BEST PRACTICES IN

The Management and Treatment of Postpartum Hemorrhage

FACULTY & DISCLOSURES

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LEARNING OBJECTIVES
- Identify the common causes of primary and secondary postpartum hemorrhage (PPH)
- Discuss the key components that should be included within an in-house protocol for prompt diagnosis and treatment of PPH
- Assess the readiness of your practice to manage women who develop PPH
- Analyze the clinical utility of methylergonovine maleate in the treatment of women with primary and secondary PPH

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Postpartum hemorrhage (PPH) is an obstetric emergency and a major cause of maternal mortality and morbidity. Worldwide, approximately 140,000 women die of PPH each year—that’s 1 death every 4 minutes. In addition, approximately 45% of serious maternal morbidity is associated with PPH.

PPH is divided into 2 stages: primary PPH, which occurs in between 1% and 5% of all deliveries, and secondary PPH, which occurs in between 0.2% and 2% of all pregnancies.

In this supplement, we’ll review some of the risk factors for both primary and secondary PPH, ways that hospitals can proactively prepare to deal with these obstetric emergencies, and appropriate interventions that may be used to successfully manage patients diagnosed with PPH.

An Overview of Postpartum Hemorrhage

Contemporary OB/GYN: How is postpartum hemorrhage (PPH) defined?

Dr. D’Alton: Historically, PPH was defined as a blood loss of >500 cc after a vaginal birth and >1000 cc after a cesarean delivery, but we now know that this is closer to the blood loss during an average delivery.

More recently, the American College of Obstetricians and Gynecologists (ACOG) revised the definition of primary or early PPH to be a cumulative blood loss of >1000 cc or blood loss accompanied by signs and symptoms of hypovolemia within 24 hours of the birth process. ACOG also suggested that a cumulative blood loss of 500 to 1000 cc alone should trigger increased supervision and potential intervention, as clinically indicated.

Secondary or delayed PPH is defined as excessive vaginal bleeding or excessive uterine bleeding that occurs between 24 hours and 12 weeks postpartum. Most data suggest that the peak incidence of secondary PPH occurs in the first or second week postpartum.

Contemporary OB/GYN: What are some of the common causes of PPH?

Dr. D’Alton: Uterine atony is the most common cause of primary PPH, accounting for approximately 80% of all cases. The diagnosis of uterine atony is made when the uterus does not become firm after uterine massage and administration of uterotonic agents. In patients with atony, the blood loss can be significant and can’t always be well visualized, as a floppy and dilated uterus can contain a large amount of blood.

Less common causes of primary PPH include cervical and vaginal lacerations, which may develop spontaneously or be related to provider interventions; hemorrhage from the uterine incision during cesarean delivery, which can be caused by extension of the incision and spontaneous tearing, especially when there’s an edematous lower segment during an otherwise uneventful cesarean delivery; and coagulopathy, which is rare but is important to recognize.

Dr. Cohen: Common causes of secondary PPH include a subinvolution of the placental site secondary to retained tissue of conception and/or infection, inherited coagulopathies, and possibly pseudoaneurysm of the uterine artery and arterovenous malformations.

Contemporary OB/GYN: What are the principal risk factors related to the development of PPH?

Dr. Weinstein: There are a number of risk factors associated with PPH. They include:

1. Retained placenta
2. Failure to progress during the second stage of labor
3. Placental implantation abnormality
4. Lacerations of the vagina or cervix
5. An instrumented delivery
6. A newborn who is large for gestational age
7. Maternal hypertensive disorder
8. Chorioamnionitis
9. A history of a prior PPH

This isn’t a comprehensive list, but it accounts for the most common risk factors.

Dr. D’Alton: There are a number of risk assessment tools that can be used either ante-partum, during labor, or in the immediate postpartum period, although it must be noted that these tools don’t reliably predict all cases of obstetric hemorrhage and that obstetric units must always be ready for an unanticipated obstetric hemorrhage.

For our in-house assessment tool, we use the version developed by the Safe Motherhood Initiative in New York State (Table 1). For instance, prenatally, we look for a patient who has a previa, an accreta, or a percreta; patients with a prepregnancy body mass index (BMI) of >50 kg/m²; the possible presence of a clinically significant bleeding disorder such as von Willebrand disease; or other significant medical or surgical risks.

At admission, we define patients to be either at medium risk or high risk of PPH. Medium risk factors include a prior cesarean or other uterine surgery, multiple previous pregnancies, >4 previous births, previous obstetric hemorrhage, large fibroids, estimated fetal weight of >4000 g, BMI >40, or initial hematocrit <30%.

High-risk patients are those with placenta previa, accreta, or percreta, as well as those with a platelet count of <70,000, active bleeding, unknown coagulopathy, or 2 or more medium-risk factors.

Planning for and Managing Primary PPH

Contemporary OB/GYN: How do you counsel women at higher risk of developing PPH during regular checkups? Is there anything you suggest to reduce their risk?

Dr. Dweck: Once we identify a woman who is at higher risk of developing PPH, we first check her hemoglobin and address any deficiencies that we may find. For any woman with a hemoglobin ≤10 g/dL, we usually start them on iron therapy and encourage them to take it with orange juice or another liquid high in vitamin C to aid in absorption.

It’s also important, in a woman with a previous PPH, to identify the reason for the hemorrhage. Was it from uterine atony, retained products of conception, infection in the uterus that caused it to clamp down poorly, or was it the result of a laceration? Knowing the reason for prior PPH may help prepare for the next delivery and prevent reoccurrence.

Contemporary OB/GYN: What is the value of developing an in-house protocol for the management of primary PPH? Who should be involved in developing the protocol?

Dr. Weinstein: Ideally, every hospital with a labor and delivery unit should have a PPH protocol that may be activated for patients who have an estimated blood loss exceeding a predefined threshold—often 500 cc for vaginal delivery and 1000 cc for a cesarean section. The protocol should provide a standardized approach to evaluating and monitoring a patient with PPH, notifying and mobilizing a multidisciplinary team, and suggesting treatment pathways. The development and consistent application of a comprehensive protocol results in improved patient outcomes.

At our hospital—Missouri Baptist Medical Center—we developed our protocol after a discussion at our bimonthly Obstetrics (OB) Best Practice Sharing Forum. At these meetings, we discuss best practices regarding issues that are not always obvious and perhaps a bit controversial and that require input from a multidisciplinary team. For something like PPH, we felt it was important to be proactive instead of reactive. This led to the development of our PPH protocol/algorithm that is shown in Figure 2.

The protocol we devised streamlines overall care. It has become our standard operating procedure for PPH on our labor and delivery unit. It fosters better communication and care among the entire labor and delivery team, which includes attending obstetricians, OB hospitalists, staff nurses, OB anesthesiologists, blood bank personnel, the operating room team, and risk management.

Dr. Cohen: At our hospital, we have mandated that OB personnel need to complete educational modules on complex topics such as dystocia and PPH every 2 years in order to maintain hospital privileges. We also made a change so that some of the medications that were often more difficult to acquire—things like carboprost tromethamine, methylergonovine maleate, and misoprostol—were brought...
onto the OB floor and stored in a Pyxis SupplyStation™.

Contemporary OB/GYN: What are some of the key steps that need to be included within an in-house protocol?

Dr. D’Alton: There are 4 key steps that need to be addressed within any in-house protocol—what we call the 4 R’s.13

The first is readiness. Every unit has to be ready with a hemorrhage cart, immediate access to hemorrhage medications, and have a response team in place that understands who to call when help is needed from the blood bank, advanced gynecologic surgery, and other support and tertiary services.

The second step is recognition, which involves the development of a reliable, quantifiable process to assess blood loss. Because approximately 40% of PPH cases occur in low-risk patients with no identifiable risk factors, every birth that comes in needs to initially be considered “at risk” and cumulative blood loss must always be assessed.12

The third step is active management of the third stage of labor, or response. This is really the single most important step to preventing PPH. There are 3 classic components of management—oxytocin, uterine massage, and cord traction. Every facility should have a protocol for oxytocin use in the immediate postpartum period. This phase should also include communication with and a support program for families of a mother being treated for PPH.

The final step of an in-house protocol should involve reporting of an obstetric event and formal follow-up procedures to review the response, including involving appropriate hospital administration and physician leadership.

Critical to these efforts, we recommend that all hospitals establish a culture of evaluation and system-based learning so that after every hemorrhage, there is a debrief to identify what went well and to identify opportunities for improvement. If there is a serious hemorrhage, there needs to be a multidisciplinary review by nursing, physicians, anesthesia, and potentially the blood bank to identify any potential system issues. Outcomes and process metrics ideally need to be evaluated on a continuous basis to determine the incidence of PPH in a particular unit. In many units, there is a regular changeover of staff, and it is vital to ingrain a culture of reflection and improvement from the start.

Treatment of Primary PPH

Contemporary OB/GYN: What are the primary goals of the treatment of primary PPH? How should providers assess the success or failure of a particular intervention?

Dr. Weinstein: The number one goal in the treatment of primary PPH is to decrease the

### TABLE 1 OBSTETRIC HEMORRHAGE RISK ASSESSMENT EVALUATION

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<thead>
<tr>
<th>PRENATAL</th>
<th>TIMING OF DELIVERY (WEEKS)</th>
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#### RISK FACTORS

- Suspected previa/accreta/incrreta/percreta
- Prepregnancy BMI >60
- Clinically significant bleeding disorder
- Other significant medical/surgical risk (consider patients who decline transfusion)

#### INTERVENTION

- Transfer to appropriate level of care for delivery

### ANTEPARTUM

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<th>TIMING OF DELIVERY (WEEKS)</th>
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#### RISK FACTORS

- Placenta accreta 34½—35½
- Placenta previa 36½—37½
- Prior classical cesarean 36½—37½
- Prior myomectomy 37½—38½
- Prior myomectomy, if extensive 36—37

### PLACENTA ACCRETA MANAGEMENT

For 1 or more prior cesareans, placental location should be documented prior to delivery. Patients at high risk for placenta accreta, should:

- Obtain proper imaging to evaluate risk prior to delivery
- Be transferred to appropriate level of care for delivery if accreta is suspected

### LABOR & DELIVERY ADMISSION

#### MEDIUM RISK

- Prior cesarean, uterine surgery, or multiple laparotomies
- Multiple gestation
- >4 prior births
- Prior PPH
- Large myomas
- EFW >4000 g
- Obesity (BMI >40)
- Hematocrit <30% & other risk

#### HIGH RISK

- Placenta previa/low lying
- Suspected accreta/percreta
- Platelet count <70,000
- Active bleeding
- Known coagulopathy
- 2 or more medium risk factors
- /
- /

#### INTERVENTION

- Type & SCREEN, review protocol
- Type & CROSS, review protocol

### INTRAPARTUM

#### MEDIUM RISK

- Chorioamnionitis
- Prolonged oxytocin >24 hours
- Prolonged 2nd stage
- Magnesium sulfate

#### HIGH RISK

- New active bleeding
- 2 or more medium (admission and/or intrapartum) risk factors
- /
- /

#### INTERVENTION

- Type & SCREEN, review protocol
- Type & CROSS, review protocol

amount of blood loss. This can be accomplished through a series of stepwise nonoperative and then potentially operative interventions. It is vital to restore or maintain adequate circulatory volume to prevent hypoperfusion, to restore or maintain adequate tissue perfusion, to reverse or prevent coagulopathy, and, most importantly, to eliminate the obstetric cause of PPH.

It’s important to remember that PPH is a sign of an underlying problem. Is it being caused by uterine atony? A laceration? A retained placental fragment? A coagulopathy? Making that identification in a timely fashion is key to initiating the appropriate intervention. Early intervention can prevent shock and the potential development of the lethal triad of hypothermia, acidosis, and coagulopathy. Almost 90% of death due to PPH occurs within 4 hours of giving birth.13

Contemporary OB/GYN: What are the initial treatment options in a woman diagnosed with primary PPH during cesarean delivery? What are some of the pros and cons of the various approaches?

Dr. Dweck: When we make the diagnosis of PPH after vaginal birth, the first step is to ensure stability of the patient and make sure the uterus is firm, bladder is empty, and that there are no lacerations of the vagina or cervix. Next, one can use a gauze wrapped around the hand to curette the uterine cavity and ensure there are no retained products of conception. If uterine atony is suspected, uterine massage and increasing oxytocin in the intravenous (IV) fluids is a reasonable initial approach.

If there is continued noticeable bleeding, unless contraindicated, we will typically initiate methylergonovine maleate 0.2 mg intramuscularly (IM). This can be repeated. My experience is that methylergonovine maleate works more effectively IM than orally because it avoids the first-pass metabolism effects from the liver. Methylergonovine maleate works extremely quickly, typically within 2 to 5 minutes. If the patient does not respond to methylergonovine maleate, my next step is 1000 µg misoprostol rectally.

If the patient is hypertensive, I will typically give 250 µg of carprost tromethamine instead of methylergonovine maleate since it is safer in patients with a history of hypertension. These medications can also be directly injected into the uterine musculature. Again, I follow with 1000 µg misoprostol rectally if there is an inadequate response.

There are nonpharmacologic approaches to PPH caused by uterine atony at the time of cesarean that can be considered as well, such as the B-lynch suture that squeezes the uterus in such a way as to stop excessive bleeding. Studies have shown that there have been very few failures using this technique, although it’s not familiar to many physicians and consequently rarely used.

Uterine artery ligation is also an option to decrease the pulse pressure and amount of blood flowing to the uterus. Historically, hypogastric artery ligation was sometimes performed, but it is rarely used today. Uterine packing is also an option to control hemorrhage, especially after a vaginal birth or dilation and curettage for miscarriage.

Dr. Cohen: The other night, I had to use a Bakri balloon for one of my patients who developed PPH, and it worked well.

In general, my approach in a vaginal delivery involves evaluation to identify the cause of the PPH, initiating oxytocin, draining the bladder, massage, methylergonovine maleate (unless contraindicated), and then progressing from there.

Contemporary OB/GYN: What are the initial treatment options in a woman diagnosed with primary PPH during cesarean delivery? What are some of the pros and cons of the various approaches?

Dr. Cohen: Again, treatment in a cesarean delivery should follow your facility’s agreed-upon protocol. A history of uterine fibroids, placenta previa, myomectomy, a classic cesarean section, or suspected placenta accreta all place the patient at higher risk for primary PPH.

Treatment options for a cesarean delivery are generally similar to a vaginal delivery—uterine massage, IV oxytocin, methylergonovine maleate, carprost tromethamine, and misoprostol, along with surgical options such as B-Lynch suture placement, Bakri balloon, uterine artery embolization, or, as a last resort, hysterectomy.

Dr. Dweck: I authored a study back in 2000, with Drs. Catherine Lynch and William Spellacy, that appeared in Infectious Diseases in Obstetrics and Gynecology looking at the use of methylergonovine maleate in women undergoing non-elective cesareans that wasn’t necessarily focused on PPH, but I think our findings are a good reminder to the OB community nonetheless.14

At the time we developed our study protocol, there was some research suggesting that postpartum methylergonovine maleate was effective in contracting the uterus after C-section and aided in expelling any necrotic tissue that may be present.15 We built upon that research by enrolling 80 patients and randomizing them to methylergonovine maleate or no methylergonovine maleate 6 hours after C-section. We continued the methylergonovine maleate until discharge from the hospital.14 Our hospital—Tampa General—had a patient population that was at significantly higher risk for postpartum endometritis than in the private sector, which made this study important for our center.

Results from our study showed that there was a significant decrease in the amount of postpartum endometritis in the patients treated with methylergonovine maleate. The drug had minimal to no side effects. During the study evaluation, we also noticed a statistically significant increase in mean postoperative hemoglobin in patients treated with methylergonovine maleate.14

The study proved 2 important points—first, that decreasing blood loss will increase postoperative hemoglobin, which is somewhat intuitive, but also that by constraining the uterine musculature, closing off the vessels, and decreasing the medium for bacterial overgrowth, we can decrease the risk of infection in women undergoing nonelective C-sections.

Contemporary OB/GYN: How can clinicians protect mothers from the development of secondary PPH during their treatment of primary PPH?

Dr. Cohen: In a patient who is treated for primary PPH, once they are stabilized, they need to be evaluated to determine whether or not they are at increased risk of subsequent bleeding once they move into postpartum care. It is important to review their hemoglobin and hematocrit levels prior to the onset of labor to help assess that risk.

In patients determined to be at risk of subsequent bleeding, I will often keep in the IV, as well as continue oxytocin, and stabilize them with methylergonovine maleate 0.2 mg orally TID while they remain in the hospital. Remember that these are women who are going to be sent home to take care of their newborn babies. Sleep deprivation is a given. The last thing you want is to send these patients home and have them become more anemic or symptomatic from their anemia and require further medical intervention during a very challenging time in their lives.

Contemporary OB/GYN: What are some of the common complications of primary PPH? How should these be managed?

Dr. Weinstein: Complications of PPH should be separated into minor and major categories. Minor complications would include things such as anemia and fatigue. Because PPH could result in significant maternal morbidity with catastrophic sequelae, major complications are extremely serious and could include hypovolemic shock, organ failure, stroke, myocardial infarction, postpartum hypopituitarism, fluid overload, transfusion-related complications, acute respiratory distress syndrome, and unplanned sterilizations due to the need for hysterectomy.13

The best way to prevent these complications is, first and foremost, to be prepared and think about the patient before the onset of PPH, to do some type of risk assessment when the patient arrives, to have a protocol, to have a collaborative team in place, and a plan to implement if PPH occurs. As we’ve been harping on, it’s vital to have that stepwise protocol in place that is well understood by the full team so that when something life threatening occurs, everyone can calmly initiate the proper interventions in the
correct order until the patient is stabilized.

There are several common mistakes made in the assessment and management of PPH, including the following:

1. Underestimating blood loss
2. Delay in noticing vital sign trends
3. Delay in laboratory assessment for anemia and coagulopathy
4. Delay in instituting blood component therapy
5. Delay in surgical interventions
6. Delay in making the mental shift from normal delivery to life-threatening emergency
7. Poor communication between the OB, nurse, and anesthesiologist
8. Lack of preoperative preparation for massive hemorrhage

If we could all work on these things at our hospitals, we will be much more efficient at recognizing PPH earlier, intervening earlier with appropriate measures, and preventing potentially catastrophic complications.

Contemporary OB/GYN: How do you determine when to discharge a woman treated for primary PPH? What guidance do you give them at discharge, especially those identified at risk of developing secondary PPH?

Dr. Dweck: In many patients being discharged after treatment for primary PPH, I will keep them on a 3-day course of methylergonovine maleate 0.2 mg orally TID to keep the uterus clamped down, as well as start them on iron therapy. It’s also important to put each patient on a pad count and instruct them to call if they have more than a predetermined amount of bleeding. For instance, if they are going through 2 or 3 pads every hour, soaking them from front to back and top to bottom, to call the office. If they are feeling dizzy or lightheaded or just not feeling well overall, patients are instructed to call for attention or go to the emergency room.

I have sent stable, essentially compensated women home with hemoglobin levels of 5 or 6 g/dL, instructing them to take iron therapy TID for 2 to 3 days to help mitigate their risk. In those cases where we have ruled out both infection and retained products, we recommend that a curettage is performed, which triggers a hematology consult. If the patient is unstable upon presentation, I have sent stable, essentially compensated women home with hemoglobin levels of 5 or 6 g/dL, instructing them to take oral methylergonovine maleate 0.2 mg given 3 times a day for up to a week.

Dr. Dweck: Treatment options for secondary PPH vary depending on the cause of the condition. If the cause is retained products of conception, dilation and curettage will often resolve the issue, although you need to be suspicious of a placenta accreta in patients whose bleeding continues. Those patients may need to be sent to interventional radiology for uterine artery embolization to decrease the amount of blood flow to the uterus and hopefully avoid a hysterectomy.

Management and Treatment of Secondary PPH

Contemporary OB/GYN: How do you determine the cause of secondary PPH?

Dr. D’Alton: When a patient presents and secondary PPH is suspected, the first step is to assess her hemodynamic status. As in patients with primary PPH, that starts with assessing the stability of the mother by taking her pulse and blood pressure, evaluating her urine output, and quantifying her oxygenation level. If the patient is stable, it’s useful to take a full history, focusing specifically on any inherited or acquired bleeding problems that have been demonstrated through regular bruising or bleeding after a dental examination, or a very heavy period.

On physical examination, you want to make sure that the uterus is contracted. Basic lab tests such as a complete blood count, and platelet count, coagulation screening including prothrombin time and active partial thromboplastin time may also be helpful. One important consideration in women who are several weeks postpartum when they present is that you may be seeing a very early pregnancy, so a pregnancy test should also be considered in these patients.

If the patient is unstable upon presentation, you should fall back on the basic principles of starting an IV and fluids. Once the labs are obtained, transfusion can be considered as needed. Once your patient is stable, the next order of business is to determine the cause of their condition. If it’s due to infection, the patient is likely to have a fever, uterine tenderness, odor from vaginal discharge, and/or a uterine infection. If it’s retained products of conception, an ultrasound should be performed, although that can be difficult to evaluate unless you have an experienced ultrasonographer on your team. Some ultrasonographers propose that the use of color flow should be included in the ultrasound evaluation of the postpartum uterus, but there is no strong evidence to support this. However, color flow may be helpful in the diagnosis of rarer conditions such as a pseudoanerysm or an arteriovenous malformation, which are rare causes of secondary PPH.

The sensitivity of ultrasound for the detection of retained products varies significantly, from as low as 44% to as high as 94%, which likely reflects the experience level of the ultrasonographer. At Columbia, we are fortunate to have a high-level ultrasound available, which is extremely useful in the detection of retained products, although it’s certainly not 100% accurate. If an ultrasound confirms or indicates a strong suspicion for retained products, we recommend that a curettage is performed, ideally under ultrasound guidance.

In those cases where we have ruled out both an infection and retained products, lab results will sometimes indicate a bleeding problem, which triggers a hematology consult. If all of these tests come back negative, we would make the diagnosis of subinvolution or atony. Those patients would be treated with oral methylergonovine maleate 0.2 mg given 3 to 4 times a day for up to a week.

Contemporary OB/GYN: Are there specific patients at risk of secondary PPH for whom a preventive approach is appropriate? If so, what does that look like?

Dr. Weinstein: Clearly, the woman who had a primary PPH is at risk for the development of secondary PPH. Unlike in primary PPH, the bleeding is usually not as significant in secondary PPH.

Otherwise, I think it goes back also to looking at the individual risk factors. Did the patient have uterine atony? Was there retained products of conception, or retained placental tissue? Was there a bleeding disorder? Did they have an overdistended uterus from having twins or triplets? Are they high in parity? Are there issues with uterine muscle contraction, where the patient has open blood vessels in the lower uterine segment that are more likely to bleed postpartum?

For patients who have 1 or more of those risk factors for the development of secondary PPH, I will send them home on oral methylergonovine maleate 0.2 mg and have them take it for 2 to 3 days to help mitigate their risk.

Contemporary OB/GYN: What are the initial treatment options in a woman diagnosed with secondary PPH? When should uterotonic agents be considered?

Dr. Dweck: Treatment options for secondary PPH vary depending on the cause of the condition. If the cause is retained products of conception, dilation and curettage will often resolve the issue, although you need to be suspicious of a placenta accreta in patients whose bleeding continues. Those patients may need to be sent to interventional radiology for uterine artery embolization to decrease the amount of blood flow to the uterus and hopefully avoid a hysterectomy.

If the patient is infected with an endometritis, she can be treated with antibiotics. If there is subinvolution of the placental site, methylergonovine maleate 0.2 mg should be considered TID for 3 days.

Safe and Effective Use of Methylergonovine Maleate in Secondary PPH

Contemporary OB/GYN: What are the specific issues to consider in a woman being treated with methylergonovine maleate who is interested in breastfeeding?

Dr. D’Alton: There was some concern when severe complications were reported in 2003 in a series of infants that were poisoned accidentally by methylergonovine maleate given to them at adult doses. The FDA issued a warning on the accidental administration of methylergonovine maleate to newborns at that time and also recommended that women avoid breastfeeding for at least 12 hours after receiving their last dose.

Contemporary OB/GYN: When should a woman be transitioned from use of IM to oral methylergonovine maleate? What are some of the potential hurdles to use...
**FIGURE 2: SAMPLE POSTPARTUM HEMORRHAGE ALGORITHM**

_Courtesy of David L. Weinstein, MD, and Missouri Baptist Medical Center_

**Time of Admission**
- Identify patients with special considerations: placenta previa/accreta, bleeding disorder, or those who decline blood products
- Follow appropriate workup, planning, preparing of resources, counseling and notification
- Screen all admissions for hemorrhage risk: low risk, moderate risk, high risk
- Low Risk: Type & Screen
- Medium Risk: Type & Screen, Review hemorrhage protocol
- High Risk: Type & Screen, Crossmatch 2 units PRBCs, Review hemorrhage protocol

**STAGE 0: ALL BIRTHS**
- Active Management of 3rd Stage of Labor
- Oxytocin IV infusion or 10 units IM
- Vigorous fundal massage for 15 seconds minimum by MD/RN
- Misoprostol for all?
- Order Crossmatch 2 units PRBCs, if not already done
- Get red box from Pyxis
- Get hemorrhage cart

**Cumulative Blood Loss**
- >500 mL VAG or >1000 mL C/S
- 15% vital sign change – or – HR >110
- BP <85/45, Q, Sat <95%
- Clinical Sx (ex. LOC change)
- Review hemorrhage protocol

**STAGE 1**
- Notify via vocera: Code H, which includes:
- OB Hospitalist, L&D and Postpartum Charge RN, OB Anesthesiologist
- Order Crossmatch 2 units PRBCs, if not already done
- Get red box from Pyxis
- Get hemorrhage cart
- Start 2nd IV line (16–18 gauge)
- DB at bedside if not already there
- VS every 5 min
- Draw CBC and DIC Panel q 30 to 60 min
- Give meds: carboprost tromethamine 250 mcg IM, on set of action 5–9 min. May repeat q 15 min with max dose 2 mg
- Notify blood bank to ascertain blood product availability and consider thawing FFP (takes 35 min to thaw)
- Consider notification of OR team
- Notify Attending MD
- Increase IV rate (LR), increase oxytocin, repeat fundal massage
- Misoprostol 800–800 mcg rectally
- Methylergonovine maleate 0.2 mg IM (if not hypertensive) Onset of action 3–5 min. If ineffective, repeat in 2 hours or next drug
- If hypertensive, carboprost tromethamine 250 mcg IM (caution with asthmatics), onset of action 5 min, may repeat q 15 min with max 2 mg
- Insert indwelling Foley catheter, keep warm, administer O, to maintain Sat >95%
- VS, Q, Sat q 5 min, measure blood loss q 5 to 15 min (weigh bloody materials), fundal massage q 15 min
- Inspect all vaginal walls, cervix, uterine cavity, and rule out retained POC, laceration or hematoma
- Draw and send blood for CBC and DIC Panel

**Ongoing Evaluation**
- Quantification of blood loss, vital signs, LOC, bladder

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**Cumulative Blood Loss**
- >500 mL VAG or >1000 mL C/S
- 15% vital sign change – or – HR >110
- BP <85/45, Q, Sat <95%
- Clinical Sx (ex. LOC change)
- Review hemorrhage protocol

**STAGE 2**
- Start 2nd IV line (16–18 gauge)
- DB at bedside if not already there
- VS every 5 min
- Draw CBC and DIC Panel q 30 to 60 min
- Give meds: carboprost tromethamine 250 mcg IM, on set of action 5–9 min. May repeat q 15–90 min, max dose 2 mg
- Continue OBL q 15–30 min
- Notify blood bank to ascertain blood product availability and consider thawing FFP (takes 35 min to thaw)
- Consider notification of OR team
- Notify Attending MD
- Increase IV rate (LR), increase oxytocin, repeat fundal massage
- Misoprostol 800–800 mcg rectally
- Methylergonovine maleate 0.2 mg IM (if not hypertensive) Onset of action 3–5 min. If ineffective, repeat in 2 hours or next drug
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- VS, Q, Sat q 5 min, measure blood loss q 5 to 15 min (weigh bloody materials), fundal massage q 15 min
- Inspect all vaginal walls, cervix, uterine cavity, and rule out retained POC, laceration or hematoma
- Draw and send blood for CBC and DIC Panel

**Continued Heavy Bleeding**
- OBL 500–1500 mL — Vag
- OBL 1000–1500 mL — C/S

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**Vaginal Birth**
- Manual fundal massage
- Retained POC: dilation and curettage
- Lower segment/implantation site/atomy: intrauterine balloon insertion
- Laceration/Hematoma: packing, repair as required
- Consider IR (if available & adequate experience)
- Transfuse 2 units PRBCs per clinical signs
- Do not wait for lab values

**Conservative Surgery**
- B-Lynch Suture/intrauterine balloon
- Continued hemorrhage: uterine artery ligation

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**Cesarean Birth**
- Continued atony: B-Lynch suture/intrauterine balloon
- Continued hemorrhage: uterine artery ligation

**Increased labor & delivery surveillance for 8 hrs post hemorrhage**
- Hand off report of OBL
- Postpartum transfer to L&D based on policy & patient acuity

**Cumulative Blood Loss >1500 mL**
- 2 units PRBCs Given
- Vital Signs unstable

**Increased postpartum surveillance**
- VS and fundal massage q 1 hr × 2, q 4 hrs × 2, q 8 hrs
- Hand off report of OBL

**Hemorrhage Continues**

**HEMORRHAGE CONTINUED**

**ICU Care**
- Postpartum support in ICU
- Hand off report of OBL
- Give copy of hemorrhage record to ICU

**Definitive Surgery**
- Hysterectomy

**Abbreviations:** BP, blood pressure; CBC, complete blood count; C/S, cesarean section; DIC, disseminated intravascular coagulation; FFP, fresh frozen plasma; HR, heart rate; ICU, intensive care unit; IM, intramuscular; IR, interventional radiology; IV, intravenous; L&D, labor & delivery; LOC, level of consciousness; LR, lactated ringers; OB, obstetrics; OR, operating room; OBL, quantification of blood loss; POC, products of conception; PRBCs, packed red blood cells; RRT, rapid response team; SAT, saturation; Sx, symptoms; Vag, vaginal; VS, vital signs.
of oral methylergonovine maleate in the at-home setting?

**Dr. Cohen:** We will always transition a patient from IM to oral methylergonovine maleate on the postpartum floor, if indicated. One of the biggest challenges at discharge for patients is being able to fill their prescription at the local pharmacy, because not all of them carry methylergonovine maleate. We typically send patients home with 3 methylergonovine maleate pills in a small envelope as a precaution against that to give them an extra day to get their prescription filled. In our hospital’s electronic system, we can also automatically send the prescription to the pharmacy on postpartum day 1 to improve the chances that it will be ready upon the patient’s discharge. Getting a family member looped in to our recommendations is also extremely useful. We need to remember that this is a new mother with a lot on her mind and medication adherence may not always be at the top of the list.

**Dr. Dweck:** Most of the pharmacies near our hospital have to order methylergonovine maleate, and it will often take them a day or 2 to get it in stock. I have some medium or high-risk patients for whom I will order a prescription of methylergonovine maleate prior to delivery and have them pick it up so that we can mitigate the risk of medication delay.

Fortunately, cost is rarely an issue with methylergonovine maleate. Especially in our patient population where we have a high percentage of patients on Medicaid, that is always an important consideration.

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**REFERENCES**


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**CLINICAL PEARLS**

- Never treat PPH without simultaneously pursuing the clinical diagnosis.
- If more than a single dose of a medication is needed to treat uterine atony, the physician needs to remain at the patient bedside until the atony has resolved.
- Every hospital with a Labor & Delivery unit should have a massive transfusion protocol that is functional and works in true practice. The protocol should be created by a multidisciplinary team and be reviewed and practiced regularly.
- Be proactive in making the diagnosis of primary PPH. Do not underestimate the volume of blood loss or delay interventions to address potential issues. Identify risk factors for the development of primary PPH as soon as possible and have a multidisciplinary team prepared.
- New mothers should all be evaluated for the risk of secondary PPH, with proactive therapy initiated in those deemed to be at risk.