, scientific, and patient safety advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed. Although the components of a particular bundle may be adapted to local resources, standardization within an institution is strongly encouraged.

The Council on Patient Safety in Women's Health Care is a broad consortium of organizations across the spectrum of women's health for the promotion of safe health care for every woman.

May 2015

For more information visit the Council's website at www.safehealthcareforeverywoman.org

How to Use This Tool Kit

This tool kit is intended to provide guidance and core concepts for the quality improvement team that will include practice components and administrative components. Hospitals have an obligation to patients, providers and others to assure patient safety and competent care, providers have an obligation to patients and the hospital to practice in a competent, high quality manner. These obligations must be closely tied together and supportive of the multi-disciplinary team including the immediate obstetric care team and the extended team to include blood bank, anesthesia, rapid response teams and others. It is everyone's responsibility to maintain vigilance in having several components in place related to the recognition of potential for hemorrhage, readiness to respond, and report on the outcomes for future improvements. This guide offers the concepts and tools which may be adopted or adapted for local use.

This document is divided into three sections with recommendations for the providers, the hospital and appendices with supplemental information and resources. The toolkit is arranged in a way that makes it easy to access needed sections; however, it is recommended that all staff read the entire toolkit in order to understand both hospital and provider aspects of obstetric hemorrhage management.

The provider section addresses standard definitions, methods for risk assessment, and methods for management. This section is intended for use by the team of care providers (physicians, nurses, advanced practice nurses, lab staff, pharmacy staff, etc.) and covers topics including intervention techniques and special circumstances.

The hospital section includes requirements for preparedness, documentation and training. This section emphasizes the importance of a team of diverse staff, well-stocked carts and available equipment, and ways to document that policy and protocol are followed. This provides an opportunity for facilities to implement change and improve the care provided to women.

Disclaimer
This toolkit is considered a resource. Readers are advised to adapt the guidelines and resources based on their local facility's level of care and patient populations served and are also advised to not rely solely on the guidelines presented here. This toolkit is a working draft. As more recent evidence-based strategies become available, hospitals and providers should update their guidelines and protocols accordingly; the FPQC will also send out updates as well as revise these materials.

2015 Toolkit Updates

- Obstetric Hemorrhage National Patient Safety Bundle – pages 5-6
- Changed Risk Assessment for Obesity to BMI > 40 kgm^2 – page 11
- Recommendations on tranexamic acid and factor XII – page 17
- Recommendations on emotional support for women with postpartum hemorrhage – page 31
- Recommendations on anti-shock garments – page 34
- Considerations for small and rural hospitals – page 35
- CMQCC OB Hemorrhage Pocket Guide – page 39

FOR THE PROVIDER

Physicians, Nurses, Midwives, Advanced Practice Nurses, Anesthesia, Blood Bank staff, Rapid Response Team members

POSTPARTUM HEMORRHAGE

DEFINITION

There is no single agreed upon definition of postpartum hemorrhage. Using definitions that rely on thresholds such as 500 mL after vaginal delivery and 1000 mL after cesarean section carry with them inaccuracies in the estimation of absolute blood loss. Volume replacement with crystalloid together with the movement of extravascular fluid to the intravascular space during the postpartum period results in concerns over setting an arbitrary threshold drop in hematocrit (e.g. 10%).

Waiting for patient symptoms (e.g. dizziness) or end organ dysfunction (e.g. oliguria) may indicate a blood loss of 10% of the total volume. Therefore, this definition is far too stringent.[19] Clinicians often underestimate blood loss when visual cues and "on the spot" assessments are made. Because of these concerns, it is recommended that clinicians use clinical "triggers," or multi-component thresholds, in an effort to identify maternal hemorrhage status and guide the need for clinical interventions.

Proposed "triggers" include an absolute threshold for **blood loss** (e.g. 500 ml after vaginal delivery), **vital signs** (e.g. >15% increase in maternal heart rate or absolute value >110), **blood pressure** (≤ 85/45), as well as **oxygen saturation** (e.g. <95%).

Table 1: Triggers

PROPOSED "TRIGGERS" FOR BLOOD LOSS, VITAL SIGNS AND OXYGEN SATURATION		
Categorical Trigger	Vaginal Delivery	Cesarean Delivery
	500	1,000
Vital Sign Trigger		
Pulse	>15% increase OR >110 bpm	>15% increase OR >110 bpm
BP	≤ 85/45	≤ 85/45
Oxygen Saturation	<95%	<95%

RECOGNITION OF RISK

Risk assessment should be performed prenatally, on admission to labor and delivery, immediately prior to birth, and postpartum.

When hemorrhage in the postpartum period is divided into *primary* (≤ 24 hours after delivery) and *secondary* (>24 hours-12 weeks postpartum) causes the identification of risk factors may be easier to recognize. Primary postpartum hemorrhage causes include uterine atony, retained placenta (this includes placenta

accrete/percreta/increta), coagulation abnormalities, lacerations and extensions of the uterine incision, cervical, vaginal, perineal lacerations, and uterine inversion. Secondary causes include sub involution of the placental site, retained products of conception, infection, and inherited coagulation defects (e.g. von Willebrand's disease).

Risk assessment is important in the establishment of any obstetric hemorrhage protocol. Because pregnancy and the postpartum period encompass nearly a one year time span it is important that risk assessment be performed on multiple occasions. It is suggested that this be performed at the initial prenatal visit in order to ascertain a history of obstetric hemorrhage in a prior pregnancy (approximately 10% recurrence risk) as well as a predisposition for bleeding such as occurs in cases of inherited coagulation defects. Next, risk assessment performed near the end of the second trimester or early in the third trimester assists in gaining awareness of obstetrical hemorrhage that might be encountered in cases of placenta previa (prior cesarean section increases risk of hemorrhage and nearly 1/3 of pregnancies in the United States are delivered by cesarean section). Finally, risk assessment applied at the time of hospitalization for delivery allows care providers that might be mobilized in the case of obstetric hemorrhage to be alerted, medications that might be necessary to be on hand, and blood products to be made readily available.

When risk assessment tools allow for stratification of risk, measures taken in anticipation of hemorrhage might vary. For example in low risk cases blood might be available in the blood bank and in high risk cases this might be on hand in the delivery room or operating room. In high risk cases, additional surgical personnel should be on alert, whereas in medium risk cases medications should be readily available.

During the intrapartum period, induction or augmentation of labor, protracted labor or an arrest disorder (arrest of dilation or descent), or chorioamnionitis indicate a medium risk of obstetric hemorrhage. Assessment of low, medium and high risk factors during the antepartum and intrapartum periods should include the items listed in the sample risk assessment table on the next page (Table 2).

Table 2: A Sample Risk Assessment Tool

Obstetric Hemorrhage Risk Factor Evaluation			
	Low	**Medium**	**High**
Antepartum	• No previous uterine incision • Singleton pregnancy • ≤ 4 previous vaginal births • No known bleeding disorder • No history of PPH	• Prior cesarean birth(s) • Prior uterine surgery • Multiple gestation • >4 previous vaginal births • Hypertension-associated conditions • History of previous PPH • Large uterine fibroids • Estimated fetal weight > 4 kg • Morbid obesity (BMI > 40 $kgm^{2)}$ • Polyhydramnios	• Placenta previa • Low-lying placenta • Suspected placenta accreta • Hematocrit <30 • Platelets <100,000 • Active bleeding at admission • Known coagulopathy • Abruptio placenta
Intrapartum		• Induction or augmentation of labor • Protracted labor or arrest disorder • Chorioamnionitis	

Adapted from the California Toolkit to Transform Maternity Care [4],[14],[15]

ACTIVE MANAGEMENT OF THE THIRD STAGE OF LABOR (AMTSL)

The data underpinning the concept of AMTSL are continuously evolving. The Cochrane database review that formed the basis of the CMQCC recommendations was replaced in 2011.[3] The World Health Organization released new guidelines in 2012 for prevention and management of postpartum hemorrhage based on a thorough analysis of the developing literature on AMTSL which significantly changed the earlier recommendations.[6] The studies reviewed used differing combinations of AMTSL components which also varied in dosing, timing and technique. The current research most strongly supported the use of uterotonics in the third stage for reduction in severe blood loss, blood transfusion and the use of additional uterotonics.[6] The recommendation for immediate cord clamping has been discontinued and the recommendations for controlled cord traction and sustained uterine massage are weak as the techniques require a skilled provider and the benefits are limited.[6][4]

The studies used in these recommendations compared various incarnations of AMTSL with expectant management. Physiologic management of third stage of labor, which requires a different skill set, may be a viable alternative for low risk women who have received no interventions that increase PPH risk and who have been properly counseled on all the risks, benefits and the alternative of AMTSL.[4]

Further research is still needed to assess the ideal time, dose and route of uterotonic administration in the third stage of labor. We recommend a range of dosage from 10 to 60 units of oxytocin in 1 liter of IV fluid, or the prepackaged dosage of the facility's choice, titrated to the fundal tone and administered at the delivery of the baby. If there is no IV in place, 10 units of oxytocin administered IM is the recommended dosage [62-66].

We recommend that women receive oxytocin and fundal massage. Gentle, controlled cord traction by a skilled care provider is an optional component of active management of the third stage. Research is continuing on the value of some of the other previously recommended components of AMTSL.

QUANTIFICATION OF BLOOD LOSS (QBL)

There is no controversy that after childbirth blood loss and clinical parameters associated with intravascular volume depletion should be closely monitored. However, there is controversy as to whether or not efforts should be made to quantify blood loss compared to utilization of clinical estimates.[6][4] QBL has been reported to improve communication among physicians and nurses resulting in improved treatment decisions.[61]

Inaccuracy of Visual Estimation

While it is common practice in obstetrics to estimate blood loss using visual cues, it is inaccurate. Research has shown that errors include underestimation and overestimation [75]-[76]. Estimation has been shown to be underestimated by as much as 50% [71].Other research has shown that training can initially improve the accuracy of visual estimation but within 9 months of training completion the skills had deteriorated [72]-[73]. Several factors were explored including specialty area and years of experience and were found to be unrelated to the accuracy of estimation [73][75][77]. More recent data has shown that quantification of blood loss using measures is significantly more accurate than estimation [77].

QBL Methods

While quantification remains inexact, it is more accurate than a "guesstimate." See Appendix J: Tips for Quantification of Blood Loss.

1. *Weighing of blood soaked items*
   Quantification by weighing pads and sponges after use and subtracting dry weight of the materials; using charts with the dry weights and weight of blood to calculate the blood loss [1 gm = 1 ml] is strongly recommended.[78]

2. *Utilization of graduated collection containers, including calibrated under-buttocks drapes.*
   Use of this method requires accounting for other fluids such as urine and amniotic fluid in doing the calculation.[78]

Transitioning from EBL to QBL

Because there has been long standing practice of estimating loss primarily from experience that does not include formal training, there is sometimes resistance to the practice (see Appendix I: Testimonials). This practice of estimating can present patient safety concerns. Training on the methods of quantification and communicating the quantities is vital to success (See Appendix H: Frequently Encountered Clinical Concerns and Responses to QBL). Just as clinicians rely on strong data in other aspects of clinical care, it is critical that blood loss quantification play an integral role in obstetrics—it is a matter of patient safety.

Clear communication is important in order to translate the message into quick action; therefore it must be interpreted clearly. If the message is not clear the team response may be ineffective or incorrect. The use of terms such as scant, small, minimal, moderate, heavy, or excessive bleeding are subjective and not defined, therefore they vary from clinician to clinician. Use of specific terms and measures provides a consistent way to share information. A clear communication provides a more accurate sense of how the patient is fairing and provides greater opportunity for an early team response before the cascade of hemorrhage and its sequelae can begin.[61]

Examples of effective communication related to blood loss:

Subjective Statement	Objective Statement
"She's bleeding a lot"	"She has a 1200 ml QBL"
"She saturated 2 pads in 1 hour"	"She has a Stage 2 PPH"

Tips for Documentation of QBL [78]

- QBL is part of ongoing postpartum recovery documentation
- Maintain real time, vigilant surveillance of blood loss
- QBL is entered at each peripad or chux change but items may be grouped together
- Ensure that blood loss is totaled and communicated to other team members at regular intervals
- Document QBL at birth then ongoing QBL until the patient is stable (approximately 2 to 4 hours)
- Adjust electronic medical records to perform the math, if possible.
- Have formulas and/or calculators inserted into the electronic medical record (EMR) that automatically deduct dry weights from wet weights of standard supplies such as chux and peri-pads

Blood Loss Staging

Birthing facilities should develop and maintain protocols addressing levels of clinical involvement in care. Obstetric hemorrhage protocols should guide all staff and clinicians involved in a hemorrhage event through stages of management.

Several stages of obstetric hemorrhage have been defined (see Examples of OB Hemorrhage Care Guidelines included in Appendix C: FPQC Hemorrhage Care Guidelines or CMQCC Sample Care Guidelines for details). Generally, estimated blood loss, vital sign changes, interventions being utilized, and clinical picture

establish the transition of patients from stage 0 obstetric hemorrhage (least serious) to stage 3 (the most serious). Please see the blood loss staging table below (Table 3).

Table 3: Blood Loss Staging

STAGE	BLOOD LOSS	VITAL SIGNS	INTERVENTION	CLINICAL PICTURE
Stage 0	<500 mL (VB) <1000 mL (C/S)	Stable	Oxytocin utilized	Normal LOC
Stage 1	>500 mL (VB) >1000 mL (C/S)	>15% change HR or HR ≥ 110 bps or BP ≤ 85/45 mm HG O2 sat <95%	Additional measures, as outlined in Care Guidelines (e.g. administer additional uterotonic agents)	Increased bleeding
Stage 2	500 – 1500 mL (VB) 1000 – 1500 mL (C/S)	Continued vital sign instability	Blood products considered or initiated	Continued bleeding
Stage 3	>1500 mL	Vital signs unstable	>2 units PRBC's transfused	Suspicion for DIC

VB = vaginal birth, C/S = cesarean section, PRBC's = packed red blood cells

Cumulative Blood Loss

Cumulative blood loss is to be recorded in the patient's chart during labor and delivery, and a handoff report provided to postpartum staff. Cumulative blood loss should be recorded until the patient is physiologically stable (approximately 2 – 24 hours).

Recommendation

Because it is clear from randomized controlled trials that visual estimates of blood loss routinely underestimate the degree of hemorrhage and that training courses used for purposes of quantifying blood loss after vaginal and Cesarean delivery result in more accurate accounts of blood loss, the FPQC recommends hospitals and providers undergo training and routinely quantify blood loss during the immediate postpartum period for purposes of diagnosing primary postpartum hemorrhage.

INTERVENTIONS

Instituting the most appropriate interventions for postpartum hemorrhage will require an initial assessment of possible causes. The obstetric etiologies of postpartum hemorrhage may focus on four areas: Tone, Trauma, Tissue, and Thrombin. Following vaginal delivery, hemorrhage may be due to one of the following: 1) uterine atony 2) retained placenta/products of conception 3) lacerations. Etiologies of hemorrhage identified at the time of cesarean section include: 1) uterine atony, 2) adherent placenta, 3) placenta accreta/increta/percreta, 4) extension of the hysterotomy, and 5) uterine rupture. Care providers should carefully assess for the most likely cause of the hemorrhage and initial management should be aimed at addressing the primary etiology. For example, address uterine atony initially with medications and consider manual extraction of the placenta or curettage using a banjo/bovine curette in cases of retained placenta/products of conception. Surgical approaches are most appropriate in the primary management of lacerations, and extensions of the hysterotomy.

MEDICATIONS

Utilization of oxytocin to facilitate the third stage of labor has been recommended worldwide in an effort to reduce the risk of postpartum hemorrhage. When postpartum hemorrhage due to uterine atony is encountered during the third stage of labor, medical interventions are appropriate. See table 4 below for suggested uterotonic medications for postpartum hemorrhage. Although misoprostol (Cytotec) is included in this table there is emerging controversy surrounding its utility in the face of risks to the patient especially when high doses are utilized. Utilization of these agents may also be of benefit when postpartum hemorrhage occurs in cases other than uterine atony. If there are no results with one agent, move to the next.

Table 4: Uterotonic Medications

UTEROTONIC AGENTS for POSTPARTUM HEMORRHAGE						
Drug	Dose	Route	Frequency	Side Effects	Contraindications	Storage
Pitocin ® (Oxytocin) 10 units/ml	10-40 units per 1000 ml, rate titrated to uterine tone	IV infusion	Continuous	Usually none Nausea, vomiting, hyponatremia ("water intoxication") with prolonged IV admin. ↓ BP and ↑HR with high dose, esp. IV push	Hypersensitivity to drug	Room temp
Methergine ® (Methylergonivine) 0.2mg/ml	0.2mg	IM (not given IV)	-Q 2-4 hours -If no response after first dose, it is unlikely that additional does will be of benefit	Nausea, vomiting, severe hypertension, esp. with rapid administration or in patients with HTN or preeclampsia	Hypertension, PIH, Heart disease. Hypersensitivity to drug - **CAUTION** if multiple does of ephedrine have been used, may exaggerate hypertensive response w/possible cerebral hemorrhage	Refrigerate Protect from light
Hemabate ® (15-methyl PG F2a) 250mcg/ml	250mcg	IM or intra-myometrial (not given IV)	-Q 15-90 min. Not to exceed 8 doses/24hrs. If no response after several doses, it is unlikely that additional doses will be of benefit	Nausea, vomiting, Diarrhea, Fever (transient). Headache, Chills, Shivering, Hypertension, Bronchospasm	Caution in women with hepatic disease, asthma, hypertension, active cardiac or pulmonary disease Hypersensitivity to drug	Refrigerate
Cytotec ®* (Misoprostol) 100 or 200 mcg tablets	800-1000mcg	Per rectum (PR)	One time	Nausea, vomiting, diarrhea, shivering, fever (transient), Headache	Rare known allergy to prostaglandin Hypersensitivity to drug	Room temp

Adapted from the California Toolkit to Transform Maternity Care.[4] Updated 2015.

*Note that studies and related commentary surrounding the use of Cytotec ® in the management of obstetric hemorrhage point to little or no advantage over the agents noted above the heavy black line. We suggest the agents above the line be used primarily, and Cytotec ® be used in low resource settings.[16]-[18][19]

Coagulopathy in pregnancy is marked by increases in fibrinogen, von Willebrand factor, FVII, FVIII, and FIX. Beginning approximately 28 weeks gestation through term, pregnancy fibrinogen is nearly double that of a non-pregnant woman. This coupled with blood loss and subsequent transfusion can complicate the management of obstetric hemorrhage. Most research studies have focused on trauma related hemorrhage, much fewer studies have been done with obstetric patients. For this reason caution must be used in applying study information to the obstetric setting. In addition to having a mass transfusion protocol, consideration of adjunctive medications in extreme hemorrhage is recommended. Two such adjuncts, tranexamic acid, and Factor VIIa are discussed below.

Tranexamic acid is a synthetic lysine derived medication that helps to block the breakdown of fibrin clots by plasmin. It can have a significant effect on blood loss reduction in operative settings without significant findings of adverse effects. Data on tranexamic acid use in post-partum hemorrhage has shown promise but there are some remaining questions about risks and there is need for continued study before recommending tranexamic acid for extensive use. The dosages for use vary and the standardization of optimal dosage is not yet determined.[79] Providers are encouraged to follow the evolving literature in order to make appropriate clinical decisions.

Factor VIIa is one of the protein factors that cause blood to clot and has been suggested as an adjunctive medication in severe life threatening post-partum hemorrhage but there is little data to support the use.[80]

BLOOD PRODUCT REPLACEMENT

The comments in this section regarding blood product replacement draw from the California Toolkit to Transform Maternity Care: Improving Health Care Response to Obstetric Hemorrhage.[4]

Massive Transfusion Protocol

We recommend that every obstetrical unit have a massive transfusion protocol that is coordinated with the blood bank and anesthesia. This protocol will often be implemented at around 4 units of blood products transfused.

Packed Red Blood Cells

Attempts should be made to maintain the patient's hematocrit between 21 and 24%. One should anticipate a rise in hematocrit after a single unit by about 3% in an average sized adult.[20] The number of units of packed red blood cells to transfuse should be determined by the stage of obstetric hemorrhage and the patient's response to therapy. When blood transfusion is considered and appropriately crossmatched blood is unavailable from the blood bank, consideration should be given to the use of uncrossed matched O negative blood while the blood bank continues to make efforts to complete a patient specific type and crossmatch.

Fresh Frozen Plasma

Fresh frozen plasma consists of the acellular portion of blood. The volume of a unit of fresh frozen plasma is approximately 250 mL. Fresh frozen plasma must be ABO – compatible. Once thawed it should be transfused immediately or maintained at 6°C for up to 24 hours.[20] In the absence of a patient specific crossmatch one can request AB negative fresh frozen plasma. This plasma is devoid of antibody against red blood cells expressing A or B antigens. Current recommendations are to keep a high ratio of packed red blood cells to fresh frozen plasma (e.g. 6:4 or 4:4). Fresh frozen plasma is generally initiated during stage III obstetric hemorrhage.

Platelets

Prophylactic preoperative transfusion is rarely required when the platelet count is >100,000/uL. Major invasive procedures (excludes vaginal delivery) generally require platelet counts of at least 40,000 – 50,000/uL. The threshold used for regional anesthesia is typically around 80,000/uL.[20] In the face of massive obstetric hemorrhage, attempts should be made to keep the platelet count between 50 and 100,000/uL. A plateletphoresis unit is derived from the equivalent of six units of whole blood wherein the platelets are pooled. A single donor unit given to an average sized patient can be expected to raise the platelet count by 40,000 – 50,000/uL. Once in stage III obstetric hemorrhage, one unit of platelets should be provided for every four or six units of packed red blood cells.

Cryoprecipitate and Fibrinogen

Cryoprecipitate is an acellular blood compound that contains at least 80 IU of factor VIII: C and 150 mg of fibrinogen. Additionally, cryoprecipitate contains factor VIII: vW F, factor XIII (participates in fibrin cross-linking), and fibronectin. These blood complements are in relatively low volumes of plasma (5 – 20 mL) when a unit of cryoprecipitate is ordered. Cryoprecipitate is typically pooled and derived from 6 to 10 donors. The volume of cryoprecipitate is indicated on the label.[20] A 10 unit pooled bag of cryoprecipitate is expected to increase the fibrinogen level in an average sized patient by 75 mg/dL. Another useful

approximation is to treat hypo-fibrinogenemia with one unit of cryoprecipitate for each 7 to 10 kg of body weight.[20]

Table 5: Blood Products

BLOOD PRODUCTS		
Product	**Considerations**	**Advantages**
Packed Red Blood Cells (PRBC)	Approx. 35-40 min. is needed for crossmatch – assuming no sample is in the lab and assuming no antibodies present If antibody positive, may take 1-24 hrs for crossmatch Tranfuse O Negative blood if you cannot wait for crossmatching	Best first-line product for blood loss 1 unit = 250 mL volume, typically increases Hct by 3%
Fresh Frozen Plasma (FFP)	Approx. 35-45 min to thaw for release	Highly desired if >2 units PRBCs given, or for prolonged PT, aPTT>1.5x control 1 unit = 250 mL volume and typically increases Fibrogen by 10mg/dL
Platelets (PLTS)	Local variation in time to release (may need to come from regional blood bank)	Priority for women with platelets <50,000 Single-donor Apheresis unit (=6 units of platelet concentrates) provides 40-50k transient increase in platelets
Cryoprecipitate (CRYO)	Approx. 35-45 min to thaw for release	Priority for women with Fibinogen levels <80 10 unit pack typically raises Fibinogen 80-100mg/dL Caution: 10 units come from 10 different donors, so infection risk is proportionate

Additional information regarding the use of blood products can be found in the Acute Adverse Effects table in the Appendix C of this document.

SURGERY AND DEVICES

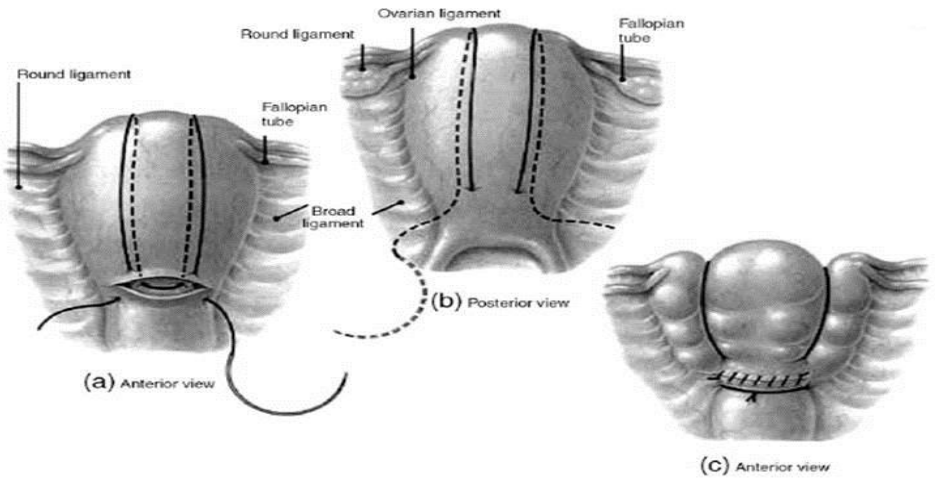
The identified etiologies of the hemorrhage and the response to noninvasive interventions are the guide to appropriate surgical intervention.

Curettage

Utilization of a banjo/bovine curettage should be considered first after a vaginal birth, especially when obstetric hemorrhage is a result of retained products of conception. The patient should be transferred to the operating room for the curettage and volume resuscitation. Risk factors for retained products of conception include abnormal placenta implantation, multiple gestation, eccentric/velementous insertion of the umbilical cord.

Strategically Placed Sutures

B–Lynch sutures are placed in response to uterine atony that is refractory to medical therapy. These sutures are most commonly placed at the time of cesarean section or after vaginal delivery when medical management of uterine atony fails. (See figure below)



B-Lynch suture. CMQCC

O'Leary stitches can be placed below an inferior lateral extension of a hysterotomy. These extensions are identified most commonly after labors complicated by arrest disorders. Using a non-cutting needle, branches of the uterine artery in the broad ligament are ligated by passing the needle through a clear space in the broad ligament then through the interior. Importantly, this suture must be placed inferior to the most distal portion of the extension. Every effort should be made to ensure the ureter is not ligated upon placement of this suture.

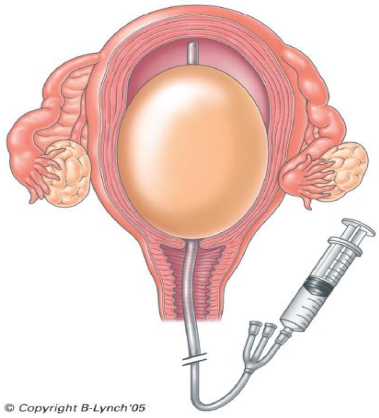
Uterine artery ligation has been described but in most circumstances requires an experienced surgeon in order to avoid worsening hemorrhage due to venous disruption in the retroperitoneal space and or improper

ligation of the posterior branch of the uterine artery. In many centers uterine artery ligation is performed with the assistance of a vascular surgeon or GYN oncologist.

Balloons and Embolization

Uterine artery balloon tip catheters have been employed preoperatively in cases at high risk for obstetric hemorrhage due to placenta accreta/increta/percreta (planned hysterectomy). Their utility has been challenged. Consensus suggests that these catheters should be placed with the guidance of experienced interventional radiologist. Furthermore, these catheters should not be inflated prophylactically but rather in the event of significant obstetric hemorrhage during planned hysterectomy.

The **intrauterine balloon** (see image below) has been used in the management of obstetric hemorrhage following delivery of a low-lying placenta, in cases of a poorly contracting lower uterine segment, uterine atony, the management of placenta accreta/increta/percreta, surgical implantation, and disseminated intravascular coagulation, and as a temporary measure for patients being considered for uterine artery embolization or hysterectomy.



Bakri Balloon. CMQCC

Uterine Artery Embolization

Arterial blood supply to the uterus is derived from four primary sources which include the right and left uterine arteries (branches of the hypogastric arteries) as well as right and left utero-ovarian arteries. When hysterectomy is performed successfully, adequate ligation of all four sources is required. This can be hindered by the many anastamoses, which occur throughout the adnexae and along the lateral/outer portion of the uterus. Aberrant vasculature is identified in cases of placenta previa, and especially cases of placenta accreta. Thus, in cases of serious hemorrhage, isolation of the utero-ovarian arteries may be routine, but as the operator descends into the pelvis there is routinely a requirement for more than two ligatures to achieve adequate hemostasis.

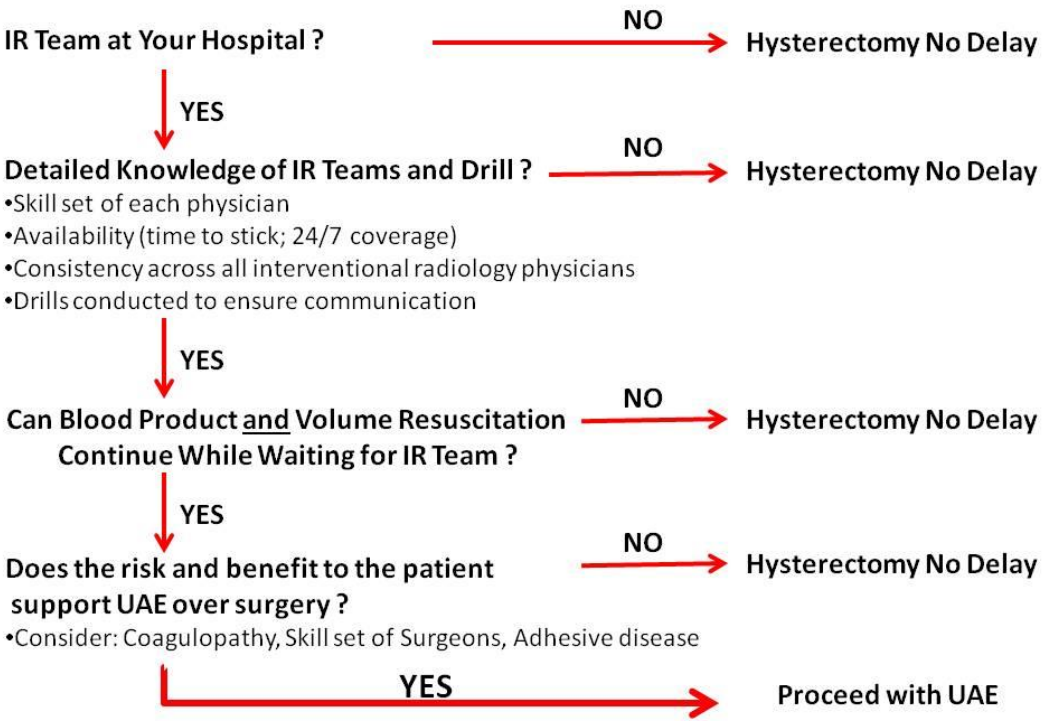
Reduction of blood flow through the uterine arteries can be achieved by mechanical methods other than placement of suture ligatures. Procedures provided by and interventional radiology (IR) team can be helpful in accomplishing this goal. Placement of hypogastric balloon tip catheters when at-risk patients are identified preoperatively can be helpful. An important aspect is to inflate the balloon tip catheters only when needed because prophylactic inflation may result in unrecognized sources of bleeding and in inability to visualize specific vessels needing attention once the balloon tip catheters are deflated.

During an ongoing hemorrhage, obstetric providers will be faced with considering hysterectomy to definitively manage hemorrhage. The option of calling an IR team may provide an opportunity to selectively embolize the uterine arteries, additional branches of the hypogastric artery, and ovarian arteries using gel foam, coils, or "glue" alone or in combination, thus allowing uterine preservation. It is also noted that in some cases UAE following hysterectomy is an appropriate adjunct to mitigate further blood loss. The material chosen for uterine artery embolization (UAE) will depend on the patient's condition, anatomy and acceptable affect. There are several major questions to consider when balancing whether or not to proceed with hysterectomy or UAE. These include:

1) Is an IR team available within the hospital system?
2) Do obstetric providers have a detailed knowledge of the IR team and Drill together?
3) Can blood product and volume resuscitation proceed while waiting for the IR team to arrive?
4) Does the risk and benefit support UAE over hysterectomy?

There are no agreed upon professional guidelines on the use of UAE for the treatment of obstetrical hemorrhage. Several reviews on this topic are available.[67]][[68] Overall, the literature supports UAE as a safe and effective measure to manage both primary and secondary postpartum hemorrhage.[69][70] Critical for any obstetric unit proposing to offer UAE as an adjunct or primary approach to address obstetric hemorrhage is a detailed knowledge of the IR team and whether the skill needed in cases of obstetric hemorrhage can be provided consistently. When this is not the case, hysterectomy should NOT be delayed while considering UAE. Furthermore, drills between the obstetric care providers and the IR team that emphasize communication and patient transfer are crucial to the success of UAE in managing obstetric hemorrhage. It is easy to see from the figure that for UAE to supersede hysterectomy many criteria must be met. However, once an effective practice culture is established, transarterial pelvic interventions provide a useful service in both mitigating the need for hysterectomy and controlling pelvic hemorrhage.

UAE Utilization Algorithm



Hysterectomy

Although listed in this sequence of approaches, peripartum hysterectomy should not be delayed in the management of obstetric hemorrhage in cases where medical management fails, bleeding has continued and more conservative nonmedical approaches are either inappropriate to consider or have failed. For those inexperienced with peripartum hysterectomy for obstetric hemorrhage, it is appropriate to mobilize additional personnel that can facilitate this procedure with minimal operative morbidity. Delay in performing a peripartum hysterectomy in response to obstetric hemorrhage can lead to maternal morbidity or mortality.

SPECIAL CIRCUMSTANCES

THE JEHOVAH'S WITNESS PATIENT

The article below is reprinted with permission from the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care: Improving Health Care Response to Obstetric Hemorrhage.[4]

Obstetric Care for Women Who Decline Transfusions (Jehovah's Witnesses and Others)

Elliott Main, MD, Department of Obstetrics and Gynecology, California Pacific Medical Center, Sutter Health

Background and Literature Review

Given the known rate of obstetric hemorrhage, it is very unsettling to many obstetricians and anesthesiologists to have a patient decline a potentially life-saving treatment. Fortunately, discussions regarding limits to intervention generally occur in advance of emergencies in pregnant women whose belief systems preclude blood transfusion.

The goals of the interaction with the woman who is declining transfusion are the following: 1) to find common ground to manage the birth as safely as possible; 2) to build trust or if not possible, to transfer to a program amenable with the plans; and 3) to develop a well thought out delivery plan to minimize blood loss and maximize decisive decisions. A large study in New York of 391 live births among Jehovah's Witness found 2 maternal deaths from hemorrhage (512 maternal deaths per 100,000 births).[21]

With regard to goal #3, there is a broad movement in the United States to develop skills and promote the concepts of "Bloodless Surgery." While this may sound a bit utopian, there are case series of open-heart surgeries and liver transplants without transfusions. The principles of this approach are listed below:[22]

General Principles of Bloodless Medicine Management

- Employ a multidisciplinary treatment approach to blood conservation
- Formulate a plan of care for avoiding/controlling blood loss
- Consult promptly with senior specialist experienced in blood conservation
- Promptly investigate and treat anemia
- Decisive intervention, including surgery
- Be prepared to modify routine practice when appropriate
- Restrict blood drawing for laboratory tests
- Decrease or avoid the use of anticoagulants and antiplatelet agents
- Stimulate erythropoiesis
- Transfer a stabilized patient, if necessary, to a major center before the patient's condition deteriorates

Not all blood products are "off the table." There is a wide range of acceptable blood interventions within the Jehovah's Witness community—50% will actually take some form of blood transfusions. Therefore it is imperative to begin discussions prenatally to educate and review all possible options to be available at the time of delivery. [23][24]

RECOMMENDATIONS

Prenatal Care

1. Comprehensive discussion with a checklist specifying acceptable interventions[25]
2. Aggressively prevent anemia (goal: maintain HCT: 36-40%)
    - Iron—PO or IV (sucrose) (+Folate and B12)
    - rh-Erythropoeitin 600 units/kg SQ 1-3x per week (each dose contains 2.5ml of albumin so is not always acceptable)
3. Line-up Consultants (consider MFM, Hematology, Anesthesiology)

Labor and Delivery

1. Early anesthesia consultation
2. Reassessment of hemorrhage risk and discussion of options (e.g. Surgery, Interventional Radiology)
3. Review specific techniques (e.g. Options Checklist and Fibrin/Thrombin glues, rFactor VIIa—but remember that rFVIIa needs factors to work)[26]
4. Review references—Have a Plan![27]
5. Be decisive

Postpartum

1. Maintain volume with crystaloids and blood substitutes
2. Aggressively treat anemia
    - Iron—IV (sucrose)
    - Rh-Erythropoeitin 600 units/kg SQ weekly (3x week); RCT's show benefit in Critical Care units

PLACENTA ACCRETA AND PERCRETA

The article below is used with permission from the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care: Improving Health Care Response to Obstetric Hemorrhage[4]
Note: Consideration should be given to intraoperative consultation, and referral made to appropriate tertiary facilities.

Placenta Accreta and Percreta: Incidence, Risks, Diagnosis, Counseling and Preparation for Delivery

Richard Lee, MD, Los Angeles County and University of Southern California Medical Center

Background and Literature Review
The rising incidence of placenta accreta is due to the rapidly rising numbers of primary and repeat cesarean births. The most recent data in California shows that 31% of all births are by cesarean section.[28] One study at The University of Chicago showed that between 1982 and 2002 (before the greatest rise in cesarean births) the overall incidence of placenta accreta was 1 in every 533 deliveries.[29]

There are four types of placenta previa: 1) a complete previa occurs when the placenta completely covers the internal os; 2) a partial previa occurs when the placenta partially covers the internal os; 3) a marginal previa occurs when the placenta is located next to the internal os; 4) a low lying placenta occurs when the placental margin is within two centimeters of the internal os, but not next to the internal os.

A placenta accreta occurs when there is abnormally firm attachment of placental villi to the uterine wall with the absence of the normal intervening deciduas basalis and Nitabuch's layer. There are three variants of this condition: 1) *accreta:* the placenta is attached to the myometrium; 2) *increta*: the placenta extends into the myometrium; and 3) *percreta*: the placenta extends through the entire myometrial layer and uterine serosa.

Risk
The risk of placenta accreta is highest in patients with both prior cesarean birth and placenta previa (placenta previa also increases with prior cesarean births). Silver, et al. reported proportionally increased risk of placenta accreta with higher numbers of prior cesareans in women with or without placenta previa.[30]

Diagnosis
A diagnosis of accreta can be confirmed with tissue histology; however, medical imaging can be an effective diagnostic tool. Ultrasound can detect the presence of accrete (80% sensitivity) and absence of accreta (95% specificity).[31]-[34] Warshak et al. reported that in cases with suspicious or inconclusive ultrasonography results, MRI accurately predicted placenta accreta with 88% sensitivity and 100% specificity.[33] While MRI's specificity is enhanced when gadolinium is used, its effects on the fetus remain uncertain; many researchers believe benefits of its use outweigh risks associated with mis- or undiagnosed placenta accreta.[33] A recent Stanford study suggests that high-resolution sonography and MRI give similar results but are complimentary when one modality is inconclusive.[34] Second trimester Maternal Serum Alpha-Fetoprotein (MSAFP) may also be helpful. In two recent studies of patients with placenta previa, MSAFP was elevated in 45% of those with accreta, and not in those without accreta.[35]

Counseling

Providers caring for patients with prenatally suspected placenta accreta should counsel patients extensively about potential risks and complications well in advance of their estimated due date. Patients with accreta are at increased risk for hemorrhage, blood transfusion, bladder/ureteral damage, infection, need for intubation, prolonged hospitalization, ICU admission, need for reoperation, thromboembolic events and death.[30][34]-[36] Discussions should involve relative likelihood for hysterectomy and subsequent infertility.

Delivery Timing

In patients with strong suspicion for placenta accreta, it is strongly advised to perform the delivery before labor begins or hemorrhaging occurs.[35] Therefore, consideration should be given to performing the cesarean birth electively and prematurely, either after corticosteroids for fetal lung maturation or after documentation of fetal lung maturity. The committee could not reach consensus on the recommended gestational age for elective delivery; some tertiary referral centers recommended 32-34 weeks and others 35-36 weeks. All agreed that patients with repeated bleeding episodes or deeper invasion (e.g. placenta percreta) should be delivered early.

Delivery Preparations

Advance planning with anesthesia, blood bank, nursing (OB and OR) and advanced surgeons is an essential first step. Advanced surgeons are gynecology oncologists or experienced pelvic surgeons familiar with the operative management of complex pelvic surgeries. A Massive Transfusion Pack with 4-6 units PRBCs, FFP and Platelets should be available. At the time of cesarean, the hysterotomy should be made away from the location of the placenta. In all but those with focal accretas, a hysterotomy — without disturbance of the placenta—is strongly advised.[35] Blood salvage equipment should also be considered where available.[37] The results of conservative surgery have been recently reviewed with many complications noted (e.g. infection, delayed hemorrhage, reoperation requiring hysterectomy, disseminated intravascular coagulation) and should only be considered in the most select situations.[38] Consultation with experienced surgeons (e.g. gynecologic oncologist) or referral to appropriate facilities is required when a provider lacks appropriate support services or surgical experience with managing placenta accreta. The use of prophylactic intravascular balloon catheters for cesarean hysterectomy for placenta accreta is controversial as a recent large case control study (UC Irvine/Long Beach Memorial) showed no benefit.[39] If a focal placenta accreta is found (typically in the lower uterine segment at the delivery of a placenta previa) management options are broader and include over-sewing, fulguration and placement of an intrauterine compression balloon (with drainage through the cervix/vagina) for 24 hours.

PATIENTS WITH COAGULATION DEFECTS

The article below is used with permission from the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care: Improving Health Care Response to Obstetric Hemorrhage.[4]

Inherited Coagulation Disorders in Pregnancy

David Lagrew, MD, Saddleback Memorial Medical Center

Background and Literature Review

The coagulation process is a complex biochemical chain reaction involving several pathways and proteins. Genetic abnormalities in any of these proteins can lead to serious coagulation problems. Although relatively rare in pregnancy, such abnormalities can lead to maternal hemorrhage events during antepartum, birth or postpartum and can have deleterious effects on the mother's and baby's health. Identifying patients with inherited coagulation disorders and carefully planning their care is crucial for optimal outcomes. Although postpartum hemorrhage can occur in these patients, coagulation defects are sufficiently rare that routine screening in patients with postpartum hemorrhage will not identify a large number of these patients.[40][41] Though incidence is low, this is an important group of individuals to identify and prepare for.[42]-[46]

The most commonly identified coagulation disorders are von Willebrand's Disease (Factor VIII platelet adhesion and coagulant deficiency), Hemophilia A (Factor VIII coagulant deficiency), Hemophilia B (Factor IX deficiency) and Hemophilia C (Factor XI deficiency). Basic knowledge of these disorders will help to better understand the management recommendations below. von Willebrand Disease (vWD) is the most common hereditary coagulation abnormality described in humans with a prevalence of 1% in the general population.[42][47][48] It occurs less frequently as an acquired disorder (acquired von Willebrand Syndrome) manifested by the presence of auto-antibodies. Von Willebrand Disease is caused by a deficiency of the plasma protein that controls platelet adhesion (VIII:vWF) and decreased activity of the protein that stabilizes blood coagulation (VIII:C). The disorder can cause mucous membrane and skin bleeding symptoms, bleeding with vaginal birth, surgical events or other hemostatic challenges. Women of child-bearing age may be disproportionately symptomatic compared with other age groups.

Several types of vWD have been described.[49] Type 1 individuals make up 60-80% of all vWD cases and have a quantitative defect (heterozygous for the defective gene) but may not have clearly impaired clotting function. Decreased levels of vWF are detected in these patients (10-45% of normal, i.e., 10-45 IU). Most patients lead nearly normal lives without significant bleeding episodes. Patients may experience bleeding following surgery (including dental procedures), noticeable easy bruising or menorrhagia (heavy periods). Type 2 vWD patients (20-30% of all vWD cases) have a qualitative defect and the tendency to bleed varies between individuals. Individuals with Types I and II are usually mildly affected by the disorder and pass on the trait in an autosomal dominant fashion.

Type III vWD is the most severe form; it is autosomal recessive and severely affected individuals are homozygous for the defective gene. Patients have severe mucosal bleeding, no detectable vWF antigen, and may have sufficiently low factor VIII. They can have occasional hemarthoses (joint bleeding) as in cases of mild hemophilia. Most vWD diagnoses are in women with a positive family history or menorrhagia. Blood testing for vWF activity provides confirmation of diagnosis.

Hemophilia A (Factor VIII coagulant deficiency) is a blood clotting disorder caused by a mutation of the factor VIII gene, which leads to Factor VIII deficiency. Inheritance is X-linked recessive; hence, males are affected while females are carriers or very rarely display a mild phenotype. It is the most common hemophilia, occurring in 1 in 5000 males. Women can, on rare occasion, exhibit a homozygous state if both parents carry the disorder. More frequently, carriers show atypical performance of "Lyonization" of the X chromosome (random inactivation of the X chromosome). Usually women have 50% activity but if inactivation of the "normal" gene occurs in greater frequency, lower levels can be seen.[50] Of note, Factor VIII activity usually increases during pregnancy. [51]

Hemophilia B (Factor IX deficiency) is a blood clotting disorder caused by a mutation of the Factor IX gene, also carried on the X-chromosome. It is the least common form of hemophilia (sometimes called "Christmas Disease," after the first afflicted patient), occurring in about 1:30,000 males and very rarely in females. Diagnosis can be made by measuring levels of IX activity in the blood, which does not usually change during pregnancy.

Hemophilia C (Factor XI deficiency) is a rare condition in the general population (less than 1:100,000) but more common in Ashkenazi Jewish patients, and it can occur in both males and females.[52] Up to 8% of these individuals are carriers (autosomal recessive) of the gene, which is located on Chromosome 4. Treatment is usually not necessary because patients have approximately 20-60% factor XI activity; however, they should be closely followed since the postpartum hemorrhage rate is 20%.

Diagnosis in pregnancy of any of these coagulation disorders may be difficult due to the variability of clotting factor activity caused by hormonal changes of pregnancy.[53] When a patient with an inherited coagulation disorder delivers, one must be concerned about extrauterine bleeding and hematomas and the effect of the disorder on the fetus. Cesarean section is rarely recommended.[54] Autoimmune acquisition of these disorders has been described and therefore may occur despite the lack of familial history.

RECOMMENDATIONS

1. Review family, surgical and pregnancy history for possible clinical symptoms of excessive bleeding following surgery (including dental procedures), noticeable easy bruising, joint hemorrhage or menorrhagia (heavy periods).
2. Request the following laboratory screening tests for patients with suspected disorders:[49][50]
    - von Willebrand Disorder: Measurement of Ristocetin Co-Factor Activity and von Willebrand Antigen (VIII:Ag) activity
    - Hemophilia A: Measurement of Factor VIII activity (Factor VIII:C assay)
    - Hemophilia B: Measurement of Factor IX activity (If Factor VIII:C is normal)
    - Hemophilia C: Measurement of Factor XI activity
    - Other tests performed for patients with bleeding problems: complete blood count (especially platelet counts), APTT (activated partial thromboplastin time), prothrombin time, thrombin time and fibrinogen level. Note that patients with von Willebrand disease typically display normal prothrombin time and variable prolongation of partial thromboplastin.
3. Affected patients or carriers, or patients with suspected history should consult with a hematologist who has specific interest and knowledge of coagulation disorders.

4. Obtain perinatal consultation for planning and coordination of antepartum and intrapartum management.
5. Refer patients for genetic counseling regarding possible testing and evaluation of the fetus and newborn.
6. Develop intrapartum and postpartum management plans well in advance of the anticipated date of birth so specific medications and blood components are available at the time of delivery and given in consultation with a hemotologist:
    - von Willebrand Disorder: Mild forms can be treated with desmopressin acetate (DDAVP) but more severe forms require vWF and VIII factor replacement.[46] DDAVP challenge testing can identify whether patients will respond to this medication.
    - Hemophilia A/B: Concentrates of clotting factor VIII (for hemophilia A) or clotting factor IX (for hemophilia B) are slowly dripped in or injected into a vein. Consider DDAVP adjunctive therapy.
    - Hemophilia C: FFP is the first product used to treat patients with hemophilia C. The main advantage of FFP is its availability. Disadvantages of its use include the large volumes required, the potential for transmission of infective agents and the possibility of allergic reactions.
    - Factor XI activity: Factor XI concentrates provide the best source for factor XI replacement.

EMOTIONAL SUPPORT FOR WOMEN EXPERIENCING POSTPARTUM HEMORRHAGE

Experiencing a stressful event such as a PPH has both physical and emotional impacts. Women having a significant hemorrhage may experience transient hypotensive episodes, pituitary ischemia or infarction, cortisol levels may elevate, and other consequences. This physical and emotional stress has the potential to negatively impact the woman and her family in multiple ways, including breastfeeding, bonding and long term emotional health. Consider a referral to psychiatric, psychosocial, and social support services for women who experience obstetric hemorrhage.

FOR THE HOSPITAL

Physicians, Nurses, Midwives, Advanced Practice Nurses, Anesthesia, Blood Bank staff, Rapid Response Team Members

CRITICAL STAFF AND EQUIPMENT

Success of a maternal hemorrhage initiative is dependent on the right leadership and a multidisciplinary team. Nurse and physician leaders will assist in defining the problem, making the case for change, setting goals and identifying local resources.

It is important to identify the clinical services involved in a response to maternal hemorrhage. These may include but are not limited to obstetrics, anesthesia, surgery, pediatrics, blood bank, critical care medicine, and interventional radiology. The development of a massive transfusion protocol in collaboration with the blood bank is particularly important in these cases and improves response while decreasing cost.[7]

All level of providers should participate in development of policies, simulation drills, and debriefs, including nurses, physicians, midlevel providers and ancillary staff.

Additionally, consistent with State and Federal Guidelines as well as the Joint Commission Statement *Advancing Effective Communication, Cultural Competence, and Patient- and Family-Centered Care*, hospitals are expected to be able to meet the needs of Limited English Proficient (LEP) patients as well as those with other disabilities (e.g. hearing impaired and speech impaired).

CARTS, KITS, AND TRAYS

Postpartum hemorrhage (PPH) is a commonly encountered obstetrical emergency on labor and delivery units. Although medical management is often successful in treating PPH, if there is a lack of response, the obstetrician may have to proceed to surgical measures. For an efficient response to the emergency, the obstetrician should have rapid access to surgical instruments and tools designed to treat PPH. Equipment and instruments compiled on an obstetrical hemorrhage "cart" is designed to treat vaginal/cervical lacerations and perform uterine tamponade or uterine/ovarian artery ligation. In short, the cart would have all the instruments necessary to treat PPH before hysterectomy is considered. A list of recommended instruments is included in Appendix E. Each institution should engage their providers, obtain feedback on the components of the hemorrhage cart and adapt this list based on their own local resources.

ANTI-SHOCK GARMENTS

The World Health Organization has offered recommendations for non-pneumatic anti-shock garments (NASG) to their recommendations for prevention and treatment of post-partum hemorrhage, primarily in low resource settings to gain time to reach definitive treatment. Limited studies have been conducted in the resourced obstetric settings. There remains a need for further research regarding use and mechanisms of action in pregnancy and post-partum.

Consideration should be given to use of NASG in the face of obstetric hemorrhage when transport of the patient is necessary to achieve definitive treatment.

CONSIDERATIONS FOR SMALL AND RURAL HOSPITALS AND BIRTHING FACILITIES

A primary focus of any patient safety initiative is preparedness. The OHI Committee identifies hospitals and other obstetric care facilities that are at particular risk for a hemorrhage emergency:

1) Low volume delivery service
2) Resource poor setting
3) Geographically isolated

We call special attention to facilities with these challenges and urge not only routine drills but "hard wiring" a formal plan for hemorrhage assessment, identification of a transfer/transport plan, relationship building with regional center capable of managing hemorrhage and early transfer of care.

SIMULATION DRILLS

Importance of Simulation

Simulation has been used to support training in high stress situations that would be unsafe to rehearse in clinical practice. It offers the opportunity for learning from error without causing harm to the patient, provides for competence acquisition, and the development of clinical reasoning skills.[8]-[10] In obstetrics, simulation has been demonstrated to improve short term response to obstetric emergencies and improved long term recollection.[9][11]-[13]

Medical simulation drills of obstetrical hemorrhage cases can assess system weaknesses and strengths, test policies and procedures for coping with hemorrhage and improve teamwork and communication skills of staff members. Drills that include all disciplines (obstetrics, anesthesia, pediatrics and nursing) can be especially effective in improving team training and communication.

In order to improve success, these simulations should include members of all of the clinical services that are required in the management of an obstetric hemorrhage, represent situations that are as similar to "real life" as possible and include a debriefing post event.

RECOMMENDATION

All hospitals adopt regularly scheduled simulation drills for practicing response to obstetric hemorrhage. Optimal implementation would require that these drills occur onsite with members of all relevant disciplines available. These drills should occur during different shifts. Unscheduled drills may also provide additional information about preparedness. Ideally these should take place on at least an annual basis.[13]

Sample simulations can be found in the CMQCC Toolkit.

DEBRIEFING

Debriefing is a process of information exchange and feedback conducted after an event and is designed to improve teamwork skills and outcomes.[58] Following an obstetric hemorrhage or any major obstetric event, conducting a debriefing will provide the team with the opportunity to decompress while identifying areas for

improvement. Simulation participants benefit from the immediate feedback provided during debriefings, increasing learner engagement and enhancing retention of information.[59] Debriefing is a crucial element of the simulation process and results in a higher level of staff preparedness and confidence, contributing to optimal outcomes when emergencies arise.[60]

Led by a facilitator who outlines the debriefing process and assists as a resource to ensure the objectives are met, the participants debrief themselves.[57] The debriefing room should be comfortable, private and away from interruptions and provide the opportunity for all participants to be seen and heard.[57] Effective debriefs allow the participants to look upon the process as a learning opportunity and not a punitive one. The debrief begins with the facilitator providing a recap of the situation, background and key events that occurred. Through a thorough and accurate reconstruction of the events, analysis of why the event occurred, what worked, and what did not work, discussions ensue of lessons learned and what should be done differently in the future.[58]

The basis for a debrief, whether it is impromptu or planned, is to answer the following questions: What did we do well? What did not go so well? What can we improve upon in the future? A simple checklist can be created with the following questions to help aid the process for both the facilitator and the participants: [58]

- What did we do well?
- As a team, assess how the following played a role in the performance of the team:
  - Team Leadership
  - Situational Awareness
  - Mutual Support
  - Communication
- Did we have the equipment and resources necessary?
- Lessons Learned?
- Goals for Improvement?
- What can we do differently?

Debriefing forms for hemorrhage drills and actual PPH emergencies should be developed in conjunction with the risk management office or other department involved with quality analysis such as root cause analyses. The forms should include information such as: the number and type of providers and staff participating; the procedures used; the equipment used; the materials used; the environment; the management and the problems identified through the process. A sample debrief form is available in Appendix G.

HEMORRHAGE DOCUMENTATION

As with other aspects of health care, obstetric hemorrhage prevention and management requires precise and thorough documentation. It is ideal if all departments utilize the same or similar documents for the same care and that communication between departments and levels of care is ongoing and comprehensive. The obstetrical hemorrhage risk assessment tool used in labor and delivery for admission should be similar, if not identical to that used in the physician and midwifery offices. The recovery room documents for cesarean section should contain the same assessment for hemorrhage information as that for the recovery of the vaginal delivery.

CONCLUSION

The Florida OHI toolkit is intended to provide guidance to hospitals and obstetric providers in the development of individualized policies and protocols related to obstetric hemorrhage. It is not to be construed as a standard of care; rather it is a collection of resources that may be adapted by local institutions in order to develop standardized protocols for obstetric hemorrhage. The toolkit will be updated as additional resources become available.

Other resources and references are also available online at the California Maternal Quality Care Collaborative website as cited in the references and appendices. Additionally, ACOG, CDC, HRSA, AWHONN, SMFM, and the American Blood Bank Association, in conjunction with other partners, are working to develop a bundle of care for future distribution.

If you have any questions related to the content or use of this toolkit, please contact the FPQC.

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APPENDICES

APPENDIX A: SAMPLE HEMORRHAGE POLICIES AND PROCEDURES

See: Example Hospital Hemorrhage Protocols

CMQCC Obstetric Hemorrhage Care Guidelines: Sample Policy and Procedure
From the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care

POLICY INDEX: O	Page 1 of X
POLICY TITLE: Obstetric Hemorrhage Care Guidelines	
DEPARTMENT AND USERS DISTRIBUTION: Maternal Child Health, Labor and Delivery, Emergency Department, Operating Room, Blood Bank, Intensive Care Unit, Post-Anesthesia Care Unit(s)	

Original Date of Issue: _____

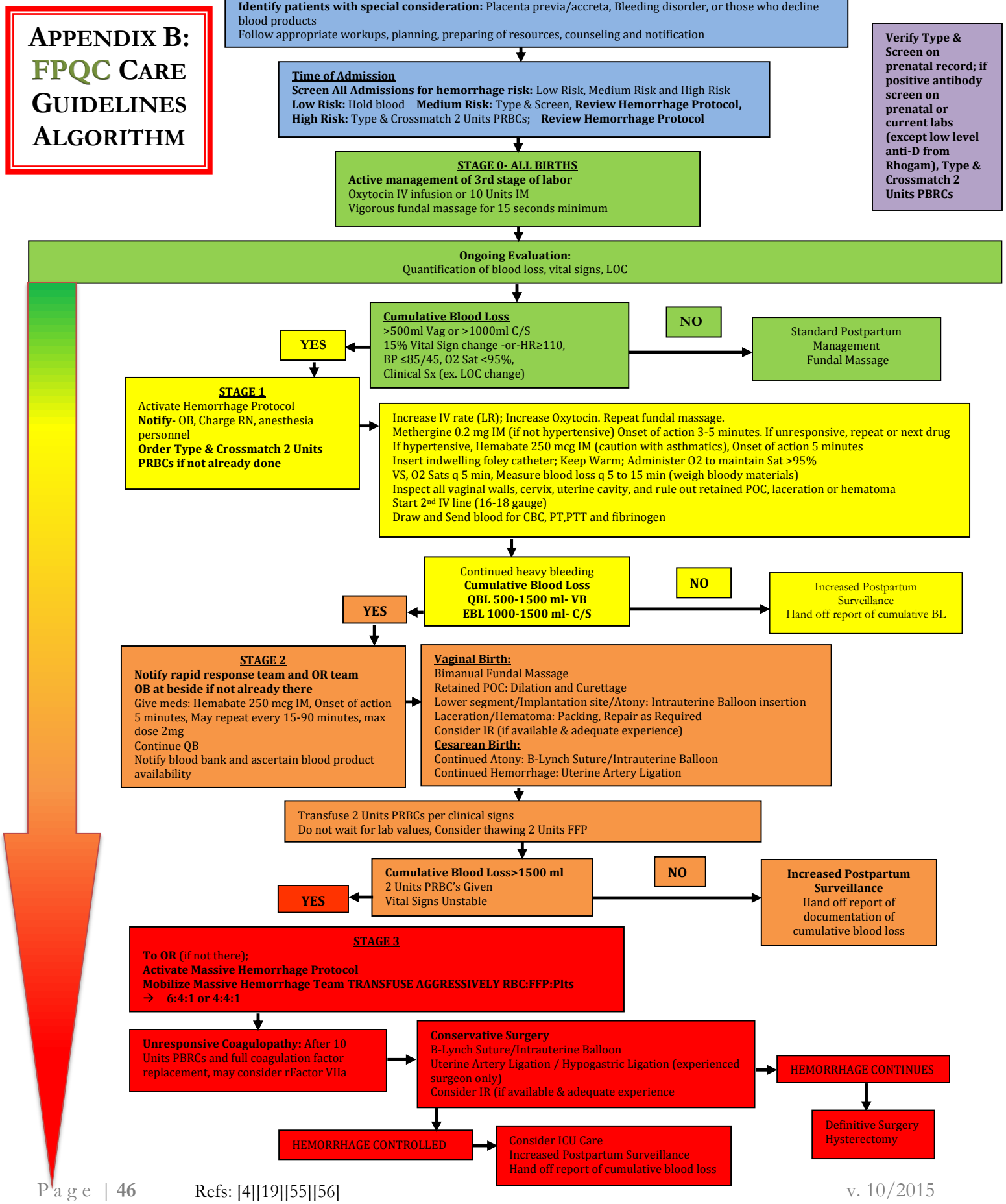
Reviewed Date					
Revised Date					

PURPOSE
The purpose of this protocol is to provide guidelines for the optimal response of the multidisciplinary team in the event of obstetric hemorrhage. This protocol will also aid in recognizing patients at risk for hemorrhage and identifying stages of hemorrhage and primary treatment goals.

POLICY STATEMENTS
Optimal response to obstetric hemorrhage requires the coordination of effort of team members from multiple disciplines and departments.

- Obstetric unit, anesthesia department, blood bank, operating room, and other appropriate services work together to identify necessary system supports and processes for mounting an efficient and coordinated response to obstetric hemorrhage.
- Obstetric physicians, obstetric RNs, certified nurse midwives, anesthesiologists, and other appropriately qualified clinicians are authorized to mobilize the team to respond to an obstetric hemorrhage.
- The OB hemorrhage critical pack/cart are always kept stocked, not expired, and available for an emergency in all areas of the hospital where women are treated for OB hemorrhage. Note: the assignments for stocking and checking the cart need to be clearly delineated by each hospital. For example: medications will be kept together in an emergency packet in the pharmacy cart on the unit; the emergency medication packet will be maintained by pharmacy; the adult resuscitation cart or a separate resuscitation cart will be designed with an OB hemorrhage supply component.
- The Obstetric (OB) Hemorrhage general and massive policies and procedures will be updated at least every three years.

APPENDIX B: FPQC CARE GUIDELINES ALGORITHM



Refs: [4][19][55][56]

APPENDIX C: CMQCC ACUTE ADVERSE EFFECTS OF TRANSFUSION

BLOOD PRODUCT REPLACEMENT: OBSTETRIC HEMORRHAGE, From Holli Mason, MD

Acute Adverse Effects of Transfusion (Onset within minutes or hours)			
Type of Reaction	**Incidence**	**Usual Cause**	**Signs or Symptoms**
Hemolysis-Immunologic (Acute Hemolytic transfusion reaction)	1:25,000	Red cell incompatibility, usually ABO	Fever, chills, renal failure, DIC, pain, hypotension, tachychardia, anxiety, hemoglobinemia, hemoglobinuria, cardiac arrest.
Hemolysis-Physical or Chemical	Unknown	Overheating, freezing, addition of hemolytic drugs or solutions.	Asymptomatic hemoglobinuria, rarely DIC, renal failure, hypotension
Febrile Nonhemolytic	0.5-1.5%	**Recipient** antibodies to donor leukocytes; or preformed cytokines in blood product	Fever, chills
Anaphylaxis	1:20,000-47,000	IGA deficient recipient with antibodies to IgA in donor plasma; antibodies to other plasma proteins, WBCs and platelets.	Respiratory obstruction and cardiovascular collapse, angioedema, anxiety, chills, agitation.
Urticarial	1-3%	Antibody to donor plasma proteins	Pruritis and hives
Transfusion Related Acute Lung Injury (TRALI, Noncardiogenic Pulmonary Edema)	Reported 0.001%, 0.02%, 0.34%	**DONOR** antibody to recipient leukocytes or patient antibody to donor specific HLA or granulocytes	Respiratory distress, pulmonary edema and hypoxemia with normal wedge pressures. “White out” on CXR
Congestive Heart Failure	Unknown	Volume overload	Respiratory distress
Septic Complication	1:1000-7:1000	Bacterial contamination	Usually gram negative sepsis when the transfusion is red cells, gram positive cocci are most common in platelet transfusion
Hypothermia	Unknown	Rapid infusion of cold blood	Chills without fever
Hyperkalemia	Unknown	**RAPID** infusion of stored red cell	Cardiac dysfunction (usually problematic only in infants or those with compromised renal function)
Hypocalcemia	Unknown	**RAPID AND MASSIVE** transfusion of stored blood **Prophylactic administration of Calcium is not recommended**.	Cardiac dysfunction (usually problematic only in patients with **SEVERE** hepatic insufficiency or neonatal massive exchange transfusion)

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Lyndon A, Lagrew D, Shields L, Melsop K, Bingham B, Main E (Eds). Improving Health Care Response to Obstetric Hemorrhage. (California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care) Developed under contract #08-85012 with the California Department of Public Health; Maternal, Child and Adolescent Health Division; Published by the California Maternal Quality Care Collaborative, July 2010.

APPENDIX D: CMQCC JEHOVAH'S WITNESS BLOOD PRODUCT AND TECHNIQUE INFORMED CONSENT/DECLINE

My signature below indicates that I request no blood derivatives other than the ones which I have designated in this consent be administered to me during this hospitalization. My attending physician,_____M.D. has reviewed and fully explained to me, ***the risks and benefits*** of the following blood products and methods for alternative non-blood medical management and blood conservation available to me. My attending physician_____M.D. has also fully explained to me the potential risks associated by not authorizing blood and / or nonblood management during this hospitalization.

	ACCEPT	DO NOT ACCEPT
COMPONENTS OF HUMAN BLOOD		
Red Blood Cells	_____	_____
Fresh Frozen Plasma	_____	_____
Platelets	_____	_____
Cryoprecipitate	_____	_____
Albumin	_____	_____
Plasma Protein Fraction	_____	_____
INTRAVENOUS FLUIDS WHICH ARE NOT COMPONENTS OF HUMAN BLOOD		
Hetastarch	_____	_____
Balanced Salt Solutions	_____	_____
MEDICATIONS WHICH CONTAIN A FRACTION OF HUMAN BLOOD		
Rhogam	_____	_____
Erythropoeitin	_____	_____
Human Immunoglobulin	_____	_____
Tisseel	_____	_____
TECHNIQUES FOR BLOOD CONSERVATION / PROCESSING		
Hemodilution	_____	_____
Cell Saver	_____	_____
Autologous Banked Blood	_____	_____
Cardiopulmonary Bypass	_____	_____
Chest Drainage Autotransfusion	_____	_____
Plasmapheresis	_____	_____
Hemodialysis	_____	_____
Other_____	_____	_____

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PLEASE CIRCLE WHICH ONE APPLIES
I do (do not) have a durable power of attorney.
I accept (do not accept) this consent as an addendum to my durable power of attorney.

I fully understand the options available to me and hereby release the hospital, its personnel, the attending physician and any other person participating in my care from any responsibility whatsoever for unfavorable reactions or any untoward results due to my decision not to permit the use of blood or its derivatives. The possible risks and consequences of such refusal on my part have been fully explained to me by my attending physician. I fully understand such risks and consequences may occur as a result of my decision.

DATE:_____ **TIME**:_____

SIGNATURE:_____
(patient/parent/guardian/conservator)

RELATIONSHIP:_____

WITNESS:_____

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Tool: Jehovah's Witness Consent Form and Management Checklist from:
Lyndon A, Lagrew D, Shields L, Melsop K, Bingham B, Main E (Eds). Improving Health Care Response to Obstetric Hemorrhage. (California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care) Developed under contract #08-85012 with the California Department of Public Health; Maternal, Child and Adolescent Health Division; Published by the California Maternal Quality Care Collaborative, July 2010.

SPECIFIC CHECKLIST FOR MANAGEMENT OF PREGNANT WOMEN WHO DECLINE TRANSFUSIONS

Prenatal Care
- ☐ Comprehensive discussion with a checklist specifying acceptable interventions
- ☐ Aggressively prevent anemia (goal: HCT: 36-40%)
- ☐ Iron—PO or IV (sucrose) with Folate and B12 as needed
- ☐ rh-Erythropoeitin 600units/kg SQ 1-3x per weekly as needed

(most preparations have 2.5ml of albumin so may be refused by some Jehovah's Witnesses)
- ☐ Line-up Consultants (consider MFM, Hematology, Anesthesiology)

Labor and Delivery
- ☐ Anesthesia consultation early
- ☐ Reassessment of hemorrhage risk and discussion of options

(e.g. Surgery, Interventional Radiology)
- ☐ Review specific techniques (e.g. Options Checklist and Fibrin/Thrombin glues, rFactor VIIa—but remember that rFVIIa needs factors to work)
- ☐ Review references—Have a Plan!!
- ☐ Be decisive

Postpartum
- ☐ Maintain volume with Crystaloids and Blood substitutes
- ☐ Aggressively treat anemia
- ☐ Iron—IV (sucrose)
- ☐ Rh-Erythropoeitin 600units/kg SQ weekly (3x week)

RCT's show benefit in Critical Care units

For more information, please review: www.CMQCC.org section on "OB Hemorrhage/Jehovah's Witness"

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CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE

Tool: Specific Checklist for Managment of Pregnant Women who Decline Transfusions from:
Lyndon A, Lagrew D, Shields L, Melsop K, Bingham B, Main E (Eds). Improving Health Care Response to Obstetric Hemorrhage. (California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care) Developed under contract #08-85012 with the California Department of Public Health; Maternal, Child and Adolescent Health Division; Published by the California Maternal Quality Care Collaborative, July 2010.

APPENDIX E: CMQCC CARTS, KITS AND TRAYS CHECKLISTS

CMQCC
CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE

Tool: OB Hemorrhage Carts, Kits, Trays-Recommended Instruments, Supplies

RECOMMENDATION
Labor and delivery units construct a sterile tray that provides rapid access to instruments used to surgically treat PPH. Hysterectomy trays are separately available.

OB Hemorrhage Cart: Recommended Instruments

- Set of vaginal retractors (long right angle); long weighted speculum
- Sponge forceps (minimum: 2)
- Sutures (for cervical laceration repair and B-Lynch)
- Vaginal Packs
- Uterine balloon
- Banjo curettes, several sizes
- Long needle holder
- Uterine forceps
- Bright task light on wheels; behind ultrasound machine
- Diagrams depicting various procedures (e.g. B-Lynch, uterine artery ligation, Balloon
- placement)

OB Hemorrhage Medication Kit: Available in L&D and Postpartum Floor
PYXIS/refrigerator

- Pitocin 20 units per liter NS 1 bag
- Hemabate 250 mcg/ml 1 ampule
- Cytotec 200mg tablets 5 tabs
- Methergine 0.2 mg/ml 1 ampule

OB Hemorrhage Tray: Available on Postpartum Floor

- IV start kit
- 18 gauge angiocath
- 1 liter bag lactated Ringers
- IV tubing
- Sterile Speculum
- Urinary catheter kit with urimeter
- Flash light
- Lubricating Jelly
- Assorted sizes sterile gloves

Labor and Delivery Emergency Hysterectomy Tray: Available in L&D OR Suite

- 4 Towel Clips, Backhaus (perforating) 5 1/4"
- 4 Mosquito, Curved, 5"

- 2 Clamp, Mixter 9"
- 2 Clamp, tonsil
- 2 Clamp, Allis, Extra long 10"
- 2 Clamp, Allis 6"
- 2 Clamp, Babcock 8"
- 2 Clamp, Babcock 6 1/4"
- 2 Clamp, Lahey 6"
- 2 Clamp, Heaney-Rezak, Straight, 8"

- 8 Kelly, Curved 5 3/4"
- 2 Kelly, Straight 5 3/4"
- 8 Pean Curved, 6 1/4"

- 2 Forceps, Debakey, 9 1/2"
- 1 Forceps, Tissue with teeth 9 3/4"
- 1 Forceps, Russian 8"
- 1 Forceps, Smooth 8"
- 1 Forceps, Ferris Smith
- 2 Forceps with Teeth, 6 "
- 1 Forceps, Russian 6"
- 2 Forceps, Adson with Teeth
- 1 Forceps, Tissue, Smooth, 7"

- 2 Kocher, Straight, 8"

- 6 Forceps, Heaney, Curved, 8 1/4"
- NH, Mayo Hegar, 8"
- 4 Sponge Stick, 9 1/2"

- 1 Scissor, Jorgensen, Curved, 9"
- 1 Scissors, bandage 7"
- 1 Scissors, curved dissecting, Metzenbaum
- 1 Scissors, Mayo, curved
- 1 Scissors, sharp/blunt, Straight, 5 1/2'
- 1 Scissors, Curved Metzenbaum 12"
- 1 Scissors, Mayo Straight 11"
- 1 Scissors, Mayo Curved 11"

- 1 Knife Handle #3
- 1 Knife Handle #4
- 1 Knife Handle #3, Long

- 1 Retractor, Kelly, large
- 1 Retractor, Deaver, Large, 3" x 12"
- 1 Retractor, Deaver, Medium
- 2 Retractor, Med/large Richardson
- 1 Retractor, Balfour Blades
- 2 Retractor, Goulet, 7 1/2"

- 1 Suction, Yankauer Tip
- 1 Suction, Pool Tip

APPENDIX F: OBSTETRIC HEMORRHAGE AUDIT TOOL

Please audit 20 vaginal delivery and 10 Cesarean delivery charts each month.

MR#_____

Risk Assessment

(Numerator= # charts with risk assessment documented / Denominator= Total Number of audited charts)

Documented in chart ☐ Yes ☐ No

Active Management of Labor

(Numerator= # charts with both oxytocin and fundal massage documented / Denominator= Total Number of audited charts)

☐ Oxytocin IV/IM ☐ Fundal Massage

Oxytocin administered at delivery of: ☐ baby OR ☐ placenta

Cumulative Blood Loss and Quantitative Measurement

(Numerator= Not measured; Estimated with Visual Cues Only; Measured using one or more of the three recommended formal measurements / Denominator= Total Number of audited charts [please audit 10 Vaginal and 10 Cesarean)

☐Vaginal Delivery ☐Cesarean Section

☐ Measurement NOT recorded in chart

☐ EBL – Visual Estimation of Blood Loss (includes mixed methods)

☐ QBL – Quantification of Blood Loss (only used quantification methods)

If QBL, Select all that apply:

☐ Formally measured by % saturation with the use of pictures to determine blood volume

☐ Formally measured by weighing

☐ Formally measured by collection

Adapted the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care

APPENDIX G: FPQC OB HEMORRHAGE TEAM DE-BRIEFING FORM

Adapted the California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care

Topic: The de-brief form provides an opportunity for maternity service teams to review then document sequence of events, successes and barriers to a swift and coordinated response to obstetric hemorrhage.
Goal: De-brief completed in 100% of all obstetric hemorrhages that progress to Stage 2 or 3. All de-briefs have at least Primary RN, and Primary MD who participates in the de-briefing session.
Instructions: Complete as soon as possible, but no later than 24 hours after any Stage 2 or 3 hemorrhages. During de-brief, obtain input from participants (all or as many as possible). *Attach additional pages with notes as needed.*
(Stage 2 or 3 hemorrhages are defined as bleeding that continues after administration of IV or IM Oxytocin, vigorous fundal massage, emptied bladder and Methergine 0.2 mg IM)

Were the following medications, procedures or blood products used? ***(Check if yes, check all that apply)***

Medications
☐ High dose misoprostol (800-1000 mcg)
☐ Carboprost tromethamine (Hemobate

Blood Volume/Options
☐ Invasive hemodynamic monitoring
☐ Blood warmer
☐ Rapid fluid infuser (level one machine)
☐ Blood cell salvage machine (cell saver)
☐ Factor VIIa (non-standard treatment)

Procedures
☐ Intrauterine balloons
☐ B-Lynch suture
☐ Uterine artery ligation
☐ Uterine artery embolization
☐ Non-pneumatic Anti-shock Garments (NASG; non-standard
treatment)

COMMENTS about medications, procedures, or blood products:

Who participated in the debrief? (check all that apply)
☐ Primary MD/DO/CNM
☐ Primary RN
☐ Other RNs
☐ Anesthesia
☐ Blood bank staff
☐ Pharmacy
☐ Lab team
☐ Rapid Response team

Post-hemorrhage, the patient required…
(Check if yes, check all that apply)
☐ Intubation ☐ Central Line
☐ Pressors ☐ Arterial Line
☐ Admission to ICU ☐ Admission to higher acuity unit (e.g., PACU)

Volume of blood lost: _____ mls

Method of Blood Loss Measurement ***(Check all that apply)***
☐ Visually Estimated Only
☐ Formal Estimate using Posters/Pictures
☐ Formal Measure by weight
☐ Formal Measure by volume collection

Blood Product Transfusion Ratios - Active Hemorrhage Treatment and Resuscitation Period (~the first 4-6 hours PP)
Units of PRBCs: _____ Units of FFP: _____
Units of Platelets: _____ Units of Cryo: _____

Thinking about how the obstetric hemorrhage was managed…

Identify what went well (*Check if yes, describe)*
☐ Communication went well
☐ Teamwork went well
☐ Leadership went well
☐ Decision-making went well
☐ Assessing the situation went well
☐ Other

Briefly describe:

Identify opportunities for improvement: "human factors"
(Check if yes, describe)
☐ Communication needed improvement
☐ Teamwork needed improvement
☐ Leadership needed improvement
☐ Decision-making needed improvement
☐ Assessing needed improvement
☐ Other

Briefly describe:

Identify opportunities for improvement: "nonhuman factors" ***(Check if yes, describe)***
☐ Delay in blood products availability
☐ Equipment issues
☐ Medications issues
☐ Inadequate support (in-unit or other areas of the hospital)
☐ Delays in transporting the patient (within the hospital or to another facility)
☐ Other

Briefly describe:

APPENDIX H: FREQUENTLY ENCOUNTERED CLINICAL CONCERNS AND RESPONSES TO QBL

Adapted from Bingham, D. & Main, E. [74] and AWHONN Slides from Council on Patient Safety in Women's Health Care QBL Safety Action Series Presentation 8/28/14.

Issue	AWHONN Response
Providers believe that their patients are unique; thus, the research does not apply to their specific group of patients.	Distribute key peer-reviewed literature related to the measurement of blood loss to every nurse and physician.
Many physicians and nurses have only performed EBL. They are not familiar with how to QBL.	The lack of experience indicates that there is a need for more education tactics with QBL details.
The providers are concerned, on the basis of their training and experience, that if they begin quantifying blood loss they will have higher blood loss levels which might reflect negatively on their practices, putting their reputations in jeopardy.	Track the number of births quantified and their relationship to early recognition of PPH. Report facts and QBL trends to the physicians and nurses.
"QBL is only needed for cases where a hemorrhage is identified."	Measurement of cumulative blood loss is the goal. Often it is too late when we recognize that the woman has lost too much blood. Perform regular quantification in non- emergency situations to prepare the team for the actual PPH event.
"QBL is not exact and therefore it is not worth doing."	The goal is not a "perfect, precise" number. There may be some discrepancies from mixing with amniotic fluid, urine, irrigant, etc. and this can be measured to some degree. It is more accurate to do some measurements than to rely solely on visual estimates.
"There was fluid already in the canister, just estimating, we forgot it and so it's just an estimate."	Since irrigation is usually done after the major bleeding is controlled, it may be best to connect to another canister BEFORE irrigating to capture this fluid separately. With continued use, documenting the measures at birth and then ongoing becomes routine practice and there is less forgetting to document.
"With QBL, it is now my responsibility to get it right." "I used to be in charge and still want the responsibility."	Shared responsibility and accountability is critical to quality patient outcomes. A shared team awareness is needed. It is no one person's responsibility. It is a TEAM responsibility.
"QBL takes a lot of time doesn't it?"	Teams that do QBL report that it becomes routine and takes very little additional time. Have QBL nurse and physician experts showcase do-ability of QBL and describe how they successfully performed QBL.
It's going to slow down OR room turnover."	Have scales and dry item lists readily available in every OR. Develop quick methods for totaling/calculating in EMR. Think of the time that will be saved by avoiding a hemorrhage event.

APPENDIX I: TESTIMONIALS
WHY DO QUANTIFICATION OF BLOOD LOSS IN OBSTETRICS?

"When I was practicing in Ohio, a quality improvement project was initiated for reduction of obstetric hemorrhage. I was skeptical about some of the components and somewhat taken aback to having anesthesiologists or nurses telling me what the blood loss amount was. I had been estimating blood loss for years without any problems and did not see the value for the added time and attention that it would take. That is, until the consistent measurements indicated that estimation was not as safe for my patients as measured quantification.
Over time, I learned from the literature that estimations were often as much as 50% inaccurate, usually underestimating the true loss. I have heard from nurses, that on day two the hematocrit is sometimes low and the patient symptomatic when estimations are used and quantifications ignored. This has made a believer out of me and now, I consistently want to have quantified measurement of blood loss for vaginal and caesarean deliveries. Quantification is not a perfect measurement but is more accurate than guessing . . .
We have the evidence that early recognition of significant blood loss and early intervention is safer for our patients. We need to get over the old thinking that we are not good at our jobs if there is blood loss and move to the evidence based model that says we are best at our work if we recognize and respond appropriately."

Judette Louis, MD, MPH
Assistant Professor, College Of Medicine Obstetrics & Gynecology Assistant Professor, Morsani College of Medicine and College of Public Health

"When it comes to obstetric hemorrhage, denial and delay in recognition can equal maternal death. The uterus can bleed 500-800 cc/minute and within 5 minutes of unrecognized hemorrhage a patient can suffer loss of an entire blood volume along with valuable clotting factors. Signs of hypotension are often masked in healthy patients due to increases in cardiac output and vasoconstriction. Quantification of blood loss in the operating room and labor and delivery room is vital to providing early intervention in recognition and treatment of obstetric hemorrhage. As medical providers, we need to join together in accurately measuring blood loss as part of the multidisciplinary approach to obstetric hemorrhage. By putting the ego aside and letting go of estimates, we can move towards evidenced based quantification of blood loss to help providers overcome the denial and delay in treatment of maternal hemorrhage."

Jean Miles, MD
Regional Director Obstetrical Anesthesia Services, Memorial Healthcare System Director Obstetrical Anesthesia, Memorial Regional Hospital Sheridan Healthcorp Hollywood, FL

"When implementing any new initiative among nursing staff it is essential to understand the 'why' behind the purpose of implementing the new process/procedure. QBL allows us to have a more accurate clinical picture of blood loss so we can proactively manage our patients rather than reactively manage their symptoms after they are already occurring. Even the most experienced clinicians can have a difference of opinion when it comes to subjective assessment. QBL is the closest we can come to objectively assessing the blood loss post-delivery so we can improve clinical outcomes for our patients".

Marie Sakowski, MSN, RNC
Nurse Manager, Perinatal, Labor and Delivery, Women's Health Pavilion, Florida Hospital Tampa

AWHONN recommends measuring blood loss for every woman who gives births in order to reduce denial that leads to delays in women receiving lifesaving treatments. Measuring blood loss makes an un-reliable subjective process much more reliable.

Debra Bingham, DrPH, RN
AWHONN Vice President of Nursing Research, Education, and Practice

APPENDIX J: TIPS FOR QUANTIFICATION OF BLOOD LOSS

Every birth needs to have quantification of blood loss (QBL). Careful planning and training are important to successful implementation of QBL.

Because there is always concern about the mixing of other fluids into the blood loss, the following information is offered to assist in decision making. Average amounts of amniotic fluid have been estimated at 700 ml for normal, 300 ml for oligohydramnios, and 1400 ml for polyhydramnios.[61] It is important to make note of fluids contained in the collection container at the time of infant delivery and continue to measure until the patient is stable, usually 2 to 4 hours postpartum. If there is amniotic fluid collected in the drape or container, this fluid should not be included in the blood loss calculation. Since the majority of blood loss occurs after the delivery of placenta, an establishment of baseline measure of other fluids should occur before delivery of the placenta.[4] The use of a calibrated drape, which has an error rate of less than 15% is recommended for vaginal deliveries.[73] For Caesarean Sections, a two part collection method is recommended, changing to a second container after the infant is delivered or noting the collection amount at the time of delivery.

Methods of QBL:

Weight

- Use scales to weigh all blood-saturated items (e.g., laps, chux, cloth pads, peripads) and clots.
- Standardize products used for deliveries and determine their dry weights.
- Create a laminated list of dry weights of items used during birth that may become blood soaked. Attach to every scale.
- Converting Grams to Milliliters: Calculate the gram weight and convert to milliliters. Grams (a unit of mass) converted to Milliliters (a unit of volume): One gram = One milliliter

Direct Measurement

- Graduated suction canisters
- Under-buttocks and OR drapes with calibrated pouches.

Quantification Tips:

- Measure amount of fluids after birth of the infant. The majority of the bleeding is after the placenta is delivered.
- Keep track of any extra fluids added e.g. irrigants, urine, feces.
- Pre-determine the dry weights of items regularly used and have these weights readily available
- A practical way of measuring blood in laps is to weigh them in groups of 5.
- Adjust electronic medical records to document and perform the math if possible
- Need ready access to measuring devices such as scales, suction canisters, etc.

QBL at Cesarean Deliveries:

- Between delivery of infant and placenta, the OB suctions the drape of amniotic fluid; scrub staff directs circulator to change suction tubing to second canister. Circulator records volume in second canister before irrigation is used (or amount of irrigation to subtract).
- Bloody lap sponges passed off scrub table by staff, circulator weights bloody sponges, and numbers are recorded.
- Train staff to account for other large sources of blood loss, if indicated.

Adapted from AWHONN Practice Brief, Quantification of Blood Loss, May 2014

APPENDIX K: OB HEMORRHAGE POCKET CARD

NCPOP-Northeastern California Perinatal Outreach Program

OB Hemorrhage Toolkit Pocket Card

This project was developed by RPPC Region 2, Northeastern California Perinatal Outreach Program (NCPOP) with Title V funding through the CDPH/MCAH, 2010.Adapted with permission from the California Department of Public Health Toolkit: "Improving the Health Care Response to Obstetric Hemorrhage" by Lyndon A, Lagrew D, Shields L, et al and the California Maternal Quality Care Collaborative, 2010. Funding for development of the toolkit and this poster was provided by the federal Title V block grant from the California Maternal, Child and Adolescent Health Division. (Updated 5/2014 for v 2.0)

Identify Risk on Admission

OB Hemorrhage—No Denial—No Delay	
Low Risk: • No previous uterine incision • Singleton Pregnancy • ≤ 4 previous vaginal births • No known bleeding disorder • No history of PPH	**Hold Specimen**
Medium Risk: • Prior c/s or uterine surgery • Multiple gestation • > 4 previous vaginal births • Chorioamnionitis • History of previous PPH • Large uterine fibroids	**Type and Screen**
High Risk: • Placenta Previa, or low lying • Suspected accreta or percreta • HCT < 30 AND other risk factors • Platelets < 100,000 • Active bleeding on admit • Known coagulopathy	**Type and Cross**

Stage 0

Stage 0

- Active management with oxytocin infusion of 10-40 units/500-1000 mL titrated; or 10 units IM

Action

- Quantitative evaluation of cumulative blood loss: use of graduated containers, visual comparisons, and weighing blood soaked materials after delivery of placenta. 1gm = 1mL

- Ongoing evaluation of vital signs per hospital protocol; more if needed per patient condition.

Proceed to STAGE 1 if:
- cumulative blood loss > 500 mL for vaginal or > 1000 mL for C/S OR
- VS > 15% change (HR ≥ 110, BP ≤ 85/45, O_2 sat < 95%) OR
- ↑ bleeding during recovery or postpartum

Stage 1

Stage 1

Continued bleeding and Blood loss: > 500 ml vaginal or > 1000 ml C/S, **OR** VS changes (by > 15% or HR ≥ 110, BP ≤ 85/45) sat < 95% **OR** increased bleeding during recovery period.

Mobilize

- Notify OB/CNM
- Notify Charge RN
- Notify Anesthesia provider

Actions

- Establish 16g IV
- Infuse oxytocin 500mL/hr (10-40 units/500-1000 mL)

- Vigorous fundal massage
- Administer 2nd uterotonic
- Vital signs including O_2 sat q 5 minutes
- Weigh and calculate blood loss
- Administer O_2 to keep sats >95%
- Empty bladder – foley with urimeter
- Type and Cross for 2 units PRBCs
- Keep patient warm

Consider potential etiologies: atony, trauma, laceration, retained placenta, AFE, inversion, coagulopathy, accreta

Proceed to STAGE 2 if:
- Continued bleeding or continued VS instability, & < 1500 mL cumulative blood loss

Stage 2

Stage 2

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

Mobilize

- OB/CNM at bedside; 2nd OB or perinatologist & anesthesiologist called to assist;
- Charge nurse: assign recorder and runner, notify nursing supervisor, call radiology to prepare for IR if available, and call for second anesthesiologist
- Notify Rapid Response Team
- Assign a 2nd RN to communicate with l bank and offer family support

Actions

- Administer hemabate or misoprostil
- Move to OR
- Transfuse 2 U PRBC (do not wait for lab results); blood warmer; request for blood bank to thaw FFP
- Order STAT CBC/plts, Chem 12, Coag panel, and ABG
- Start 2nd IV
- Weigh & calculate cumulative blood loss
- Announce vital signs
- Ready essential equipment.

THINK:

Prepare for procedures/interventions based on etiology for: balloon, selective embolization with IR (atony), repair (trauma), B-lynch suture for (C/S), etc.

Proceed to STAGE 3 if:

- still bleeding ,cumulative blood loss > 1500 mL, > 2 units PRBCs given, VS unstable or suspicion for DIC

Stage 3

Stage 3

Cumulative blood loss > 1500 mL, > 2 U PRBCs given, VS unstable or suspect DIC

Mobilize

- **Activate Massive Transfusion Protocol**
- Notify GYN/Onc Surgeon
- Call in OR staff (anesthesia assist)
- Call in supervisor, CNS, Manager
- Blood bank to stay ahead of blood products

Actions

- Announce VS and cumulative blood loss
- Assist anesthesiologist with art line, PA or CVP line, or intubation.
- Use fluid warmer and/or rapid infuser
- Keep patient warm.
- Apply sequential. compression stockings to lower extremities.
- Repeat labs q 30-60 minutes.

THINK:

- Selective Embolization (IR)
- Interventions based on etiology from previous stage not yet completed; prevent hypothermia, acidemia, and hypocalcemia
- Surgeries: uterine artery ligation or hysterectomy
- For resuscitation: aggressively transfuse based on VS, and blood loss.

After first 2 units PRBC, near equal FFP and PRBC for massive hemorrhage
4-6 PRBC:4FFP:1 apheresis platelets

- Once stable: modify postpartum management consider ICU

Blood Products

Packed Red Blood Cells (PRBCs)

- Best first line product
- 1 unit = 200 ml volume
- If antibody positive, may take 1-24 hrs for crossmatch

Fresh Frozen Plasma (FFP)

- Approximately 35-45 min to thaw
- Highly desired if > 2 units PRBCs given, or for prolonged PT, PTT
- 1 unit = 18 ml volume

Platelets (PLTs)

- Priority for women with platelets < 50,000
- Single—donor apheresis unit (= 6 units of platelet concentrates) provides 40-50 K transient increase in platelets

Cryoprecipitate (CRYO)

- Approximately 35-45 min to thaw
- Priority for women with Fibrinogen levels < 80
- 10 unit pack raises Fibrinogen 80-100 mg/dl
- Best for DIC with low Fibrinogen and don't need volume replacement
- Caution: 10 units come from 10 different donors, so infection risk is proportionate
- Warm upper body with blankets or warming device
- Sequential compression stockings

Uterotonic Agents

Drug/Dose	Route/Frequency	Side Effects	Contraindications
Pitocin (Oxytocin) 10 units/ml 10-40 units per 500-1000 ml, titrated to uterine tone	Continuous IV infusion	Usually none; nausea/vomiting, hyponatremia ("water intoxication") with prolonged IV; ↓ BP and ↑ HR with high doses, esp IV push	Hypersensitivity to drug
Methergine (Methylergonivine) 0.2 mg/ml 0.2 mg	IM only/every 2-4 hours	Nausea/vomiting, severe hypertension, esp with rapid administration or in patients with HTN or Preeclampsia	HTN, Preeclampsia, heart disease; hypersensitivity Caution: if multiple doses of ephedrine have been used, may exaggerate hypertensive response w/possible cerebral hemorrhage
Hemabate (15-methyl PG F2a) 250 mcg/ml 250 mcg	IM only or intramyometrial only/every 15-90 min, NTE 8 doses in 24 hours	Nausea/vomiting, diarrhea, fever (transient), headache, chills, shivering, HTN, bronchospasm	Caution in women with hepatic disease, asthma, HTN, active cardiac or pulmonary disease; hypersensitivity to drug
Cytotec 100 or 200 mcg tablets 600-800 mcg	Sublingual (SL) or Orally (PO)/ One time	Nausea/vomiting, diarrhea; shivering; fever (transient); headache	Rare; known allergy to prostaglandin; hypersensitivity to drug

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