Optimizing Management of Obstetric Hemorrhage

Resources adapted from:
- The American Congress of Obstetricians and Gynecologists (ACOG) District II, *Optimizing Protocols in Obstetrics*
- California Maternal Quality Care Collaborative (CMQCC) *Obstetric hemorrhage Toolkit*

Published March 2014
Dear Colleagues;

On behalf of the Georgia Obstetrical and Gynecological Society (GOGS), we are pleased to provide you with this toolkit on Optimizing Management of Postpartum Hemorrhage. Every day, 2 to 3 women die in the United States of pregnancy-related complications, ranking the U.S. as number 46th in the world for maternal mortality.

Maternal mortality rates have steadily increased over the past decade (CDC, 2009). While some of the increase is due to improved data collection, these rates still have risen significantly. Georgia ranks among the highest in the United States with 35 maternal deaths per 100,000 live births in 2011, up from 20.5 from 2001 to 2006. Determined to reduce its maternal mortality rate, Dr. Brenda Fitzgerald, commissioner of the Georgia Department of Public Health (DPH) and an Obstetrician/Gynecologist, notes that many obstetric hemorrhage deaths are preventable. In response to rising maternal mortality, DPH, GOGS and a multidisciplinary team of experts from around the state have been diligently working on this very issue. In 2011, they formed the Georgia Maternal Mortality Review Committee (GA MMRC) to improve surveillance and understanding of pregnancy-related deaths in Georgia.

In an effort to improve maternal mortality in this state, the Society continues to identify areas where improving policies, programs and services will impact the lives of all women and end preventable death and injury. Toward this goal, we are providing this postpartum hemorrhage (PPH) toolkit: Optimizing Management of Obstetric Hemorrhage to encourage all birthing hospitals in Georgia to review and implement the best practices and tools for managing obstetric hemorrhage. Enclosed in this toolkit you will find:

- Core elements for the management of obstetric hemorrhage
- Recommendations to optimize the management of obstetric hemorrhage
- ACOG Practice Bulletin #76 – Postpartum Hemorrhage
- California Maternal Quality Care Collaborative (CMQCC) hemorrhage care checklist, flow chart, table chart and training tools for the measurement of blood loss.
- Information on the importance of drills and sample PPH drill scenarios
- Additional information on postpartum hemorrhage

Providers are encouraged to review their hospital's existing hemorrhage protocols and modify them if necessary to optimize the management of obstetrical hemorrhage. Standardization of health care processes and reduced variation in practice has been shown to improve outcomes and quality of care.

Thank you for supporting this important initiative. If you have any questions regarding the enclosed materials, please contact Kaprice Welsh, Clinical Liaison for GOGS, 770-904-5288 or kwelsh@georgiaobgyn.org.

Sincerely,

Dr. Roland Matthews, MD
President, Georgia OBGyn Society
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Improving Obstetric Hemorrhage in Georgia

Obstetric hemorrhage is the leading cause of maternal deaths in the United States with an estimate that 54-93 percent of these deaths are preventable. Unfortunately, our state’s maternal mortality ratio is 20.5 maternal deaths per 100,000 live births, which ranks 50th among all states in the U.S.

The Georgia Obstetrical and Gynecological Society and the Department of Public Health would like to improve these statistics. To achieve this goal, we ask physicians and hospitals to use this toolkit to review and improve obstetric hemorrhage management in their own facilities. In addition, hospitals may apply to join a postpartum hemorrhage improvement initiative in which hospitals in Georgia, New Jersey and the District of Columbia have been invited to participate.

Georgia’s PPH Multi-Hospital Quality Improvement Initiative

The Georgia OBGyn Society is excited to lend its support to the Georgia Department of Public Health, Georgia Hospital Association, Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN), and Merck for Mothers, on a new Postpartum Hemorrhage Initiative to improve clinical practice and reduce errors related to postpartum hemorrhage. Georgia will be a part of this multi-state hospital quality improvement initiative to improve readiness, recognition, and response to postpartum hemorrhage.

Over the next three years, the collaborative will be working to improve outcomes for women and families in Georgia through participating birthing hospitals. We encourage your hospital to sign up to participate in the baseline survey about PPH practices at your institution. The survey can be accessed at www.pphproject.org. Hospitals that complete the baseline survey may apply to participate in a multi-hospital, multi-state learning collaborative. Hospitals selected to participate in the learning collaborative will work with local leaders and a group of national experts composed of nurses, physicians, and AWHONN staff to identify areas of improvement and work to change clinical practice at their facility.

Utilizing this Toolkit to Optimize Management of Obstetric Hemorrhage

The Society has researched obstetric hemorrhage management resources from many excellent sources and included some of the best information in this toolkit. It is our hope that with this information and resources provided in this toolkit and with your leadership and encouragement, your hospital will review its hemorrhage protocols and implement the best practices for the women in your care.

If you have questions about the initiative, please contact: hemorrhage@awhonn.org.
Purpose of Toolkit

This document 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. While the components of a particular protocol and/or checklist may be adapted to local resources, standardization of protocols and checklists within an institution is strongly encouraged.

Resources for Optimizing Protocols in Obstetric Hemorrhage

We have gathered materials from a number of sources in an effort to select the ideal requirements for a comprehensive approach to obstetrical hemorrhage. These included:

- ACOG Practice Bulletin No. 76, Postpartum Hemorrhage

Each hospital must take into account the resources available within its own institution and community to design a protocol that will assist them in the optimal management of obstetrical hemorrhage. Each institution is encouraged to review its existing policy and protocols, and modify them if necessary to provide safe patient care, or consider the creation of a policy that will optimize the management of obstetrical hemorrhage.

Given the previous excellent work done in this area by the California Maternal Quality Care Collaborative (CMQCC), the American Congress of Obstetricians and Gynecologists (ACOG), and other organizations, we encourage individuals to utilize these extensive resources in the development of a hemorrhage protocol that will fit the needs of their individual institutions.

Core Elements

The following is a list of the components of any protocol that is created for the management of obstetrical hemorrhage. Hospitals should individualize their protocols based on an assessment of their own resources.

- Definitions
- Risk Factors/Etiology
- Initial Interventions
- Medical Treatment
- Surgical Treatment
- Defined Care Team and Escalation Role Clarity
- Checklist Algorithm
- Mass Transfusion Policy
- Simulation Drills
Introduction to Obstetric Hemorrhage Management

Obstetric hemorrhage continues to cause maternal morbidity and mortality in Georgia and across the United States. Most of these cases occur in spite of women delivering in hospitals staffed by physicians, nurses and support personnel who are knowledgeable, highly motivated, and well trained. Often these cases occur in hospitals that have very well written obstetric hemorrhage protocols in place. Obstetric hemorrhage management is a time and team dependent performance that requires precise choreography. Having a “good protocol” that has never been practiced as a drill or dry run is similar to a football team that studies its plays but never works through the timing on the practice field, or a dance troupe that never rehearses before opening night.

We have evaluated and chosen resources that not only can be used to prevent serious harm associated with obstetric hemorrhage, but can be used to design very good hemorrhage protocols. However, to be effective, your protocol must have two things:

1. Each hemorrhage protocol must be designed and/or approved by the people who will execute it (and they must be given time and resources and permission needed to produce or thoroughly study the written protocol that will work specifically in the institution where it is designed).

2. Each hemorrhage protocol must be tested for feasibility within the institution and taught and rehearsed through dry runs or drills to improve its quality and the precision team work necessary to effectively manage obstetric hemorrhage.

California Maternal Quality Care Collaborative

The CMQCC toolkit provides excellent resources and can be viewed in complete form at https://www.cmqcc.org/ob_hemorrhage. The toolkit begins with a section on, “How To Use This Toolkit” (CMQMM pages 1-2) followed by a compendium of evidence-based, best practices related to obstetric hemorrhage. In this document we have included CMQCC Obstetric hemorrhage care guidelines which are presented in three forms starting with the most comprehensive “Checklist,” followed by the most streamlined version of the “Flowchart” and finally by a care summary “Table chart.” (See GOGS Toolkit pages 29–34, CMQCC pages 110–122.) The comprehensive “Checklist” delineates all topics the workgroup thought should be included in a protocol except for simulation/drills topic.

A comprehensive document exists within the CMQCC tool kit related to obstetric hemorrhage drills and simulations. This document includes two detailed, ready to use scenarios which focus on both the technical management of obstetric hemorrhage, team function, communication, and role clarity. The document finishes with a Hospital Level Implementation Guide, which addresses practical planning for implementation of new evidence-based protocols and guidelines for quality improvement (GOGS pages 45-55, CMQCC pages 34-47).
Recommendations to Optimize Management of Obstetric Hemorrhage

Here are PPH Toolkit examples that are either included in this GOGS toolkit or are part of the CMQCC Toolkit, including page numbers where they can be found:

**Antepartum assessment is essential to identify women at risk for obstetrical hemorrhage.**

- Risk factor identification
- A prewritten order set for admission to L&D includes “risk scoring” for obstetric hemorrhage
- Definition checklist
  - Definitions & Early Recognition (CMQCC pages 3-6)
  - Incidence Risks & Diagnosis (CMQCC pages 22-25)

Each institution should develop an effective written protocol for responding to maternal hemorrhage, including rapid emergency blood transfusion, which requires coordination among physicians, nurses, anesthesiologists and the blood bank.

- Blood bank protocols should ensure that the institution has appropriate blood products for obstetric emergencies, and they should eliminate barriers to rapid blood access when needed.
  - Sample Hemorrhage Policy (GOGS pages 23-28, CMQCC pages 110-115)
  - Methods for developing training and tools for quantitative measurement of blood loss (GOGS page 42, CMQCC page 126)

**Other suggestions include:**

- On initiation of the obstetric hemorrhage protocol, a complete set of prewritten orders should instantly be authorized and executed. The attending physician only will sign this order set after the emergency is completed.
- Debriefings should occur after every drill and after every actual OB hemorrhage emergency. This allows for continuous quality improvement.
- Flow charts, checklists, and other documentary materials needed for managing the OB hemorrhage emergency should be available to assist in the management.
  - Toolkit examples
    * Surgical Treatment (CMQCC pages 72-73)
      I. Literature Review (CMQCC pages 70-71)
      II. Carts, Kits and Trays (GOGS pages 37-41, CMQCC pages 26-31)
    * Medical Treatment (CMQCC pages 74-75)
    * Checklist/Algorithms (GOGS pages 29-34, CMQCC pages 86-92)

**Be vigilant regarding blood loss during pregnancy, labor, and delivery, and in the early postpartum period.**

- Nursing staff and physicians in the Labor, Delivery, Recovery and Postpartum areas must be trained in accurately assessing the degree of maternal hemorrhage.
- When problems are identified, the nurse assigned must notify the physician immediately.
  - See CMQCC toolkit for checklist example
  - Toolkit examples
    * Definitions & Early Recognition (CMQCC pages 3-6)
    * Simulation & Drills (GOGS pages 45-53, CMQCC pages 32-47)
Use fluid resuscitation and transfusion based on the estimation of current blood loss and the expectation of continued bleeding, regardless of apparent maternal hemodynamic stability.

- Accurately estimate blood loss
  - Developing Training & Tools for Quantitative Measurement of Blood Loss (GOGS page 42, CMQCC page 126)
  - Toolkit examples
    * Simulation & Drills (GOGS pages 45-53, CMQCC pages 32-47)
    * Transfusion Policy (CMQCC pages 60-69)

Work with hospital staff to conduct drills or simulation to ensure the most efficient management of obstetric hemorrhage.

- Hospitals should run drills at different times of the day to ensure that appropriate hemorrhage team members are available at all times.
- All members of the health care team should participate, including nurses, physicians and ancillary staff, as appropriate
  - Simulation & Drills (GOGS pages 45-53, CMQCC pages 32-47)

The maternal hemorrhage team should include, in addition to a team leader:

- A surgeon with experience and expertise in controlling massive hemorrhage as well as operating room staff in case surgery is needed.
- A critical care physician or anesthesiologist who is familiar with severe hemorrhage to help with assessment of organ perfusion and cardiovascular function.
- A hematologist or clinical pathologist available on site to advise on appropriate blood products, and to coordinate and mobilize appropriate personnel to provide these products immediately.

Provide continuing medical education on hemorrhage for your entire medical team.

- Ensure all hospital staff, including physicians, nurses, laboratory personnel and others are aware of the protocol related to dealing with maternal hemorrhage. Incorporate this protocol into your hospital’s mandatory annual educational programs and ensure all new staff is oriented to its content.
- Findings from obstetrical quality improvement initiatives should be incorporated on an on-going basis into improvements of the hemorrhage protocol.
**HEMORRHAGE**

*Remains the major cause of obstetric morbidity and mortality*

- Hemorrhage >500ml (vaginal birth) = ~5-8%
- Transfusion (vaginal birth) = ~0.5%
- Transfusion (cesarean birth) = ~2%
- Severe (massive) hemorrhage (>4 units, >1500ml) = ~2/1,000 births
- 50-60% of severe morbidity in obstetrics
- >60% of all postpartum maternal ICU admissions
- The rate of severe hemorrhage is increasing, nearly doubling over the last decade
- The greatest cause of maternal mortality by far, world-wide

**MISSING IMPROVEMENT OPPORTUNITIES IN MANAGEMENT OF POSTPARTUM HEMORRHAGE**

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

Elliott Main, MD, Chair, California Pregnancy Associated Mortality Review Committee: personal communication (January 2009)
ISSUES WITH HEMORRHAGE RESPONSE IN OBSTETRICS

(from case review)

DENIAL, DELAY...
- Poor quantification of blood loss
- Lack of step-wise progression
- Underutilization of non-pharmacologic approaches
- Poor utilization of blood products:
  - “Too little, too late”
    — Resuscitation v. Treatment
  - “Old wine in new bottles” — “Whole blood” v. PRBCs

Step 1: Communication!
Postpartum Hemorrhage

Severe bleeding is the single most significant cause of maternal death worldwide. More than half of all maternal deaths occur within 24 hours of delivery, most commonly from excessive bleeding. It is estimated that, worldwide, 140,000 women die of postpartum hemorrhage each year—one every 4 minutes (1). In addition to death, serious morbidity may follow postpartum hemorrhage. Sequelae include adult respiratory distress syndrome, coagulopathy, shock, loss of fertility, and pituitary necrosis (Sheehan syndrome).

Although many risk factors have been associated with postpartum hemorrhage, it often occurs without warning. All obstetric units and practitioners must have the facilities, personnel, and equipment in place to manage this emergency properly. Clinical drills to enhance the management of maternal hemorrhage have been recommended by the Joint Commission on Accreditation of Healthcare Organizations (2). The purpose of this bulletin is to review the etiology, evaluation, and management of postpartum hemorrhage.

Background

The physiologic changes over the course of pregnancy, including a plasma volume increase of approximately 40% and a red cell mass increase of approximately 25%, occur in anticipation of the blood loss that will occur at delivery (3). There is no single, satisfactory definition of postpartum hemorrhage. An estimated blood loss in excess of 500 mL following a vaginal birth or a loss of greater than 1,000 mL following cesarean birth often has been used for the diagnosis, but the average volume of blood lost at delivery can approach these amounts (4, 5). Estimates of blood loss at delivery are notoriously inaccurate, with significant underreporting being the rule. Limited instruction on estimating blood loss has been shown to improve the accuracy of such estimates (6). Also, a decline in hematocrit levels of 10% has been used to define postpartum hemorrhage, but determinations of hemoglobin or hematocrit concentrations may not reflect the current hematologic status (7). Hypotension, dizziness, pal-
lor, and oliguria do not occur until blood loss is substantial—10% or more of total blood volume (8).

Postpartum hemorrhage generally is classified as primary or secondary, with primary hemorrhage occurring within the first 24 hours of delivery and secondary hemorrhage occurring between 24 hours and 6–12 weeks postpartum. Primary postpartum hemorrhage, which occurs in 4–6% of pregnancies, is caused by uterine atony in 80% or more of cases (7). Other etiologies are shown in the box “Etiology of Postpartum Hemorrhage,” with risk factors for excessive bleeding listed in the box “Risk Factors for Postpartum Hemorrhage.”

If excessive blood loss is ongoing, concurrent evaluation and management are necessary. A number of general medical supportive measures may be instituted, including provision of ample intravenous access; crystalloid infusion; blood bank notification that blood products may be necessary; prompt communication with anesthesiology, nursing, and obstetrician–gynecologists; and blood collection for baseline laboratory determinations.

When treating postpartum hemorrhage, it is necessary to balance the use of conservative management techniques with the need to control the bleeding and achieve hemostasis. A multidisciplinary approach often is required. In the decision-making process, less-invasive methods should be tried initially if possible, but if unsuccessful, preservation of life may require hysterectomy. Management of postpartum hemorrhage may vary greatly among patients, depending on etiology of the bleeding, available treatment options, and a patient’s desire for future fertility. At times, immediate surgery is required because time spent using other treatment methods would be dangerous for the patient. There are few randomized controlled studies relevant to the management of postpartum hemorrhage, so management decisions usually are made based on clinical judgment.

Evaluation and Management Considerations

In an effort to prevent uterine atony and associated bleeding, it is routine to administer oxytocin soon after delivery. This may be given at the time of delivery of the anterior shoulder of the fetus, or more commonly in the United States, following delivery of the placenta.

It may be helpful to post protocols for hemorrhage management in delivery rooms or operating suites. A sample poster from the New York City Department of Health and Mental Hygiene is available at http://home2.nyc.gov/html/doh/downloads/pdf/ms/ms-hemorr-poster.pdf.

Clinical Considerations and Recommendations

What should be considered in the initial evaluation of a patient with excessive bleeding in the immediate puerperium?

Because the single most common cause of hemorrhage is uterine atony, the bladder should be emptied and a bimanual pelvic examination should be performed. The finding of the characteristic soft, poorly contracted (“boggy”) uterus suggests atony as a causative factor. Compression or massage of the uterine corpus can diminish bleeding, expel blood and clots, and allow time for other measures to be implemented.

If bleeding persists, other etiologies besides atony must be considered. Even if atony is present, there may be other contributing factors. Lacerations should be ruled out by careful visual assessment of the lower genital tract. Proper patient positioning, adequate operative assistance, good lighting, appropriate instrumentation (eg, Simpson or Heaney retractors), and adequate anesthesia are necessary for the identification and proper repair of lacerations. Satisfactory repair may require transfer to a well-equipped operating room.

Genital tract hematomas also can lead to significant blood loss. Progressive enlargement of the mass indicates a need for incision and drainage. Often a single bleeding source is not identified when a hematoma is incised. Draining the blood within the hematoma (sometimes

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**Etiology of Postpartum Hemorrhage**

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterine atony</td>
<td>Subinvolution of placental site</td>
</tr>
<tr>
<td>Retained placenta—especially placenta accreta</td>
<td>Retained products of conception</td>
</tr>
<tr>
<td>Defects in coagulation</td>
<td>Infection</td>
</tr>
<tr>
<td>Uterine inversion</td>
<td>Inherited coagulation defects</td>
</tr>
</tbody>
</table>

Risk Factors for Postpartum Hemorrhage

- Prolonged labor
- Augmented labor
- Rapid labor
- History of postpartum hemorrhage
- Episiotomy, especially mediolateral
- Preeclampsia
- Overdistended uterus (macrosomia, twins, hydramnios)
- Operative delivery
- Asian or Hispanic ethnicity
- Chorioamnionitis


Ongoing blood loss in the setting of decreased uterine tone requires the administration of additional uterotonic as the first-line treatment for hemorrhage (Table 1). Some practitioners prefer direct injection of methylergonovine maleate and 15-methyl prostaglandin (PG) F₂α into the uterine corpus. Human recombinant factor VIIa is a new treatment modality shown to be effective in controlling severe, life-threatening hemorrhage by acting on the extrinsic clotting pathway. Intravenous dosages vary by case and generally range from 50 to 100 mcg/kg every 2 hours until hemostasis is achieved. Cessation of bleeding ranges from 10 minutes to 40 minutes after administration (11–14). Concern has been raised because of apparent risk of subsequent thromboembolic events following factor VIIa use (15). Compared with other agents, factor VIIa is extremely expensive. Additional clinical experience in all specialties will help
determine factor VIIa’s role in the treatment of patients with postpartum hemorrhage.

► When is packing or tamponade of the uterine cavity advisable?

When uterotonic agents fail to cause sustained uterine contractions and satisfactory control of hemorrhage after vaginal delivery, tamponade of the uterus can be effective in decreasing hemorrhage secondary to uterine atony (Table 2). Such approaches can be particularly useful as a temporizing measure, but if a prompt response is not seen, preparations should be made for exploratory laparotomy.

Packing with gauze requires careful layering of the material back and forth from one cornu to the other using a sponge stick, packing back and forth, and ending with extension of the gauze through the cervical os. The same effect often can be derived more easily using a Foley catheter, Sengstaken-Blakemore tube, or, more recently, the SOS Bakri tamponade balloon (16), specifically tailored for tamponade within the uterine cavity in cases of postpartum hemorrhage secondary to uterine atony.

► When are surgical techniques used to control uterine bleeding?

When uterotonic agents with or without tamponade measures fail to control bleeding in a patient who has given birth vaginally, exploratory laparotomy is indicated. A midline vertical abdominal incision usually is preferred to optimize exposure. Several techniques are available to control bleeding (Table 3). Hypogastric artery ligation is performed much less frequently than in years past. Its purpose is to diminish the pulse pressure of blood flowing to the uterus via the internal iliac (hypogastric) vessels. Practitioners are less familiar with this technique, and the procedure has been found to be considerably less successful than previously thought (17). Bilateral uterine artery ligation (O’Leary sutures) accomplishes the same goal, and this procedure is quicker and easier to perform (18, 19). To further diminish blood flow to the uterus, similar sutures can be placed across the vessels within the uteroovarian ligaments.

The B-Lynch technique is a newer procedure for stopping excessive bleeding caused by uterine atony (20). The suture provides even pressure to compress the uterine corpus and decrease bleeding. One study reported more

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**Table 1. Medical Management of Postpartum Hemorrhage**

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<thead>
<tr>
<th>Drug*</th>
<th>Dose/Route</th>
<th>Frequency</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytocin (Pitocin)</td>
<td>IV: 10–40 units in 1 liter normal saline or lactated Ringer's solution IM: 10 units</td>
<td>Continuous</td>
<td>Avoid undiluted rapid IV infusion, which causes hypotension.</td>
</tr>
<tr>
<td>Methylergonovine (Methergine)</td>
<td>IM: 0.2 mg</td>
<td>Every 2–4 h</td>
<td>Avoid if patient is hypertensive.</td>
</tr>
<tr>
<td>15-methyl PGF$_{2α}$ (Carboprost) (Hemabate)</td>
<td>IM: 0.25 mg</td>
<td>Every 15–90 min, 8 doses maximum</td>
<td>Avoid in asthmatic patients; relative contraindication if hepatic, renal, and cardiac disease. Diarrhea, fever, tachycardia can occur.</td>
</tr>
<tr>
<td>Dinoprostone (Prosting E$_2$)</td>
<td>Suppository: vaginal or rectal 20 mg</td>
<td>Every 2 h</td>
<td>Avoid if patient is hypertensive. Fever is common. Stored frozen, it must be thawed to room temperature.</td>
</tr>
<tr>
<td>Misoprostol (Cytotec, PGE$_1$)</td>
<td>800–1,000 mcg rectally</td>
<td></td>
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</tr>
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*All agents can cause nausea and vomiting.


**Table 2. Tamponade Techniques for Postpartum Hemorrhage**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Uterine tamponade</td>
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</tr>
<tr>
<td>—Packing</td>
<td>—4-inch gauze; can soak with 5,000 units of thrombin in 5 mL of sterile saline</td>
</tr>
<tr>
<td>—Foley catheter</td>
<td>—Insert one or more bulbs; instill 60–80 mL of saline</td>
</tr>
<tr>
<td>—Sengstaken-Blakemore tube</td>
<td></td>
</tr>
<tr>
<td>—SOS Bakri tamponade balloon</td>
<td>—Insert balloon; instill 300–500 mL of saline</td>
</tr>
</tbody>
</table>
than 1,000 B-Lynch procedures with only seven failures (21). However, because the technique is new, many clinicians have limited experience with this procedure (22).

Hemostatic multiple square suturing is another new surgical technique for postpartum hemorrhage caused by uterine atony, placenta previa, or placenta accreta. The procedure eliminates space in the uterine cavity by suturing both anterior and posterior uterine walls. One study reported on this technique in 23 women after conservative treatment failed. All patients were examined after 2 months, and ultrasound findings confirmed normal endometrial linings and uterine cavities (23).

What are the clinical considerations for suspected placenta accreta?

Abnormal attachment of the placenta to the inner uterine wall (placenta accreta) can cause massive hemorrhage. In fact, accreta and uterine atony are the two most common reasons for postpartum hysterectomy (24, 25). Risk factors for placenta accreta include placenta previa with or without previous uterine surgery, prior myomectomy, prior cesarean delivery, Asherman’s syndrome, submucous leiomyomata, and maternal age older than 35 years (26).

Prior cesarean delivery and the presence of placenta previa in a current pregnancy are particularly important risk factors for placenta accreta. In a multicenter study of more than 30,000 patients who had cesarean delivery without labor, the risk of placenta accreta was approximately 0.2%, 0.3%, 0.6%, 2.1%, 2.3%, and 7.7% for women experiencing their first through sixth cesarean deliveries, respectively. In patients with placenta previa in the current pregnancy, the risk of accreta was 3%, 11%, 40%, 61%, and 67% for those undergoing their first through their fifth or greater cesarean deliveries, respectively (27).

Women with placenta previa or placenta accreta have a higher incidence of postpartum hemorrhage and are more likely to undergo emergency hysterectomy (28). In the multicenter study cited previously, hysterectomy was required in 0.7% for the first cesarean delivery and increased with each cesarean delivery up to 9% for patients with their sixth or greater cesarean delivery.

In the presence of previa or a history of cesarean delivery, the obstetric care provider must have a high clinical suspicion for placenta accreta and take appropriate precautions. Ultrasonography may be helpful in establishing the diagnosis in the antepartum period. Color Doppler technology may be an additional adjunctive tool for suspected accreta (29). Despite advances in imaging techniques, no diagnostic technique affords the clinician complete assurance of the presence or absence of placenta accreta.

If the diagnosis or a strong suspicion is formed before delivery, a number of measures should be taken:

- The patient should be counseled about the likelihood of hysterectomy and blood transfusion.
- Blood products and clotting factors should be available.
- Cell saver technology should be considered if available.
- The appropriate location and timing for delivery should be considered to allow access to adequate surgical personnel and equipment.
- A preoperative anesthesia assessment should be obtained.

The extent (area, depth) of the abnormal attachment will determine the response—curettage, wedge resection, medical management, or hysterectomy. Uterine conserving options may work in small focal accretas, but abdominal hysterectomy usually is the most definitive treatment.

Under what circumstances is arterial embolization indicated?

A patient with stable vital signs and persistent bleeding, especially if the rate of loss is not excessive, may be a candidate for arterial embolization. Radiographic identification of bleeding vessels allows embolization with Gelfoam, coils, or glue. Balloon occlusion is also a technique used in such circumstances. Embolization can be used for bleeding that continues after hysterectomy or can be used as an alternative to hysterectomy to preserve fertility.

When is blood transfusion recommended? Is there a role for autologous transfusions or directed donor programs?

Transfusion of blood products is necessary when the extent of blood loss is significant and ongoing, particularly if vital signs are unstable. Postpartum transfusion...
rates vary between 0.4% and 1.6% (30). Clinical judgment is an important determinant, given that estimates of blood loss often are inaccurate, determination of hematocrit or hemoglobin concentrations may not accurately reflect the current hematologic status, and symptoms and signs of hemorrhage may not occur until blood loss exceeds 15% (8). The purpose of transfusion of blood products is to replace coagulation factors and red cells for oxygen-carrying capacity, not for volume replacement. To avoid dilutional coagulopathy, concurrent replacement with coagulation factors and platelets may be necessary. Table 4 lists blood components, indications for transfusion, and hematologic effects.

Autologous transfusion (donation, storage, retransfusion) has been shown to be safe in pregnancy (31, 32). However, it requires anticipation of the need for transfusion, as well as a minimal hematocrit concentration often above that of a pregnant woman. Autologous transfusion generally is reserved for situations with a high chance of transfusion in a patient with rare antibodies, where the likelihood of identifying compatible volunteer-provided blood is very low. Blood donated by directed donors has not been shown to be safer than blood from unknown, volunteer donors. Cell saver technology has been used successfully in patients undergoing cesarean delivery. In a multicenter study of 139 patients using such devices, no untoward outcomes were noted when compared with control patients (33).

**What is the management approach for hemorrhage due to a ruptured uterus?**

Rupture can occur at the site of a previous cesarean delivery or other surgical procedure involving the uterine wall from intrauterine manipulation or trauma or from congenital malformation (small uterine horn), or it can occur spontaneously. Abnormal labor, operative delivery, and placenta accreta can lead to rupture. Surgical repair is required, with the specific approach tailored to reconstruct the uterus, if possible. Care depends on the extent and site of rupture, the patient’s current clinical condition, and her desire for future childbirth. Rupture of a previous cesarean delivery scar often can be managed by revision of the edges of the prior incision followed by primary closure. In addition to the myometrial disruption, consideration must be given to neighboring structures, such as the broad ligament, parametrial vessels, ureters, and bladder. Regardless of the patient’s wishes for the avoidance of hysterectomy, this procedure may be necessary in a life-threatening situation.

**What is the management approach for an inverted uterus?**

Uterine inversion, in which the uterine corpus descends to, and sometimes through, the uterine cervix, is associated with marked hemorrhage. On bimanual examination, the finding of a firm mass below or near the cervix, coupled with the absence of identification of the uterine corpus on abdominal examination, suggests inversion. If the inversion occurs before placental separation, detachment or removal of the placenta should not be undertaken; this will lead to additional hemorrhage. Replacement of the uterine corpus involves placing the palm of the hand against the fundus (now inverted and lowermost at or through the cervix), as if holding a tennis ball, with the fingertips exerting upward pressure circumferentially (34). To restore normal anatomy, relaxation of the uterus may be necessary. Terbutaline, magnesium sulfate, halogenated general anesthetics, and nitroglycerin have been used for uterine relaxation.

Manual replacement with or without uterine relaxants usually is successful. In the unusual circumstance in which it is not, laparotomy is required. Two procedures have been reported to return the uterine corpus to the abdominal cavity. The Huntington procedure involves

<table>
<thead>
<tr>
<th>Table 4. Blood Component Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
</tr>
<tr>
<td>Packed red cells</td>
</tr>
<tr>
<td>Platelets</td>
</tr>
<tr>
<td>Fresh frozen plasma</td>
</tr>
<tr>
<td>Cryoprecipitate</td>
</tr>
</tbody>
</table>

progressive upward traction on the inverted corpus using Babcock or Allis forceps (35). The Haultain procedure involves incising the cervical ring posteriorly, allowing for digital repositioning of the inverted corpus, with subsequent repair of the incision (36).

► What is the management approach for secondary postpartum hemorrhage?

Secondary hemorrhage occurs in approximately 1% of pregnancies; often the specific etiology is unknown. Postpartum hemorrhage may be the first indication for von Willebrand’s disease for many patients and should be considered. The prevalence of von Willebrand’s disease is reported to be 10–20% among adult women with menorrhagia (37). Hence, testing for bleeding disorders should be considered among pregnant patients with a history of menorrhagia because the risk of delayed or secondary postpartum hemorrhage is high among women with bleeding disorders (38, 39).

Uterine atony (perhaps secondary to retained products of conception) with or without infection contributes to secondary hemorrhage. The extent of bleeding usually is less than that seen with primary postpartum hemorrhage. Ultrasound evaluation can help identify intrauterine tissue or subinvolution of the placental site. Treatment may include uterotonic agents, antibiotics, and curettage. Often the volume of tissue removed by curettage is minimal, yet bleeding subsides promptly. Care must be taken in performing the procedure to avoid perforation of the uterus. Concurrent ultrasound assessment at the time of curettage can be helpful in preventing this complication. Patients should be counseled about the possibility of hysterectomy before initiating any operative procedures.

► What is the best approach to managing excessive blood loss in the postpartum period once the patient’s condition is stable?

Regardless of the cause of postpartum hemorrhage, subsequent replacement of the red cell mass is important. Along with a prenatal vitamin and mineral capsule daily (which contains about 60 mg of elemental iron and 1 mg folate), two additional iron tablets (ferrous sulfate, 300 mg, each yielding about 60 mg of elemental iron) will maximize red cell production and restoration. Erythropoietin can hasten red cell production in postpartum anemic patients to some extent, but it is not approved by the U.S. Food and Drug Administration for postoperative anemia, and it can be costly (40). Postpartum hemorrhage in a subsequent pregnancy occurs in approximately 10% of patients (8).

Summary of Recommendations and Conclusions

The following recommendations and conclusions are based primarily on consensus and expert opinion (Level C):

► Uterotonic agents should be the first-line treatment for postpartum hemorrhage due to uterine atony.

► Management may vary greatly among patients, depending on etiology and available treatment options, and often a multidisciplinary approach is required.

► When uterotonics fail following vaginal delivery, exploratory laparotomy is the next step.

► In the presence of conditions known to be associated with placenta accreta, the obstetric care provider must have a high clinical suspicion and take appropriate precautions.

Proposed Performance Measure

If hysterectomy is performed for uterine atony, there should be documentation of other therapy attempts.

References


20


The MEDLINE database, the Cochrane Library, and the American College of Obstetricians and Gynecologists’ own internal resources and documents were used to conduct a literature search to locate relevant articles published between January 1901 and June 2006. The search was restricted to articles published in the English language. Priority was given to articles reporting results of original research, although review articles and commentaries also were consulted. Abstracts of research presented at symposia and scientific conferences were not considered adequate for inclusion in this document. Guidelines published by organizations or institutions such as the National Institutes of Health and ACOG were reviewed, and additional studies were located by reviewing bibliographies of identified articles. When reliable research was not available, expert opinions from obstetrician–gynecologists were used.

Studies were reviewed and evaluated for quality according to the method outlined by the U.S. Preventive Services Task Force:

I Evidence obtained from at least one properly designed randomized controlled trial.

II-1 Evidence obtained from well-designed controlled trials without randomization.

II-2 Evidence obtained from well-designed cohort or case–control analytic studies, preferably from more than one center or research group.

II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence.

III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories:

Level A—Recommendations are based on good and consistent scientific evidence.

Level B—Recommendations are based on limited or inconsistent scientific evidence.

Level C—Recommendations are based primarily on consensus and expert opinion.
APPENDICES
APPENDIX A. SAMPLE HEMORRHAGE POLICY AND PROCEDURE

Obstetric Hemorrhage Care Guidelines: Sample Policy and Procedure

<table>
<thead>
<tr>
<th>POLICY TITLE: Obstetric Hemorrhage Care Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT AND USERS DISTRIBUTION: Maternal Child Health, Labor and Delivery, Emergency Department, Operating Room, Blood Bank, Intensive Care Unit, Post-Anesthesia Care Unit(s)</td>
</tr>
</tbody>
</table>

Original Date of Issue: ___________________________

<table>
<thead>
<tr>
<th>Reviewed Date</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised Date</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
DEFINITIONS
General Hemorrhage: ≥500 ml blood loss for vaginal birth; ≥1000 ml blood loss for cesarean birth
Massive Hemorrhage: ≥1500 ml blood loss for any birth

MONITORING
Perform annual assessment of readiness to respond to an obstetric hemorrhage.

SUMMARY OF STAGES OF OBSTETRIC HEMORRHAGE AND PRIMARY TREATMENT GOALS

**Prenatal Screening and Treatment:**
Risk assessment
Aggressive treatment of anemia
Risk appropriate blood work on admission

**Stage 0:**
Prevention and Recognition of OB Hemorrhage in All Births
Active Management of Third Stage Labor
Ongoing Quantitative Evaluation of Blood Loss
Ongoing Evaluation of Vital Signs

**Stage 1:**
Cumulative Blood Loss >500 ml vaginal birth or >1000 ml cesarean birth –OR–
Vital Signs>15% change or HR ≥110, BP ≤85/45, O₂ sat <95% -OR-
Increased bleeding during recovery or postpartum
ACTIVATE HEMORRHAGE PROTOCOL, INITIATE PREPARATIONS, GIVE METHERGINE IM ONCE; IF NO RESPONSE, MOVE TO PROSTAGLANDINS (HEMABATE, CYTOTEC) (See Uterotonic Agent Information Table; Addendum A)

**Stage 2:**
Continued Bleeding or Vital Sign instability and 1000-1500 ml cumulative blood loss
SEQUENTIALLY ADVANCE THROUGH MEDICATIONS AND PROCEDURES;
MOBILIZE HELP & BLOOD BANK SUPPORT;
KEEP AHEAD WITH VOLUME AND BLOOD PRODUCTS

**Stage 3:**
Cumulative Blood Loss >1500 ml, >2 units PRBCs given, Vital Signs unstable of suspicion for Disseminated Intravascular Coagulopathy
ACTIVATE MASSIVE TRANSFUSION PROTOCOL AND INVASIVE SURGICAL APPROACHES TO CONTROL BLEEDING
**PROCEDURES**

**Prenatal, Admission and Ongoing Risk Assessment**
- Identify and prepare for patients with special considerations: Placenta Preview/Accreta, Bleeding Disorder, or those who decline blood products
- Screen and aggressively treat severe anemia: if oral iron fails, initiate IV Iron Sucrose Protocol ([Best Practice: Iron Sucrose Protocol](#)) to reach desired Hgb/Hct, especially for at-risk mothers

<table>
<thead>
<tr>
<th>Admission Assessment &amp; Planning</th>
<th>Evaluate for Risk Factors (see below)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If not available,</strong></td>
<td><strong>If medium risk:</strong></td>
</tr>
<tr>
<td>Order Type &amp; Screen (lab will notify if 2nd clot needed for confirmation)</td>
<td>Order Type &amp; Screen</td>
</tr>
<tr>
<td><strong>If prenatal or current antibody screen positive (if not low level anti-D from Rho-GAM),</strong></td>
<td>Review Hemorrhage Protocol</td>
</tr>
<tr>
<td>Type &amp; Crossmatch 2 units PRBCs</td>
<td></td>
</tr>
<tr>
<td><strong>All other patients,</strong></td>
<td><strong>If high risk:</strong></td>
</tr>
<tr>
<td>Send Clot to blood bank</td>
<td>Order Type &amp; Crossmatch 2 units PRBCs</td>
</tr>
<tr>
<td></td>
<td>Review Hemorrhage Protocol</td>
</tr>
<tr>
<td></td>
<td>Notify OB Anesthesia</td>
</tr>
<tr>
<td></td>
<td>Identify women who may decline transfusion</td>
</tr>
<tr>
<td></td>
<td>Notify OB provider for plan of care</td>
</tr>
<tr>
<td></td>
<td>Early consult with OB anesthesia</td>
</tr>
<tr>
<td></td>
<td>Review Consent Form</td>
</tr>
</tbody>
</table>

**Ongoing Risk Assessment**
- **If evaluate for development of additional risk factors in labor:**
  - Prolonged 2nd Stage labor
  - Prolonged oxytocin use
  - Active bleeding
  - Chorioamnionitis
  - Magnesium sulfate treatment
- Increase Risk level (see below) and convert to Type & Screen or Type & Crossmatch
- Treat multiple risk factors as High Risk

**Admission Hemorrhage Risk Factor Evaluation**

<table>
<thead>
<tr>
<th>Low (Clot only)</th>
<th>Medium (Type and Screen)</th>
<th>High (Type and Cross)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
<td>Prior cesarean birth(s) or uterine surgery</td>
<td>Placenta previa, low lying placenta,</td>
</tr>
<tr>
<td>Singleton pregnancy</td>
<td>Multiple gestation</td>
<td>Suspected placenta accreta or percreta</td>
</tr>
<tr>
<td>≤4 previous vaginal births</td>
<td>&gt;4 previous vaginal births</td>
<td>Hematocrit &lt;30 AND other risk factors</td>
</tr>
<tr>
<td>No known bleeding disorder</td>
<td>Chorioamnionitis</td>
<td>Platelets &lt;100,000</td>
</tr>
<tr>
<td>No history of PPH</td>
<td>History of previous PPH</td>
<td>Active bleeding (greater than show) on admit</td>
</tr>
<tr>
<td>Large uterine fibroids</td>
<td></td>
<td>Known coagulopathy</td>
</tr>
<tr>
<td>Estimated fetal weight greater than 4 kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morbid obesity (BMI &gt;35)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If admitted patients are started on magnesium sulfate they are at higher risk of postpartum hemorrhage.*
PROCEDURES, CONTINUED

STAGE 0
Prevention & Recognition of Hemorrhage during all births

Active Management of Third Stage of Labor
1. Administer Oxytocin infusion: 10-20 Units/1000 ml solution for women with IV access. Note that the dosage and rates should be clearly specified by each hospital.
   a. Titrate infusion rate to uterine tone.
   b. Use 10 units IM for women without IV access.
   c. Do not give oxytocin as IV push
2. Provide vigorous fundal massage for at least 15 seconds

Ongoing Quantitative Measurement of Blood Loss at all Births
1. Assess blood loss at birth, prior to delivery of the placenta whenever possible.
2. Reassess cumulative blood loss after delivery of the placenta
3. Use formal methods to assess blood loss:
   a. Use graduated under-buttock drapes
   b. Weigh blood soaked materials on gram scale (1 gm = 1ml)
      i. Subtract known dry weight of materials
      ii. Use a hemorrhage report or Early Warning Chart (National Health Survey, NHS)
   *NOTE: if a dry chux is used to protect scale from blood-soaked material, ZERO the scale after placing dry chux and prior to placing saturated item(s).

Ongoing Evaluation of Vital Signs and Clinical Triggers

STAGE 1
Cumulative Blood Loss >500 ml vaginal birth or >1000 ml C/S -OR- Vital Signs >15% change or HR ≥110, BP ≤85/45, O2 sat <95% -OR- Increased bleeding during recovery or postpartum

Interventions:
Follow Obstetric hemorrhage care guidelines checklist to mobilize response, act to mitigate bleeding, and move sequentially through treatment.

Evaluate patient response to interventions:
1. If the patient is stable following Stage 1 interventions then perform increased postpartum surveillance.
STAGE 2
Proceed to STAGE 2 for any of the following when cumulative blood loss is <1500 mL:
1. Continued bleeding
2. Continued vital sign instability

Evaluate patient response to interventions:
1. If stabilized during Stage 2 (<1500 ml cumulative blood loss) then perform increased postpartum surveillance

STAGE 3
Proceed to STAGE 3 if cumulative blood loss >1500 mL OR:
1. >2 units PRBCs administered
2. Unstable vital signs after stage 2 interventions
3. Suspicion of DIC

Evaluate patient response to interventions:
1. If stabilized during Stage 3 (cumulative blood loss >1500 ml) then perform increased postpartum surveillance, consult with intensivist and/or transfer to ICU

Do not delay other interventions while waiting for response to medication(s).

Do not wait for laboratory values to initiate transfusions:
1. Transfuse based on clinical signs and patient response.
2. Transfuse aggressively with a high ratio of Fresh Frozen Plasma to PRBCs for massive hemorrhage (>1500 mL cumulative blood loss); key is high ratio of FFP to PRBC
   - Either 6:4:1 PRBCs:FFP:Platelets
   - Or 4:4:1 PRBCs:FFP:Platelets

COMMUNICATION and DOCUMENTATION
1. Verbally acknowledge actions you will take and orders received.
2. Provide ongoing updates about patient’s status with other departments.
3. Record intake and output records.
REFERENCES and RELATED DOCUMENTS:

1. CMQCC OB Hemorrhage Task Force: Care Guidelines and Compendium of Best Practices, OB Hemorrhage Care Guidelines Checklist: use the checklist to help think through possible etiologies and anticipate next steps and to identify Risk Factors: Prenatal, Admission and Ongoing Assessment
3. Casper, L., Lee, R., Carts, Kits and Trays
4. Gregory, K., et al, Definitions, Early Recognition, and Rapid Response Using Triggers
**APPENDIX B: CMQCC OB HEMORRHAGE CARE GUIDELINES CHECKLIST**

### Obstetric Hemorrhage Care Guidelines: Checklist Format

#### Prenatal Assessment & Planning
- **Identify and prepare for patients with special considerations:** Placenta Previa/Accreta, Bleeding Disorder, or those who Decline Blood Products
- **Screen and aggressively treat severe anemia:** if oral iron fails, initiate IV Iron Sucrose Protocol to reach desired Hgb/Hct, especially for at risk mothers.

#### Admission Assessment & Planning

<table>
<thead>
<tr>
<th>Low (Clot only)</th>
<th>Medium (Type and Screen)</th>
<th>High (Type and Crossmatch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
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</tr>
<tr>
<td>Morbid obesity (BMI &gt;35)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Admission Hemorrhage Risk Factor Evaluation

- Evaluate for **Risk Factors** (see below)
- **If medium risk:**
  - Order Type & Screen
  - Review Hemorrhage Protocol
- **If high risk:**
  - Order Type & Crossmatch 2 units PRBCs
  - Review Hemorrhage Protocol
  - Notify OB Anesthesia
  - Identify women who may decline transfusion
  - Notify OB provider for plan of care
  - Early consult with OB anesthesia
  - Review Consent Form

#### Ongoing Risk Assessment
- Evaluate for development of additional risk factors in labor:
  - Prolonged 2nd Stage labor
  - Prolonged oxytocin use
  - Active bleeding
  - Chorioamnionitis
  - Magnesium sulfate treatment
- **Increase Risk level (see below) and convert to Type & Screen or Type & Crossmatch**
- **Treat multiple risk factors as High Risk**

#### STAGE 0: All Births: Prevention & Recognition of OB Hemorrhage

- **Active Management of Third Stage**
  - Oxytocin infusion: 10-20 units oxytocin/1000ml solution titrate infusion rate to uterine tone; or 10 units IM; do not give oxytocin as IV push
  - Vigorous funidal massage for at least 15 seconds
- **Ongoing Quantitative Evaluation of Blood Loss**
  - Using formal methods, such as graduated containers, visual comparisons and weight of blood soaked materials (1gm = 1ml)
- **Ongoing Evaluation of Vital Signs**

If: **Cumulative Blood Loss** >500ml vaginal birth or >1000ml C/S -OR-
Vital signs >15% change or HR >110, BP <85/45, O2 sat <95% -OR-
Increased bleeding during recovery or postpartum,
proceed to **STAGE 1**

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CMQCC Obstetric Hemorrhage Tool-Kit, April 2009, www.cmqcc.org
## OB HEMORRHAGE TOOLKIT

**APPENDIX B: CHECKLIST, continued**

### STAGE 1: OB Hemorrhage

**Cumulative Blood Loss >500ml vaginal birth or >1000ml C/S**

**-OR-**

**Vital signs >15% change or HR >110, BP <85/45, O2 sat <95%**

**-OR-**

**Increased bleeding during recovery or postpartum**

<table>
<thead>
<tr>
<th>MOBILIZE</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nurse, Physician or Midwife to:</td>
<td>Primary nurse:</td>
<td>Consider potential etiology:</td>
</tr>
<tr>
<td>- Activate OB Hemorrhage Protocol and Checklist</td>
<td>- Establish IV access if not present, at least 18 gauge</td>
<td>- Uterine atony</td>
</tr>
<tr>
<td>- Notify obstetrician (in-house and attending)</td>
<td>- Increase IV fluids rates (Lactated Ringers preferred) and increase Oxytocin rate (500 mL/hour of 10-40 units/1000mL solution); Titrate Oxytocin infusion rate to uterine tone</td>
<td>- Trauma/Laceration</td>
</tr>
<tr>
<td>- Notify charge nurse</td>
<td>- Continue vigorous fundal massage</td>
<td>- Retained placenta</td>
</tr>
<tr>
<td>- Notify anesthesiologist</td>
<td>- Administer Methergine 0.2 mg IM per protocol (if not hypertensive); give once, if no response, move to alternate agent; if good response, may give additional doses q 2 hr</td>
<td>- Amniotic Fluid Embolism</td>
</tr>
<tr>
<td></td>
<td>- Vital Signs, including O2 sat &amp; level of consciousness (LOC) q 5 minutes</td>
<td>- Uterine Inversion</td>
</tr>
<tr>
<td></td>
<td>- Weigh materials, calculate and record cumulative blood loss q 5-15 minutes</td>
<td>- Coagulopathy</td>
</tr>
<tr>
<td></td>
<td>- Administer oxygen to maintain O2 sats at &gt;95%</td>
<td>- Placenta Accreta</td>
</tr>
<tr>
<td></td>
<td>- Empty bladder: straight cath or place Foley with urimeter</td>
<td>- Uterine Rupture</td>
</tr>
<tr>
<td></td>
<td>- Type and Crossmatch for 2 units Red Blood Cells STAT (if not already done)</td>
<td>- Keep patient warm</td>
</tr>
<tr>
<td></td>
<td>- Keep patient warm</td>
<td>- Once stabilized: Modified Postpartum management with increased surveillance</td>
</tr>
</tbody>
</table>

**Physician or midwife:**

- Rule out retained Products of Conception, laceration, hematoma
- Surgeon (if cesarean birth and still open)
- Inspect for uncontrolled bleeding at all levels, esp. broad ligament, posterior uterus, and retained placenta

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

proceed to STAGE 2

### UTEROTONIC AGENTS for POSTPARTUM HEMORRHAGE

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Route</th>
<th>Frequency</th>
<th>Side Effects</th>
<th>Contraindications</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitolin® (Oxytocin) 10 units/ml</td>
<td>10-40 units per 1000 ml, rate titrated to uterine tone</td>
<td>IV infusion</td>
<td>Continuous</td>
<td>Usually none Nausea, vomiting, hypotension (“water intoxication”) with prolonged IV admin. ↓ BP and ↓ HR with high doses, esp IV push</td>
<td>Hypersensitivity to drug</td>
<td>Room temp</td>
</tr>
<tr>
<td>Methergine® (Methylergonovine) 0.2mg/ml</td>
<td>0.2 mg (not given IV)</td>
<td>IM</td>
<td>-Q 2-4 hours</td>
<td>Nausea, vomiting Severe hypertension, esp. with rapid administration or in patients with HTN or PIH</td>
<td>Hypertension, PIH, Heart disease Hypersensitivity to drug</td>
<td>Refrigerate Protect from light</td>
</tr>
<tr>
<td>Hemabate® (15-methyl PG F2a) 250mcg/ml</td>
<td>250 mcg</td>
<td>IM or intra- myometrial (not given IV)</td>
<td>-Q 15-90 min</td>
<td>Nausea, vomiting, Diarrhea Fever (transient), Headache Chills, shivering Hypertension Bronchospasms</td>
<td>Cautions in women with hepatic disease, asthma, hypertension, active cardiac or pulmonary disease Hypersensitivity to drug</td>
<td>Refrigerate</td>
</tr>
<tr>
<td>Cytotec® (Misoprostol) 100 or 200mcg tablets</td>
<td>800-1000mcg</td>
<td>Per rectum (PR)</td>
<td>One time</td>
<td>Nausea, vomiting, diarrhea Shivering, Fever (transient) Headache</td>
<td>Rare Known allergy to prostaglandin Hypersensitivity to drug</td>
<td>Room temp</td>
</tr>
</tbody>
</table>

## STAGE 2: OB Hemorrhage
Continued bleeding or Vital Sign instability, and <1500 mL cumulative blood loss

<table>
<thead>
<tr>
<th>MOBILIZE</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary nurse (or charge nurse):</strong></td>
<td><strong>Team leader (OB physician):</strong></td>
<td>Sequentially advance through procedures and other interventions based on etiology:</td>
</tr>
<tr>
<td>☐ Call obstetrician to bedside</td>
<td>☐ Additional uterotonic medication: Hemabate 250 mcg IM [if not contraindicated] OR Misonprostol 800-1000 mcg PR</td>
<td>Vaginal birth</td>
</tr>
<tr>
<td>☐ Call Anesthesiologist</td>
<td>☐ Can repeat Hemabate up to 3 times every 20 min; (note-75% respond to first dose)</td>
<td>If trauma (vaginal, cervical or uterine):</td>
</tr>
<tr>
<td>☐ Activate Response Team:</td>
<td><strong>Do not delay other interventions</strong> (see right column) while waiting for response to medications</td>
<td>• Visualize and repair</td>
</tr>
<tr>
<td>PHONE #:</td>
<td>☐ Bimanual uterine massage</td>
<td>If retained placenta:</td>
</tr>
<tr>
<td>☐ Notify Blood bank of hemorrhage; order products as directed</td>
<td>☐ Move to OR (if on postpartum unit, move to L&amp;D or OR)</td>
<td>• D&amp;C</td>
</tr>
<tr>
<td><strong>Charge nurse:</strong></td>
<td>☐ Order 2 units PRBCs and bring to the bedside</td>
<td>If uterine atony or lower uterine segment bleeding:</td>
</tr>
<tr>
<td>☐ Notify Perinatologist or 2nd OB</td>
<td>☐ Order labs STAT (CBC/Pits, Chem 12, PT/INR, Fibrinogen, ABG)</td>
<td>• Intrauterine Balloon</td>
</tr>
<tr>
<td>☐ Initiate OB Hemorrhage Record</td>
<td>☐ Transfuse PRBCs based on clinical signs and response, do not wait for lab results</td>
<td>If above measures unproductive:</td>
</tr>
<tr>
<td>☐ If selective embolization, call Interventional Radiology Team and second anesthesiologist</td>
<td></td>
<td>• Selective embolization (Interventional Radiology if available &amp; adequate experience)</td>
</tr>
<tr>
<td>☐ Notify nursing supervisor</td>
<td></td>
<td><strong>C-section:</strong></td>
</tr>
<tr>
<td>☐ Assign single person to communicate with blood bank</td>
<td></td>
<td>• Uterine hemostatic suture, e.g., B-Lynch Suture, O’Leary, Multiple Squares</td>
</tr>
<tr>
<td>☐ Call medical social worker or assign other family support person</td>
<td></td>
<td>• Intrauterine Balloon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Uterine Inversion:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Anesthesia and uterine relaxation drugs for manual reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Amniotic Fluid Embolism:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximally aggressive respiratory, vasopressor and blood product support</td>
</tr>
</tbody>
</table>

**Secondary nurse (or charge nurse):**
- Place Foley with urimeter (if not already done)
- Obtain portable light and OB procedure tray or Hemorrhage cart
- Obtain blood products from the Blood Bank
- Assist with move to OR (if indicated)

**Blood Bank:**
- Determine availability of thawed plasma, fresh frozen plasma, and platelets; initiate delivery of platelets if not present on-site
- Consider thawing 2 FFP (takes 30 min), use if transfusing >2 units PRBCs
- Prepare for possibility of massive hemorrhage

---

Re-Evaluate Bleeding and Vital Signs
If cumulative blood loss >1500mL, >2 units PRBCs given, VS unstable or suspicion for DIC, **proceed to STAGE 3**

---

This project was supported by Title V funds received from the State of California Department of Public Health, Center for Family Health: Maternal Child and Adolescent Health Division

CMQCC Obstetric Hemorrhage Tool-Kit, April 2009, [www.cmqcc.org](http://www.cmqcc.org)
### STAGE 3: OB Hemorrhage
Cumulative blood loss >1500ml, >2 units PRBCs given, VS unstable or suspicion for DIC

<table>
<thead>
<tr>
<th>MOBILIZE</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
</table>
| Nurse or Physician: | Establish team leadership and assign roles | • Selective Embolization (IR)  
• Interventions based on etiology not yet completed  
• Prevent hypothermia, Acidemia |
| ☐ Activate Massive Hemorrhage Protocol | Team leader (OB physician + OB anesthesiologist, anesthesiologist and/or perinatologist and/or intensivist): |  |
| PHONE #: | ☐ Order Massive Hemorrhage Pack |  |
| Charge Nurse or designee: | (RBCs + FFP + 1 pheresis pack PLTS—see note in right column |  |
| ☐ Notify advanced Gyn surgeon (e.g. Gyn Oncologist) | ☐ Move to OR if not already there |  |
| ☐ Notify adult intensivist | ☐ Repeat CBC/PLTS, Chem 12, PT/aPTT, Fibrinogen, ABG STAT q 30-60 min |  |
| ☐ Call-in second anesthesiologist | Anesthesiologist (as indicated): |  |
| ☐ Call-in OR staff | ☐ Arterial blood gases |  |
| ☐ Reassign staff as needed | ☐ Central hemodynamic monitoring |  |
| ☐ Call-in supervisor, CNS, or manager | ☐ CVP or PA line |  |
| ☐ Continue OB Hemorrhage Record (In OR, anesthesiologist will assess and document VS) | ☐ Arterial line |  |
| ☐ If transfer considered, notify ICU | ☐ Vasopressor support |  |
| Blood Bank: | ☐ Intubation |  |
| ☐ Prepare to issue additional blood products as needed – stay ahead | Primary nurse: |  |
| | ☐ Announce VS and cumulative measured blood loss q 5-10 minutes |  |
| | ☐ Apply upper body warming blanket if feasible |  |
| | ☐ Use fluid warmer and/or rapid infuser for fluid & blood product administration |  |
| | ☐ Apply sequential compression stockings to lower extremities |  |
| | ☐ Circulate in OR |  |
| | Second nurse and/or anesthesiologist: |  |
| | ☐ Continue to administer meds, blood products and draw labs, as ordered |  |
| | Third Nurse (or charge nurse): |  |
| | ☐ Recorder |  |
| | |  |

### BLOOD PRODUCTS

- **Packed Red Blood Cells (PRBC)**  
  (approx. 35-45 min. for crossmatch—assuming no sample is in the lab and assuming no antibodies are present)  
  Transfuse O Negative blood if you cannot wait

  - Best first-line product for blood loss  
  - 1 unit = 450ml volume  
  - If antibody positive, may take 1-24 hrs. for crossmatch  
  - 1 unit=450ml volume and 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 = 180ml volume and typically increases Fibrinogen 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 Fibrinogen levels <80  
  - 10 unit pack typically raises Fibrinogen 80-100mg/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.
### Obstetric Hemorrhage Care Summary: Flow Chart Format

#### Pre-Admission
- Identify patients with special consideration: Placenta previa/accreta, Bleeding disorder, or those who decline blood products

#### Time of Admission
- Screen all admissions for hemorrhage risk: Low Risk, Medium Risk, and High Risk
  - **Low Risk**: Hold clot
  - **Medium Risk**: Type & Screen, Review Hemorrhage Protocol
  - **High Risk**: Type & Crossmatch 2 Units PRBCs, Review Hemorrhage Protocol

#### Stage 0
- **All Births**
  - All women receive active management of 3rd stage
  - Oxytocin IV infusion or 10 Units IM
  - Vigorous fundal massage for 15 seconds minimum

#### Stage 1
- **Activate Hemorrhage Protocol**
  - Blood Loss: >500 ml Vaginal, >1000 ml CS
  - Increase IV rate (LR); Increase Oxytocin
  - Methergine 0.2 mg IM (if not hypertensive)
  - Continue Fundal massage; Empty Bladder; Keep Warm
  - Administer O₂ to maintain Sat >95%
  - Rule out retained POC, laceration, or hematoma
  - Order Type & Crossmatch 2 Units PRBCs if not already done

#### Stage 2
- **Sequentially Advance through Medications & Procedures**

#### Stage 3
- **Activate Massive Hemorrhage Protocol**
  - Blood Loss: >1500 ml
  - Unresponsive Coagulopathy: After 10 Units PRBCs and full coagulation factor replacement, may consider rFactor VIIa
  - Conservative Surgery: B-Lynch Suture/Intrauterine Balloon, Uterine Artery Ligation, Hypogastric Ligation (experienced surgeon only), Consider IR (if available & adequate experience)

#### Ongoing Evaluation:
- Quantification of blood loss and vital signs

#### Cumulative Blood Loss
- NO
  - Standard Postpartum Management
  - Fundal Massage
- YES
  - **Activate Hemorrhage Protocol**
    - CALL FOR EXTRA HELP
  - Increased heavy bleeding
  - Transfuse 2 Units PRBCs per clinical signs
  - Do not wait for lab values
  - Consider thawing 2 Units FFP

#### Increased Bleeding
- YES
  - **CALL FOR EXTRA HELP**
  - Give Meds: Hemabate 250 mcg IM -or- Misoprostol 800-1000 mcg PR
  - Increased Postpartum Surveillance

#### Hemorrhage Continues
- YES
  - Fertility Strongly Desired
  - Definitive Surgery: Hysterectomy

#### Controlled
- NO
  - Consider ICU Care; Increased Postpartum Surveillance

---

California Maternal Quality Care Collaborative (CMQCC), Hemorrhage Taskforce (2009) visit: www.CMQCC.org for details

This project was supported by Title V funds received from the State of California Department of Public Health, Center for Family Health; Maternal, Child and Adolescent Health Division
### Obstetric Hemorrhage Care Summary: Table Chart Format

<table>
<thead>
<tr>
<th>Stage 0</th>
<th>Every woman in labor/giving birth</th>
</tr>
</thead>
</table>
| **Stage 0 focuses on risk assessment and active management of the third stage.** | - Assess every woman for risk factors for hemorrhage  
- Ongoing quantitative evaluation of blood loss on every birth |
| **Active Management 3rd Stage:** | - Oxytocin IV infusion or 10u IM  
- Fundal Massage- vigorous, 15 seconds min.  
- If Medium Risk: T&Scr  
- If High Risk: T&C 2 U  
- If Positive Antibody Screen (prenatal or current, exclude low level anti-D from RhoGam): T&C 2 U |

### Stage 1

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

**Stage 1 is short: activate hemorrhage protocol, initiate preparations and give Methergine IM.**

| OB access (if not already there) | - Extra help: 2nd OB, Rapid Response Team (per hospital), assign roles  
- VS & cumulative blood loss q5-10 min  
- Weigh bloody materials  
- Complete evaluation of vaginal wall, cervix, uterine cavity, placenta  
- Send additional labs, including DIC panel  
- If in Postpartum: Move to L&D/OR  
- Evaluate for special cases:  
  - Uterine Inversion  
  - Amn. Fluid Embolism |

**2nd Level Uterotonic Drugs:**

| Hemabate 250 mcg IM or  
| Misoprostol 800-1000 mcg PR |

**2nd IV Access (at least 18gauge)**

- Bimanual massage  
- Vaginal Birth: (typical order)  
  - Move to OR  
  - Repair any tears  
  - D&C: r/o retained placenta  
  - Place intrauterine balloon  
  - Selective Embolization (Interventional Radiology)  
- Cesarean Birth: (still intra-op) (typical order)  
  - Inspect broad lig, posterior uterus and retained placenta  
  - B-Lynch Suture  
  - Place intrauterine balloon  

**Notice Blood Bank of OB Hemorrhage**

- Bring 2 Units PRBCs to bedside, transfuse per clinical signs – do not wait for lab values  
- Use blood warmer for transfusion  
- Consider thawing 2 FFP (takes 35+min), use if transfusing >2u PRBCs  
- Determine availability of additional RBCs and other Coag products

### Stage 2

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

| OB back to bedside (if not already there) | - Extra help: 2nd OB, Rapid Response Team (per hospital), assign roles  
- VS & cumulative blood loss q5-10 min  
- Weigh bloody materials  
- Complete evaluation of vaginal wall, cervix, placenta, uterine cavity  
- Send additional labs, including DIC panel  
- If in Postpartum: Move to L&D/OR  
- Evaluate for special cases:  
  - Uterine Inversion  
  - Amn. Fluid Embolism |

**2nd Level Uterotonic Drugs:**

| Hemabate 250 mcg IM or  
| Misoprostol 800-1000 mcg PR |

**2nd IV Access (at least 18gauge)**

- Bimanual massage  
- Vaginal Birth: (typical order)  
  - Move to OR  
  - Repair any tears  
  - D&C: r/o retained placenta  
  - Place intrauterine balloon  
  - Selective Embolization (Interventional Radiology)  
- Cesarean Birth: (still intra-op) (typical order)  
  - Inspect broad lig, posterior uterus and retained placenta  
  - B-Lynch Suture  
  - Place intrauterine balloon

**Notify Blood Bank of OB Hemorrhage**

- Bring 2 Units PRBCs to bedside, transfuse per clinical signs – do not wait for lab values  
- Use blood warmer for transfusion  
- Consider thawing 2 FFP (takes 35+min), use if transfusing >2u PRBCs  
- Determine availability of additional RBCs and other Coag products

### Stage 3

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

| Stage 3 is focused on the Massive Transfusion protocol and invasive surgical approaches for control of bleeding. | - Mobilize team  
  - Advanced GYN surgeon  
  - 2nd Anesthesia Provider  
  - OR staff  
  - Adult Intensivist  
  - Repeat labs including coags and ABG’s  
  - Central line  
  - Social Worker/ family support |

**Activate Massive Hemorrhage Protocol**

| Laparotomy:  
| B-Lynch Suture  
| Uterine Artery Ligation  
| Hysterectomy  
| Patient support  
| Fluid warmer  
| Upper body warming device  
| Sequential compression stockings |

**Transfuse Aggressively**

- Massive Hemorrhage Pack  
- Near 1:1 PRBC:FFP  
- 1 PLT pheresis pack per 6units PRBCs  
- Unresponsive Coagulopathy: After 10 units PRBCs and full coagulation factor replacement: may consider rFactor VIIa


This Project was supported by Title V funds received from the State of California, Department of Public Health, Center for Family Health; Maternal, Child and Adolescent Health Division
Patient at risk for uncontrollable bleeding

Call:
- OB
- Anesthesia
- RN Manager
- Pharmacy
- Blood Bank (Blood Bank notify HemoChemistry and Hemo to prep/review for schistocytes (DIC)
- If pregnant -- Neonatal NP/MD
- Draw STAT lab for initial labs

Need MTP
MD/RN can call based on analysis

Activate MTP
* Call charge RN
* Notify Blood Bank (BB)
* Send runner to BB for initial MTP pkg.
+ 4 RBC
+ 1 apheresis PLT unit
+ 1 FFP (BB can begin thawing 3 more FFP’s)

EMPERIC CRYO if clinically indicated, notify BB to prepare

Lab Results
WNL

Ongoing bleeding not

Deactivate MTP:
Criteria: Normalized lab values and or no evidence of ongoing bleeding

Blood Bank call charge Nurse if MTP has not been deactivated & no products sent for > 60

Debriefing by designated committee

Collaborative Guideline for Massive Transfusion
(Adapted from Lucille Packard's Hospital at Stanford)

MTP Panel
- PT
- PTT
- Fibrinogen
- D-Dimer
- CBC (tube color)
- Type and Cross Match (tube color)

Conventional Resuscitation
Reevaluate at intervals to reconsider for MTP

Neonate Syringe
- Prepare 60cc unXM RBC quad syringe
- Call charge nurse when syringe ready

- If platelet count not <25K give 1 apheresis PLT (Increases PLT’s by 20-30K)
- If INR > 1.5...give 4 units FFP, repeat until INR controlled.
- If fibrinogen <100 mg/dl if MD requests. Give 10 pack CRYO. Blood bank to notify floor if low and automatically prepare more CRYO.
- If PTT > 36...suggestive of various coag. deficiencies/inhibitors, heparin, liver dz.
- If D-Dimer > 0.4ug/ml...suggestive of activation of fibrinolytic system.

Repeat lab Coag. and CBC

If bleeding continues after 1-2 cycles of blood products consider Recombinant Factor VII (FFVIIa/Novaseen®). Notify Pharm

Initial dose: round the dose to the nearest 2.4mcg increment.
- 90mcg/kg IV over 2-5 minutes.
- May repeat in 2 hours if life threatening bleeding present.

Subsequent dose: round the dose to the nearest 2.4mcg increment.
Dose ranging from 15-180 mcg/kg have been used to reverse bleeding in a variety of pt populations. Titrate subsequent dose based on the pt’s initial response to therapy.
- 90mcg/kg IV every 3 hr. for 9 doses was reported to be efficient in a case report of post partum bleeding associated with DIC.
- Consider decreasing the dose or extending the frequency of administration from q2 to q3, q4, to q6 as the condition improves.

PHONE NUMBERS:
Anesthesia
OB Hospitalist
OB Nurse Manager
Neonatal RN
OB OR
LDRP
Main Pharmacy
Blood Bank

Collaborative Guideline for Massive Transfusion
(Adapted from Lucille Packard’s Hospital at Stanford)
OB HEMORRHAGE: CARTS, KITS, TRAYS
LESLIE CASPER, MD, RICHARD LEE, MD

San Diego Medical Center, Southern California Permanente Medical Group; Division of Maternal-Fetal Medicine, Women’s & Children’s Hospital, University of Southern California

BACKGROUND
Postpartum hemorrhage (PPH) is a commonly encountered emergency on labor and delivery units throughout California. Although medical management is often successful in treating PPH, the obstetrician may have to resort to surgical measures to treat it. In such settings, the care provider may find it practical to have rapid access to surgical instruments and tools designed to treat PPH. Equipment compiled on an obstetrical hemorrhage “cart” is designed to treat vaginal/cervical lacerations and provide the instruments for uterine tamponade or uterine/ovarian artery ligation. In short, the cart would have all the instruments necessary to treat PPH before hysterectomy is performed, if needed. The reader is referred to other guidelines that depict the use of these techniques. For more in-depth details about the hemorrhage “cart” the reader is referred to articles by T.F. Baskett (1, 2).

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

EDUCATIONAL TOOLS, SUPPORT DOCUMENTS

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 [WEB LINK])
- Vaginal Packs
- Uterine balloon [WEB-LINK]
- 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, Fedris 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
**EVIDENCE GRADING**

**Level of Evidence: III.** Opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees.

**Level of Evidence: II-3.** Evidence obtained from multiple time series with or without intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence. Strong quality improvement data such as statistical process control, or other well-designed analysis.

**REFERENCES**


OB Hemorrhage Resources:

Fully stocked Obstetrical Hemorrhage Cart

iStat

Thromboelastogram
Thromboelastography (TEC) OVERVIEW

- Thromboelastography measures the visco-elastic properties of whole blood as it clots
- Shows the interaction of platelets with the coagulation cascade (aggregation, clot strengthening, fibrin cross linking and fibrinolysis)
- Assesses speed of clot formation
- Assesses potential for hypercoagulable state
- Assesses accelerated clot breakdown/fibrinolysis
- Assessment of clot strength
- Partial assessment of components of clotting process (platelets and coagulation factors)

Lab Goals:

- HCT >30
- INR 1.4
- Platelet count >50,000/ul
- Fibrinogen > 100,000mg/dl
- Base excess > -5
- Normothermia 96.8 F or greater.

*i-Stat System: Save Time! Point of Care Lab results*

The *i-STAT System™* rapid turnaround of test results could prove to be vital to decision making during PPH. The *i-Stat System* allows clinicians to access key test results on the spot, rather than wait for the 20-30 minutes it could take for sampling processing at the hospital lab.

- Anesthesiologist are trained to use
- Immediate lab results
- Unit cost 12K (most ICU’s have them)
- Cartridges are refrigerated: Cost ~$7
Recommended methods for ongoing quantitative measurement of blood loss:

1. Formally estimate blood loss by recording percent (%) saturation of blood soaked items with the use of visual cues such as pictures/posters to determine blood volume equivalence of saturated/blood soaked pads, chux, etc.
2. Formally measure blood loss by weighing blood soaked pads/chux
3. Formally measure blood loss by collecting blood in graduated measurement containers

Quantifying blood loss by weighing (see images at right and below)
- Establish dry weights of common items
- Standardize use of pads
- Build weighing of pads into routine practice
- Develop worksheet for calculations

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

Used with kind permission of Bev VanderWal, CNS
Patient Safety Checklist

POSTPARTUM HEMORRHAGE FROM VAGINAL DELIVERY

Date_________________ Patient ___________________________ Date of birth_________ MR # __________
Physician or certified nurse-midwife ___________________________ Last menstrual period __________
Gravidity/Parity ___________________________ Estimated date of delivery __________

For hemorrhage of more than 500 mL estimated blood loss, but less than 1,000 mL, from vaginal delivery:

☐ Start intravenous (IV) line if not present
☐ Increase IV fluid rate
☐ Increase IV oxytocin by increasing infusion rate, or by increasing concentration to
  40–80 international units/L
☐ Empty bladder
☐ Conduct vigorous fundal massage
☐ Administer 0.2 mg of methylergonovine intramuscularly every 2–4 hours if patient is not hypertensive
☐ Type and crossmatch 2 units packed red blood cells
☐ Evaluate for retained product of conception, lacerations, uterine atony, and uterine inversion
☐ Administer 0.25 mg of 15-methyl prostaglandin F₂α intramyometrially or intramuscularly (may repeat
  every 15–90 minutes for a maximum of eight doses), or 800–1,000 micrograms of misoprostol rectally (1)

If no response by 1,000 mL estimated blood loss:

☐ Call for help—second obstetrician, anesthesia, and blood bank
☐ Order stat complete blood cell count and coagulation studies, including hematocrit, platelets, fibrinogen,
  and prothrombin time and partial thromboplastin time
☐ Begin blood product transfusion based on clinical signs and judgment
☐ Establish second large-bore IV line
☐ Administer oxygen as needed to maintain oxygen saturation greater than 95% (2)
☐ Consider move to operating room for dilation and curettage or laceration repair
☐ Consider intrauterine balloon or uterine packing
☐ Consider warm blanket to prevent hypothermia
☐ Type and crossmatch 2–4 additional units packed red blood cells and thaw 2–4 units
  fresh frozen plasma
☐ Place Foley catheter with urometer

If no response by 1,500 mL estimated blood loss:

☐ Initiate massive transfusion protocol
☐ Consider transfusion protocol of packed red blood cells, fresh frozen plasma, and platelets at a
  ratio of 1:1:1
☐ Consider uterine artery ligation, B-Lynch sutures, or hysterectomy
References


Standardization of health care processes and reduced variation has been shown to improve outcomes and quality of care. The American College of Obstetricians and Gynecologists has developed a series of patient safety checklists to help facilitate the standardization process. This checklist 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 checklist may be adapted to local resources, standardization of checklists within an institution is strongly encouraged.

How to Use This Checklist

The Patient Safety Checklist on Postpartum Hemorrhage From Vaginal Delivery should be used to guide the process if a patient who is undergoing vaginal delivery experiences an estimated blood loss greater than 500 mL.

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SIMULATIONS & DRILLS
Leslie Casper, MD, San Diego Medical Center, Southern California Permanente Medical Group

BACKGROUND AND LITERATURE REVIEW
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 communication and coordination among team members.

Drills are practice sessions of relatively uncommon but critical events, such as antenatal or postpartum hemorrhage and amniotic fluid embolism. Critical Event Training simulations for all physicians, midwives, anesthesiologists and nurses may improve neonatal outcomes (1). Implementing a rapid response team and addressing systems’ issues for management of obstetrical hemorrhage has been shown to decrease maternal mortality and improve outcomes (2). The Joint Commission recommends team training in their 2005 Executive Summary of Strategies to Improve the Medical Liability System and Prevent Patient Injury (3).

Human factors training can improve communications and teamwork. Such training includes briefings, handoffs, time-outs and situational awareness for the team, which is a shared understanding of what is happening now and what happens next. Explicit communication skills to be taught include: addressing team members by name, making eye contact, repeating back orders and confirming that you are responding to an order, and not speaking to the room and assuming that you were heard. In addition, the concept of “Just Culture” or a similar environment should be implemented in all health care settings so that all team members feel respected and comfortable with asserting observations, suggestions and opinions. Improving team communications skills is one of the Joint Commission 2009 National Patient Safety Goals.

Scenarios for simulation should be designed for the needs of the learners (nurses, physicians, residents, respiratory therapy, etc.) and tailored to available resources. Interdisciplinary training should include all disciplines involved in the care of obstetric patients. Simulation can be low tech—using live models—or high tech, using complex computerized simulators or a combination of both. The objective of simulation is to create situations that are as similar to “real life” as possible. Simulation in situ may improve ability to address systems issues and provides practice in one’s own hospital setting with familiar resources. Simulation in a computerized simulation center offers high technology in an environment similar to real life, but without the distractions of the hospital. The choice of high or low fidelity simulation is institution
dependent; both can work well for hemorrhage scenarios. For practicing complex events requiring a maternal cardiorespiratory arrest, high fidelity may be a better choice since chest compressions cannot be performed on a live model, for example. Some institutions use a combination of both types. Debriefing is appropriate both for simulation drills and for live events.

Video taken during simulation serves as a realistic debriefing tool to explore what went well and what needs improvement after a scenario is performed. Evaluation tools such as checklists for expectations of each participant in their role and for team and individual performances can provide an objective approach to debriefing. Similarly, follow-up evaluation ensures that specific goals and objectives for each level of participant are met. The Ottawa Crisis Resource Management Global Rating Scale (4) and Mayo High Performance Teamwork Scale are examples (5).

**RECOMMENDATION**
All hospitals adopt regularly scheduled simulation drills for practicing response to obstetric hemorrhage. The choice of high or low fidelity drills is institution dependent; both can work well for hemorrhage scenarios.

**EDUCATIONAL TOOLS**
1. Obstetric Hemorrhage Sample Scenario 1: Drill for Abruptio Placentae (attached)
2. Obstetric Hemorrhage Sample Scenario 2; Drill for Placenta Previa (attached)
3. Obstetric Hemorrhage Sample Scenario 3: Hemorrhage and Hypotension (attached)
4. Obstetric Hemorrhage Sample Scenario 4: Atonic Uterus (attached)
5. Kaiser Evaluation Form for Drills; Debriefing Tool: “Labor and Delivery/Family Centered Care, Mock Obstetrical Hemorrhage, Roles and Responsibilities of Staff Skills Validation” (attached)
6. Dreyfus Model of Skill Acquisition (6) (attached)
7. Ottawa Crisis Resource Management Global Rating Scale (4)
8. Mayo High Performance Team Work Scale (5)

**EVIDENCE GRADING**
**Level of Evidence: B.** Recommendations based on limited or inconsistent evidence.

**REFERENCES**


Importance of Drills/Simulations  
Safety and QI Leader: Paul Preston, MD

“Medicine is the last high-risk industry that expects people to perform perfectly in complex, rare emergencies but does not support them with high-quality training and practice throughout their careers.”

“Certain individual and team skills require regular practice that cannot ethically occur in routine care.”

What you need to know for a Postpartum Hemorrhage Drill

1. What are the risk factors for postpartum hemorrhage in the patient’s history?
2. Who is in charge?
3. Who should be called to assist with complications and how should they be called?
4. Where are the supplies (U/S machine, PRBC’s, platelets, cryoprecipitate, Hem abate)?
5. What needs to be documented?
6. Who will be documenting during the emergency?
7. What is communicated to the family?
8. How do you communicate with other staff members, i.e., RN’s, clerks, supervisors?
SAMPLE SCENARIO #2: PLACENTA PREVIA
Leslie Casper, MD

**SCENARIO:** a 21 year old gravida 2 para 1100 Caucasian woman presents at 37 weeks estimated gestational age to Labor and Delivery in early labor with the onset of contractions approximately one hour ago. She has had intermittent prenatal care starting at 12 weeks estimated gestational age. Her records indicate she is carrying a singleton pregnancy in the vertex presentation. Her past medical history is uncomplicated, she has no allergies, and she takes no medications other than prenatal vitamins. She admits to smoking less than one-half pack per day of cigarettes. Her prenatal labs are negative and her pregnancy has been uncomplicated except for intermittent spotting in the last six weeks. An external fetal monitor is in place.

Physical examination reveals:

- Normal vital signs
- Uterus: longitudinal fetal lie, vertex presentation
- Cervix: dilatation 2 cm, effacement 10%, station -3, intact membranes

Fetal Monitor Output:

**Fetal Heart Rate**
- Baseline: 140 beats per minute
- Deviations from baseline: frequent accelerations throughout labor; bradycardia and late decelerations occur late in labor, simultaneously with frank hemorrhage

**Fetal Heart Rate Variability**
- Short-term: normal initially, demises as vaginal bleeding worsens
- Long-term: normal initially, demises as vaginal bleeding worsens

**Maternal Uterine Activity**
- Frequency: gradually increases to a rate of one contraction every two minutes
- Duration: gradually increases to 60 seconds
- Intensity: gradually increasing to 100 mm Hg

**CASE SUMMARY:** Placenta previa is defined as a placenta that develops in the lower uterine segment adjoining or covering the internal os. Three forms have been described. (8) In marginal placenta previa the edge of the placenta is in contact with the margin of the cervical os but does not cover it. Partial placenta previa incompletely covers the cervical os. Total placenta previa completely covers the os. Varying degrees of bleeding occur during the third trimester as the lower uterine segment matures in preparation for labor.
The incidence of placenta previa is approximately 0.4%. Risk factors include previous cesarean section and tobacco use. (9, 11) The management of a pregnancy complicated by placenta previa is dependent on first recognition of the presence of the abnormally located placenta; this is usually done by ultrasound (digital examination may inadvertently lead to severe hemorrhage). A history of prior cesarean section or total placenta previa likely mandates operative delivery. In patients with marginal or partial placenta previa, as in this case, vaginal delivery may be attempted, provided an emergency cesarean section can be performed should uncontrollable hemorrhage result. The descending fetal head often places pressure on the edge of the placenta and may act to limit bleeding.

In this case fetal bradycardia and late decelerations ensue after frank hemorrhage develops late in labor.
SAMPLE SCENARIO #4: ATOMIC UTERUS AND POSTPARTUM HEMORRHAGE (12)
Used with permission from Martin P. Eason, MD, JD

Participants: OB residents, FM residents.

Learning Objectives
At the end of the session the participants will be able to:
1) recognize the signs of uterine atony
2) appropriately treat uterine atony and hemorrhage
   a. use correct medications
   b. order appropriate labs
   c. ensure resuscitation measures are instituted
   d. make decision to treat surgically

Simulation Overview
This case involves the condition of uterine atony. It is the most common cause of significant obstetric bleeding. It may be associated with placenta previa, placental abruption, retained placenta, or occur alone. Factors associated with uterine atony include multiple gestation, macrosomia, polyhydramnios, high parity, prolonged labor, excessive use of oxytocin, and chorioamnionitis. An atonic uterus may contain up to 1L of blood. Although rarely life threatening, uterine atony can cause severe postpartum hemorrhage and hypotension. The problem should be recognized and treated quickly. Treatment should include administration of appropriate medication to stimulate uterine contractions (oxytocin, Hemabate---prostglandin F2 alpha, ergonivine) and management of hypovolemic shock. Postpartum hemorrhage should be treated as follows:
1. Initiate appropriate general resuscitation principals (ABC’s)
2. Ask for assistance
3. Place large bore intravenous lines
4. Order blood tests and blood products
5. Begin volume replacement with crystalloid and/or colloid solutions
6. Consider invasive monitoring
7. Treat bleeding disorders if present
8. Monitor urine output
9. Consider use of vasopressors

Patient History
Patient is a 32 year old G4P3 female with no prenatal care who presents in labor. She is crowning and ready for delivery. She is a stat transfer from the ED.
Patient History, continued

PMH: Asthma
PSH: None
Meds: albuterol 2 puffs BID prn
All: bee stings
SHx: married; husband is rushing from work. Smokes ½ pack per day; no ETOH; she wants more children
FHx: none

ROS: labor started about 2 hours ago. Water broke 45 minutes ago; clear

Physical examination (provided only if asked)

Cardiac: tachycardic otherwise normal
Lungs: clear bilaterally
Neck: supple

Labs:
None initially available
If ordered: CBC Hct 35% Platelets 235; WBC 8.2
Chem 7 WNL
PT/PTT 9.5/26 seconds

Simulation Parameters

Initial Parameters
BP: 135/78
Hr: 96
RR: 20
Sat: 98%
Heart Sounds: Normal
Lung sounds: clear

Scenario Run
The patient will present with the fetal head crowning; she will be wanted to push. The baby will be delivered OA without complications. Immediately after the placenta is removed, blood will come from the vaginal opening. If palpated the uterus will soft. It will remain so despite medications. The blood pressure will drop from the initial readings over the next 10 minutes to 70/40. Oxytocics will not cause uterine contraction. If Hemabate is given, the patient will complain of shortness of breath and her sats will drop to 80%. If the lungs are auscultated, wheezing will be evident. Rise in blood pressure will depend on replacement of volume. If large bore IVs are placed rapidly and put on pressure bags, the pressure will initially improve to 80/45 but will slowly (over five minutes)
decrease back to the 70’s. Decision to take patient to OR for operative intervention will end case. If not, patient will expire.

**Materials needed**

**Platform:** Laerdal® or METI® monitor; Noelle birthing simulator modified with external tubing attached to “blood” bag for bleeding

**Diagnostic studies:** CBC, coagulation studies

**Props:** L and D delivery drapes
- Fetal monitor
- IV equipment
- Drugs

**Personnel:** one “L and D nurse”
- Patient Voice

**Expected actions by participants (checklist)**

- Take appropriate history from patient
- Order IV access
- Order placement of fetal monitors
- Order placement of maternal monitor (BP, sat)
- Successfully deliver baby
- Recognize post-partum hemorrhage
- Assess uterine tone
- Order fundal massage
- Order labs to include CBC, type and screen, clotting studies
- Order placement of secondary IV access (large bore) with rapid fluid replacement
- Call for help
- Order vasopressors (correct drug in correct amount)
- Order blood to be administered
- Order oxytocin in appropriate dose
- Consider Hemabate® but hold its administration
- Order ergonovine in appropriate dose and route
- Makes decision to go to OR for surgical intervention
- Order surgical team to be called in
- Discusses the need for potential hysterectomy with patient and gets consent
Adopt a Systems Approach to Managing OB Hemorrhage

Department
OB Hemorrhage Protocol with stages

Hospital
Massive Transfusion Protocol

Summary Flow algorithm
Graphic or tabular

Nursing checklist by stages

Documentation forms
OB Hemorrhage Report

Worksheets to assist with assessment of blood loss

Hemorrhage cart/kit

Instruction cards for new procedures in cart or operating room

Drills
PPH PEARLS

PREVENTION

- Active management of the 3rd stage for all
- Time Management: Manage the 3rd stage. Manage the Uterus
- Do a formal assessment of blood loss
- Identify vital sign triggers
- Know your lab goals
- “Move along” on uterotonic medications

DON’T DELAY

- Activate the PPH Protocol
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to the utilization of blood products. A role for rFactor VIIa (Novoseven)
- Avoid the Lethal Triad: Hypothermia, Acidosis and Coagulopathy
- Realize the value of a formal protocol
Reference Articles Relating to Obstetric Hemorrhage

Please visit our website, www.georgiaobgyn.org, to access links to these resource articles and the online version of the GOGS Toolkit.

References used in the GOGS Tool Kit

California Maternal Quality Care Collaborative Toolkit

OB Massive Transfusion Protocol

Optimizing Protocols in Obstetrics: Management of Obstetric Hemorrhage

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