



Postpartum Hemorrhage

Click the next button to continue...



Copyright © 2024 Shelly Betancourt and Michelle Becher

All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other noncommercial uses permitted by copyright law. For permission requests, write to the publisher at the address below.

Maternal 911 Education Systems, LLC
475 West Center St.
Ithaca, MI 48847
www.maternal911.com

Maternal 911 and Maternal 911 in Action contains information designed as an educational resource to aid practitioners in providing obstetric care and the use of this information is voluntary. This information should not be considered as inclusive of all proper treatments or methods of care or as a statement of the standard of care. It is not intended to substitute for the independent professional judgement. Maternal 911 reviews the publication regularly, but may not reflect the most recent evidence.

Maternal 911 makes every effort to present accurate and reliable information. The Maternal 911 and Maternal 911 in Action are publications provided 'as is' without any warranty of accuracy, reliability or otherwise, either express or implied. Maternal 911 does not guarantee, warrant, or endorse the products or services of any firm, organization, or person. Neither co-founder nor any officers, directors, members, employees, participants or agents will be liable for any loss, damage or claim with respect to liabilities, including direct, special, indirect, or consequential damages, incurred in connection with this publication or reliance on the information presented.

Data from completing the modules may be used in research and publications with privacy maintained.



Course Description:

When will the next postpartum hemorrhage occur for a patient under your care? Postpartum hemorrhage is a phenomenon that will continue to plague the delivering environment. This module will help you strengthen your knowledge, then build upon your base, to better prepare for future hemorrhage encounters.

Approximate Time to Complete: 75 minutes



Click here to download a print version of this course.





The purpose of this module is to improve participant's understanding of postpartum hemorrhage:

- Help participants develop sound critical judgment in the delivery of health care when postpartum hemorrhage occurs.
- Expand the participant's knowledge base on learning theories and their instructional implications regarding health care delivery when postpartum hemorrhage occurs.
- Enhance the participant's ability to put knowledge into active health care delivery. This will allow for rapid implementation of the necessary steps needed when postpartum hemorrhage occurs.
- Prepare participants to address issues and implement changes in the health care unit as necessary to ensure a safe environment. Equipment and supplies needed when postpartum hemorrhage occurs will be available.
- Enable participants to convert proven learning into actual health care delivery.





- Table of Contents
- How to use the module
- Respectful, Equitable and Supportive Care
- Definition of Post Partum Hemorrhage
- Five R's
- Occurrence Rates
- Risk Factors
- Etiologies
- Planning & Prevention
- Management & Treatment
- Initial Intervention
- Medications
- Management
- Treatment
- Laboratories
- Complication
- Summary



Respectful, Equitable and Supportive Care [26]

Every person

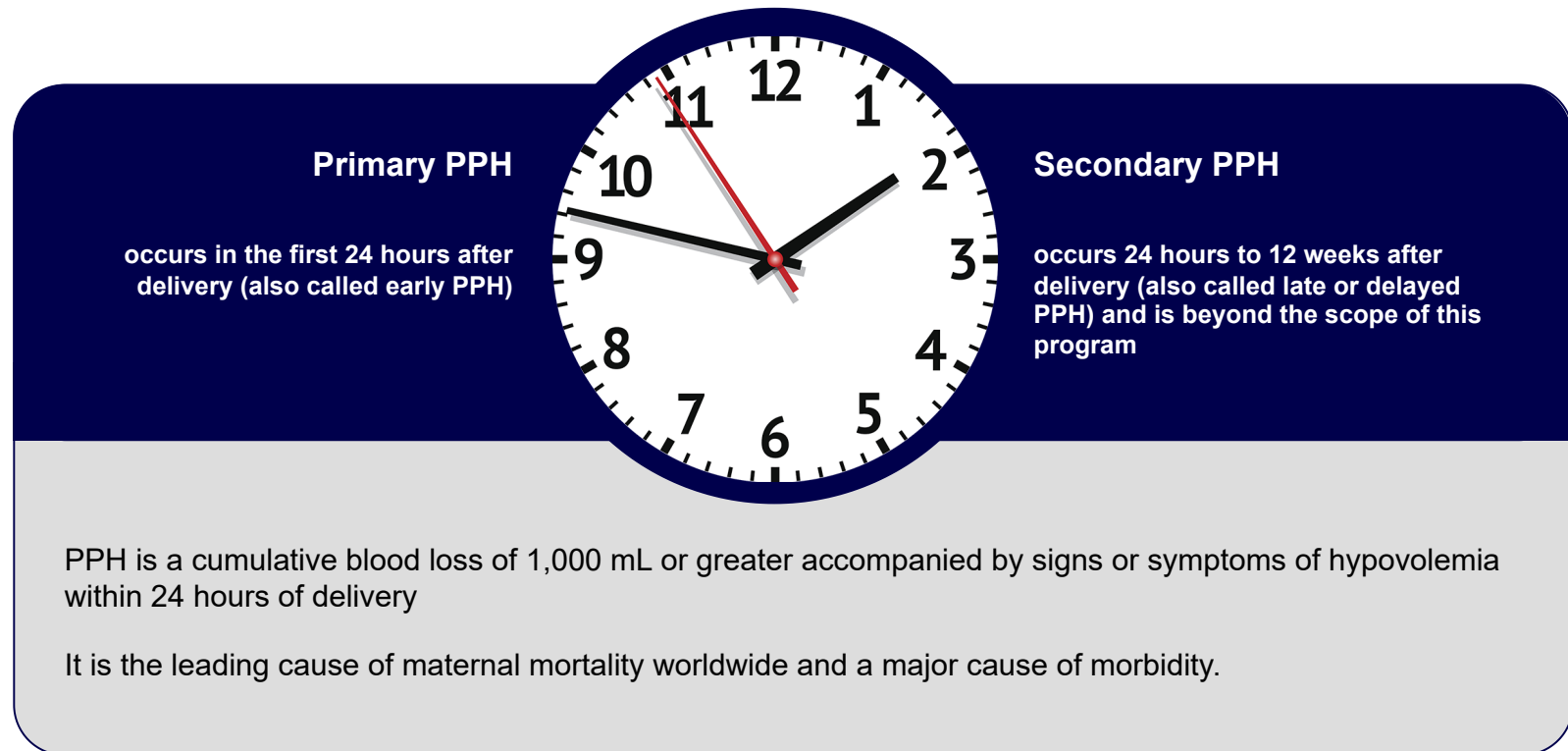
Every provider

Every team member

- Each patient and their support network should be treated as respected members and contributors to the multidisciplinary care team and as participants in patient-centered huddles and debriefs
- Engage in open, transparent and empathetic communication with pregnant and postpartum people and their support network to understand diagnosis, options and treatment plans.



Postpartum Hemorrhage (PPH) is defined as [1]:





The Alliance for Innovation on Maternal Health (AIM) has set forth best practices that make birth safer, improves maternal outcomes and saves lives. From this, there are 5 R's set forth regarding PPH [26]:

1. Readiness
2. Recognition and prevention
3. Response
4. Reporting and systems learning
5. Respectful, equitable and supportive care

Full details can be found here: [AIM Safety Bundle - Obstetric Hemorrhage](#)





The incidence of PPH varies widely.

PPH occurs in 1-5% of all deliveries [3].

The rate of hemorrhage increased 26% from 1994-2006, primarily related to increased uterine atony. However, the rate of mortality related to hemorrhage decreased, which is attributed to increased rates of transfusion and peripartum hysterectomy.

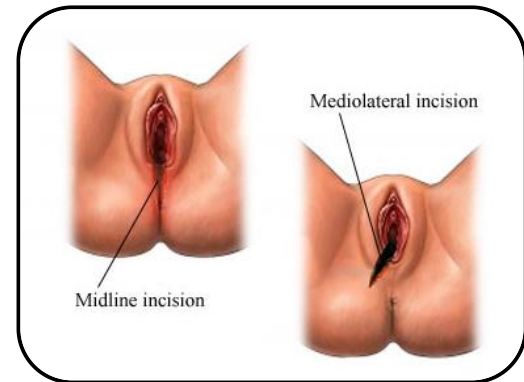
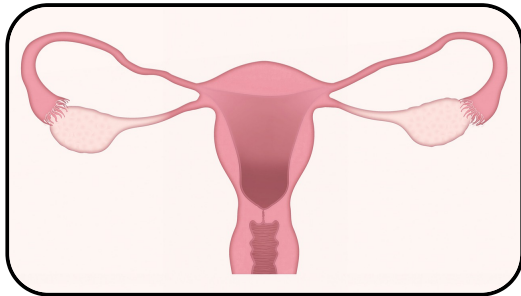


Obstetric hemorrhage is unpredictable, common and can cause severe morbidity and mortality. Because of this, all obstetric care providers should be prepared to manage hemorrhage.

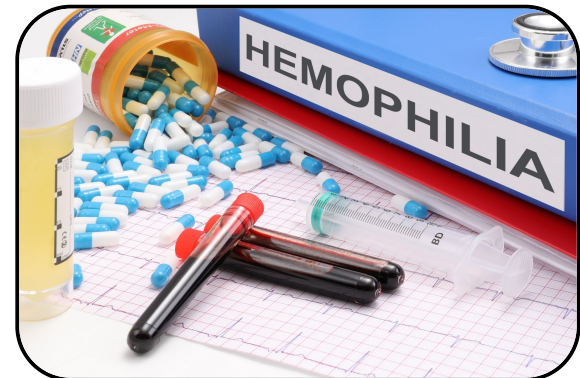
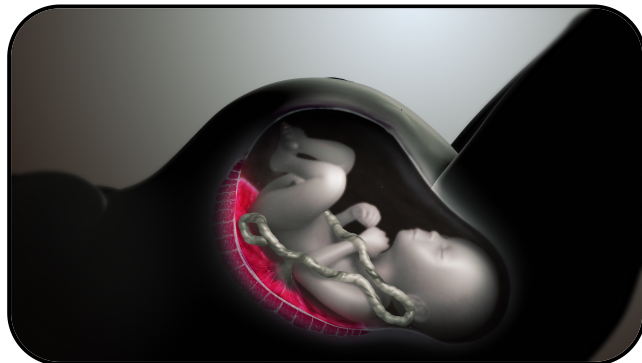
State and national organizations have suggested that a maternal risk assessment be conducted antenatally, at the time of admission and throughout the delivery process to identify women at increased risk of hemorrhage.



Antenatal and Intrapartum Risk Factors for PPH [1]



Click the pictures to see more information.



Abnormalities of uterine contraction, atony

- **Primary Problems**

- Atonic Uterus

- **Risk Factors, Signs**

- High parity
 - Chorioamnionitis
 - General anesthesia

- Over distended Uterus

- **Risk Factors, Signs**

- Twins or multiple gestation
 - Polyhydramnios
 - Macrosomia

- Fibroid Uterus

- **Risk Factors, Signs**

- Multiple uterine fibroids

- Uterine inversion

- **Risk Factors, Signs**

- Excessive umbilical cord traction
 - Short umbilical cord
 - Fundal implantation of the placenta

Retained placental tissue

- **Primary Problems**
- Retained placenta
 - **Risk Factors, Signs**
 - Succenturiate placenta
 - Previous uterine surgery
 - Incomplete placenta at delivery
- Placenta accrete
 - **Risk Factors, Signs**
 - Previous uterine surgery
 - Incomplete placenta at delivery

Genital tract trauma

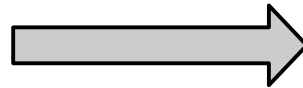
- **Primary Problems**
- Cervical, vaginal, and perineal lacerations
 - **Risk Factors, Signs**
 - Precipitous delivery
- Uterine rupture

Abnormalities of coagulation

Primary Problems

If the primary problem is:

- Severe Infection
- Amniotic fluid embolism (AFE)
- Inherited clotting factor deficiency (von Willebrand, hemophilia)
- Preeclampsia



Risk Factors, Signs

- Abnormal bruising
- Petechia
- Fetal death
- Placental abruption
- Fever, sepsis
- Hemorrhage
- Current thromboembolism treatment

The following risk factors for PPH

- placenta previa
- personal history of previous PPH
- obesity
- high parity
- Asian or Hispanic race
- precipitous labor
- first stage of labor >24 hours
- uterine over-distention
- uterine infection
- some drugs, such as antidepressants

have been associated with PPH [6-17].





Women with severe factor XI deficiency or who are hemophilia carriers are at increased risk of both early and late PPH (16 to 22% for early and 11 to 24% for late).



PPH may be due to an acquired hemophilia A (pregnancy-related FVIII autoantibodies) [18]



AFE, placental abruption, or preeclampsia with severe features, can be the cause of acute coagulopathies.



Undiagnosed bleeding disorders are rarely the cause of PPH; therefore, PPH by itself is not an indicator to screen for inherited bleeding disorders [19].

- One of 50 women in a study, who had PPH, had postpartum screening that identified a bleeding disorder.

A bleeding disorder should be considered if a woman experiences PPH that does not respond to general treatment measures when she has a history of menorrhagia, excessive bleeding after minor injury, or a known family history of a bleeding disorder [20].



Generally, hemostasis begins when the placenta separates from the uterus, which causes the myometrium to contract and vessels to constrict that supplied the placental bed and activates the coagulation pathways. This forms a clot at the placental attachment site.

PPH results from a disturbance in one or more of these events.

These disturbances can be associated with incomplete placental separation as seen in invasive placental disease, uterine atony, acquired or inherited factor deficiencies, thrombocytopenia, drugs that affect coagulation, retained products of conception, uterine rupture, uterine inversion and possibly trauma.



Although uterine atony is the most common cause of PPH, it is often responsive to therapy and thus not the most common reason for massive transfusion after delivery [21].

In a large worldwide series, 54% of women with PPH received a blood transfusion [73].



Late pregnancy uterine arterial blood flow is 500-700mL/min and accounts for approximately 15% of cardiac output. This increase in blood flow contributes to PPH.

Most women do not hemorrhage because uterine bleeding is controlled by:

- Contraction of the myometrium which constricts the blood vessels supplying the placental bed
- Localized decidual hemostasis



Symptoms related to blood loss with PPH [1,2]

Blood Loss	Blood Pressure, mmHg	Signs and Symptoms
<500mL vaginal or <1000mL cesarean	Normal/stable	May have no symptoms or elevated heart rate (HR), no change in blood pressure (BP), pulse pressure or respiratory rate (RR)
>500mL vaginal delivery or >1000mL cesarean delivery or change in vital signs	≤85/45mmHg	HR ≥110 beats/minute, O ₂ saturation <95%, RR 20-24, decreased pulse pressure, weakness, and sweating
Continued bleeding with total blood loss remaining <1500mL	BP continues to be ≤85/45mmHg	HR >120 and thready, RR markedly elevated, capillary refill delayed, restlessness, confusion, pallor, and oliguria
>1500mL Massive Transfusion protocol and surgical approach to control bleeding	unstable systolic and further decreasing BP	HR >120, lethargy, air hunger, anuria, and collapse



Atony

Trauma

Coagulation Defects

The most common cause of PPH is uterine atony which complicates 1 in 40 births in the United States and is responsible for at least 70-80% of the cases of PPH [21].

Uterine atony is caused by an inability of the uterine myometrium to contract effectively.

Risk factors for uterine atony include:

- Uterine overdistension (multiple gestation, polyhydramnios, macrosomia)
- Uterine infection
- Uterine relaxants
- Prolonged labor
- Uterine inversion
- Retained placenta
- Uterine leiomyoma



*Click the tabs to
see more information.*



PPH generally is caused by diffuse uterine atony which responds to uterotonic drugs and is not a common reason for massive transfusion following delivery [6].

If the uterus appears to be firmly contracted after delivery, other etiologies of hemorrhage should be considered.

A well-contracted fundus does not exclude the possibility of atony of the lower segment.

Women with persistent bleeding despite a firm fundus should always undergo a vaginal examination to identify ballooning of the lower uterus, as well as cervical and vaginal lacerations.

Treatment of lower uterine segment atony is evacuation of clot and bimanual compression while waiting for uterintonic medication or intracavitary balloon placement.

click to close



Click here to see more about the etiology of PPH.



Atony

Trauma

Coagulation Defects

Trauma-related bleeding can be due to:

- Lacerations (i.e., perineal, vaginal, cervical, uterine)
- Uterine rupture

Lacerations are more common after instrumental delivery.

Genital tract hematomas involving the labia, vagina, broad ligament or retroperitoneum can also lead to significant blood loss.

Additional risk factors include fetal malpresentation, fetal macrosomia, precipitous delivery, Duhrssen incisions and shoulder dystocia.

A genital tract laceration should be suspected if bleeding persists after delivery despite good uterine tone.

If arterial bleeding is suspected, rapid suture ligation may be required.



***Click the tabs to
see more information.***



Atony**Trauma****Coagulation Defects****Acute coagulopathy**

Acute coagulopathy at the time of delivery can be caused by preeclampsia with severe features, HELLP, placental abruption, AFE, sepsis, acute fatty liver of pregnancy (AFLP) or fetal demise.

Acquired causes included disorders related to the pregnancy; severe preeclampsia, HELLP syndrome, placenta abruption, fetal demise, AFE, and sepsis.

The mechanism is related to hemodilution, failure of liver synthetic function, or disseminated intravascular coagulation (DIC).

Treatment of acute coagulopathy is to identify and treat the underlying etiology.



*Click the tabs to
see more information.*

**Retained Products of Conception****Invasive Placental Disease****Uterine Rupture/Inversion**

- Causes hemorrhage by inhibiting the uterus from adequate contraction.
- Can be diagnosed based on visual inspection of the placenta following delivery or by ultrasound demonstrating a thickened endometrial stripe.
- Risk factors include second trimester delivery, chorioamnionitis, prior uterine surgery and placental succenturiate lobe.
- Treatment includes attempted manual removal, "banjo" curettage or postpartum dilation & curettage.



*Click the tabs to
see more information.*





Retained Products of Conception

Invasive Placental Disease

Uterine Rupture/Inversion

- Caused by abnormal placental attachment to the myometrium.
- Most common in the setting of prior uterine surgery (particularly prior cesarean sections) and placenta previa.
- Best diagnosed by ultrasound during pregnancy.
- Typically requires cesarean hysterectomy for treatment.



*Click the tabs to
see more information.*





Retained Products of Conception

Invasive Placental Disease

Uterine Rupture/Inversion

Uterine rupture

- Rare cause of PPH.
- Biggest risk factor is a trial of labor after cesarean section.
- May not present with vaginal bleeding, but rather abdominal pain and fetal heart decelerations.

Uterine inversion

- Rare cause of PPH.
- Presents as a rounded mass in the vagina with no palpable fundus abdominally.
- Most commonly caused by fundal placentation with excessive cord traction following delivery.



*Click the tabs to
see more information.*



To improve outcomes in women who develop PPH, protocol for management should be developed to identify heavy bleeding and hemorrhage before it becomes life threatening [22-25]. Quantifying blood loss (QBL) rather than estimating the blood loss (EBL) is important to help determine the amount of blood loss.

Development of a PPH protocol has been associated with quicker resolution of bleeding, decreased use of blood products and decreased incidence of DIC.

Clinical training programs or simulations encourage a team approach which may improve outcomes by quicker response to and treatment of hemorrhage.

Women who are identified as at risk for PPH should be educated and counseled appropriately for their level of risk and the gestational age.

Planning for a PPH event involves establishing resources to ensure adequate care.

A resource to help build the items needed for PPH can be found here:
[Improving Health Care Response to Obstetric Hemorrhage, V3.00](#)



A PPH kit, which includes medication and equipment to manage hemorrhage, should be carried along to all deliveries.

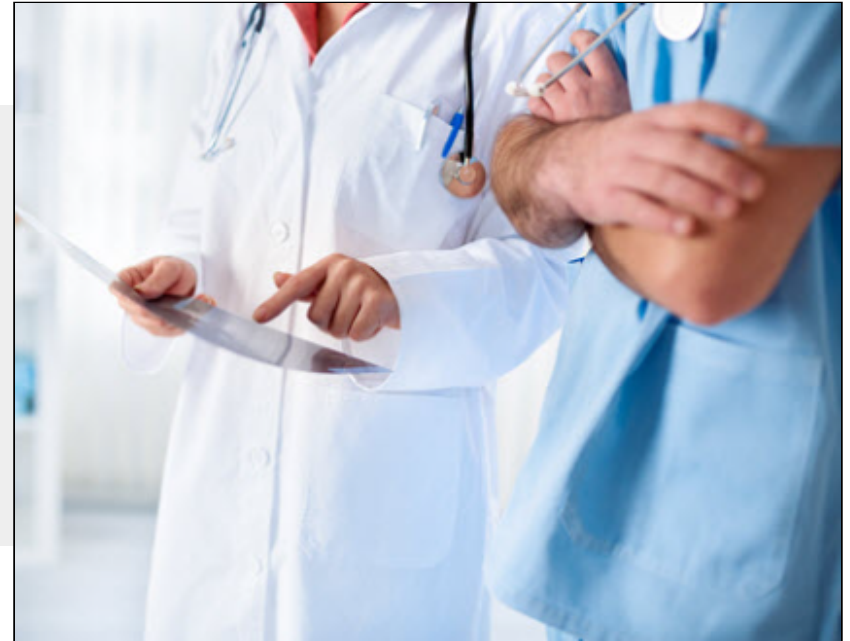
Simulation drills on a PPH event will assist in identifying areas needing improvement. This practice is recommended by The Joint Commission [29].

Identifying deficiencies in clinical knowledge and performance can be demonstrated in simulation-based teaching of management of PPH [27,28].

Simulations are in the Maternal 911 in Action portion of this program.

Teamwork and communication failures are responsible for up to 70% of obstetric sentinel events [29].

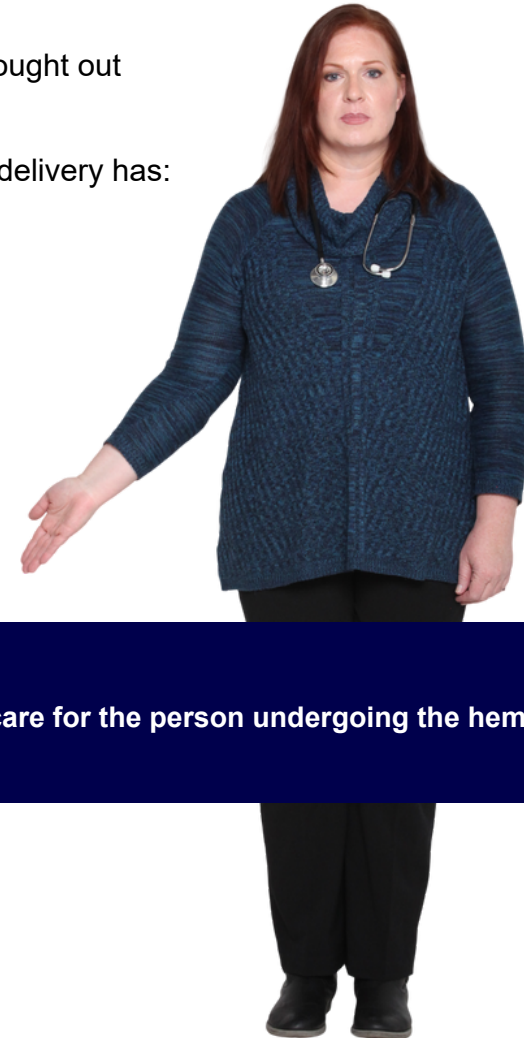
The Joint Commission, the American College of Obstetricians and Gynecologists (ACOG), and the Institute of Medicine, all recognize teamwork and communication as an important element of patient safety [29,30,31].



The management of PPH is multifaceted and potentially requires care by a well thought out plan of action.

To help lower incidence and help prevent maternal mortality, it is imperative every delivery has:

1. Readiness to respond to an obstetrical hemorrhage.
2. Recognition and prevention measures in place for all patients.
3. A plan of care for transfer when excessive maternal bleeding occurs.
4. De-briefing to learn and improve responsiveness



Knowledge, protocols, and simulation training will allow coordinated efforts and care for the person undergoing the hemorrhage.



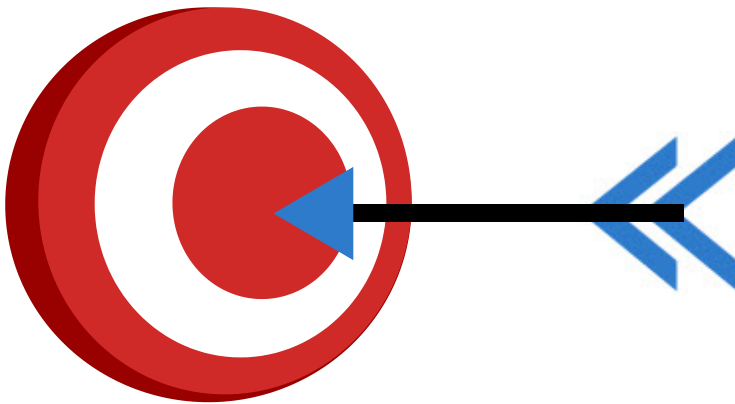
Recognition and Prevention [26]

- Assess and communicate hemorrhage risk
- Measure and communicate cumulative blood loss using quantitative approaches
- Actively manage the third stage of labor
- Provide ongoing education to the patient with PPH risk, early warning signs and risks for complications



The approach and aggressiveness of interventions will be dependent on the rate and amount of bleeding, and vital signs.

If one treatment option does not adequately control bleeding, the provider should promptly select the next treatment. Non-operative and operative interventions for PPH can be used alone or in combination [33,35].



The goal is to:

- Maintain or restore circulation to vital organs
- Maintain or restore tissue oxygenation
- Prevent or reverse coagulopathy
- Identify and eliminate the cause of PPH



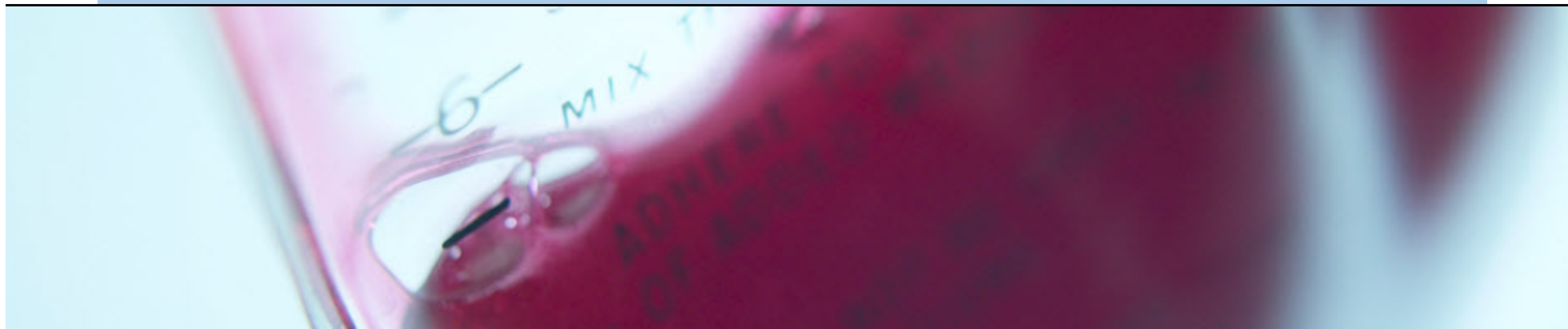
If an intervention does not succeed in decreasing hemorrhage, the next treatment should be quickly implemented.

Delayed recognition or uncertainty in treatment may result in further bleeding which may cause dilutional coagulopathy, life-threatening hypovolemia, tissue hypoxia, hypothermia, and acidosis [33].

Delay in controlling hemorrhage may increase the need for a hysterectomy, or may result in hemorrhagic shock, or death.



Development of a standardized approach to management of PPH improves outcomes.

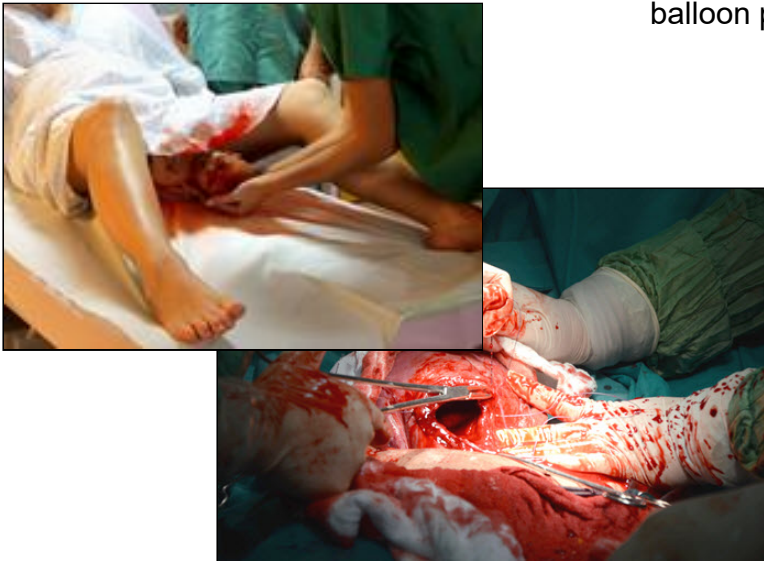


Management & Treatment Cont'd



The approach to treatment of PPH differs somewhat depending on the cause.

- Hemorrhaging lacerations caused by trauma will need to be repaired using either the transvaginal or transabdominal approach.
- Vaginal hematomas should not be drained unless expanding to reduce likelihood of further blood loss.
- If hemorrhage is caused by uterine atony, uterotonic medication and/or intrauterine balloon placement is recommended.



Key components of evaluation and treatment

Rapid evaluation and management of excessive vaginal bleeding after delivery requires:

- Frequent assessment of BP, HR, RR, peripheral oxygen saturation, and urine output.
- A provider at bedside.
- Active management of the third stage of labor with oxytocin and secondary uterotonic drugs such as tranexamic acid or misoprostol.



Initial Interventions

- Women with persistent postpartum vaginal bleeding should be closely monitored and supported with fluids and blood products, as needed.
- The source of bleeding should be determined and treated; clinical assistance should be requested, as appropriate.



Although the initial interventions described below are often successful, in the setting of hemodynamic instability it is important to avoid prolonged, futile attempts at conservative therapy before proceeding to transfer.

Uterine massage and compression is necessary if uterine atony is present.

- Initial evaluation should include a vaginal and uterine exam. The uterus should be evacuated of any blood clots.
- Bimanual uterine massage should be initiated. The provider places one hand into a fist and inserts vaginally to the anterior fornix and the other hand massages the fundus to compress the uterus between the hands.
- Massage should continue until bleeding decreases. If the uterine fundus is firm and bleeding continues, further massage is unlikely to be effective, and other measures should be implemented.



Response [26]

- Utilize a standard PPH emergency management plan with checklists and with consideration for transfer:
 - advanced preparations (i.e. medications, large caliber foley, etc)
 - evaluate the patient for an etiology of PPH
 - use the rapid response team
 - evidence-based medication administration or use of non-pharmacologic interventions
- Appropriate communication when transfer is necessary
- Provide trauma-informed support for patient, support network and staff for all PPH including discussions regarding birth event, follow up care, and resources.



Warm blankets should be used to assist in maintaining normothermia.



Treatment of PPH

- Oxytocin (Pitocin)
- Misoprostol (Cytotec)
- Tranexamic acid (Lysteda)





Treatment of PPH - Oxytocin

Oxytocin

- IM dose is 10 units either into the patient's thigh or directly into the myometrium.

Medication - Oxytocin





*Click the arrows to
see more information.*

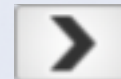
Treatment of Postpartum Hemorrhage - Misoprostol

Where injectable uterotonics are unavailable or contraindicated, Misoprostol is useful for treatment for PPH.

There is no evidence that misoprostol is more effective than other uterotonics either for primary therapy of PPH or as an adjunctive treatment to oxytocin infusion [36].

The optimum dose and route of misoprostol administration is unclear [40-46].

1 of 3



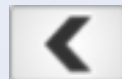


*Click the arrows to
see more information.*

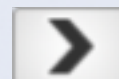
Treatment of Postpartum Hemorrhage - Misoprostol

Sublingual Administration (600-1,000 mcg)	Rectal Administration
Sublingual misoprostol is absorbed rapidly.	Takes up to one hour to peak
Peak concentration in 30 minutes.	800-1000mcg is the most commonly used dose [43,44,47,48].
Peak concentration is higher and sustained for approximately 3 hours compared with oral administration due to avoidance of the first-pass hepatic metabolism.	Duration of action is 4 hours.
Larger doses over 400mcg are associated with an increasing potential for hyperthermia.	

Medication - Misoprostol



2 of 3





Treatment of Postpartum Hemorrhage - Misoprostol

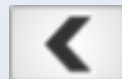
Due to heavy bleeding, it is not recommended to use the vaginal route of administration.

Misoprostol can be administered to women with hypertension or asthma.

Monitoring of the maternal temperature is important because pyrexia >40 degrees Celsius can occur when increasing misoprostol dose. Elevated temperature should be treated with acetaminophen.



*Click the arrows to
see more information.*





*Click the arrows to
see more information.*

Treatment of Postpartum Hemorrhage - Tranexamic Acid [73,74]

Tranexamic acid (TXA) is recommended by the World Health Organization (WHO) to be used within 3 hours, following vaginal birth with a diagnosis of PPH.

TXA is a competitive inhibitor of plasminogen activation and can reduce bleeding by inhibiting the breakdown of fibrinogen and fibrin clots.

By giving within 3 hours of birth, maternal death from hemorrhage may be prevented, regardless of the cause. There are no noted adverse maternal effects from the medication.





*Click the arrows to
see more information.*

Treatment of Postpartum Hemorrhage - Tranexamic Acid [73,74]

- TXA for PPH should not be utilized more than 3 hours after birth.
 - The benefits of TXA appear to decrease by 10% for every 15-minute delay, with no benefit seen after 3 hours from birth.
- TXA should be initiated as soon as possible after the onset of bleeding and within 3 hours of birth and should be considered part of the standard PPH treatment package (i.e. uterotonics, non-surgical and surgical interventions).
- Regardless of whether the PPH is from the genital tract trauma or other causes, TXA should be used in all cases.





*Click the arrows to
see more information.*

Treatment of Postpartum Hemorrhage - Tranexamic Acid [73,74]

- TXA administration may be given orally with 1300mg being administered.
 - A decreased dose should be given in the setting of renal insufficiency.
- The half-life of TXA is 2 hours and antifibrinolytic effect lasts for 7-8 hours.

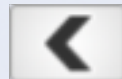




*Click the arrows to
see more information.*

Treatment of Postpartum Hemorrhage - Tranexamic Acid [73,74]

- **Contraindications to TXA**
 - Known thromboembolic event in pregnancy
 - History of coagulopathy
 - Active intravascular clotting
 - Known hypersensitivity to TXA





Evaluating for retained products of conception (POC) [49,50]

- Examine the uterus for any retained POC, placenta fragments or fetal membrane. The POC can be removed manually or with ring forceps.





Management and Treatment of PPH Cont'd

If hemorrhage is caused by uterine atony, this is typically treated with uterotonics, uterine balloon tamponade, uterine compression sutures or uterine artery embolization. If these measures fail, hysterectomy is required.

If hemorrhage is caused by uterine rupture, operative management is required. The patient may require hysterectomy if uterine repair cannot be performed or bleeding cannot be controlled.

If hemorrhage is caused by invasive placental disease, cesarean hysterectomy is required for definitive treatment.

A woman with concern for invasive placental disease, or uterine rupture may need an early hysterectomy to control the hemorrhage [68,70].

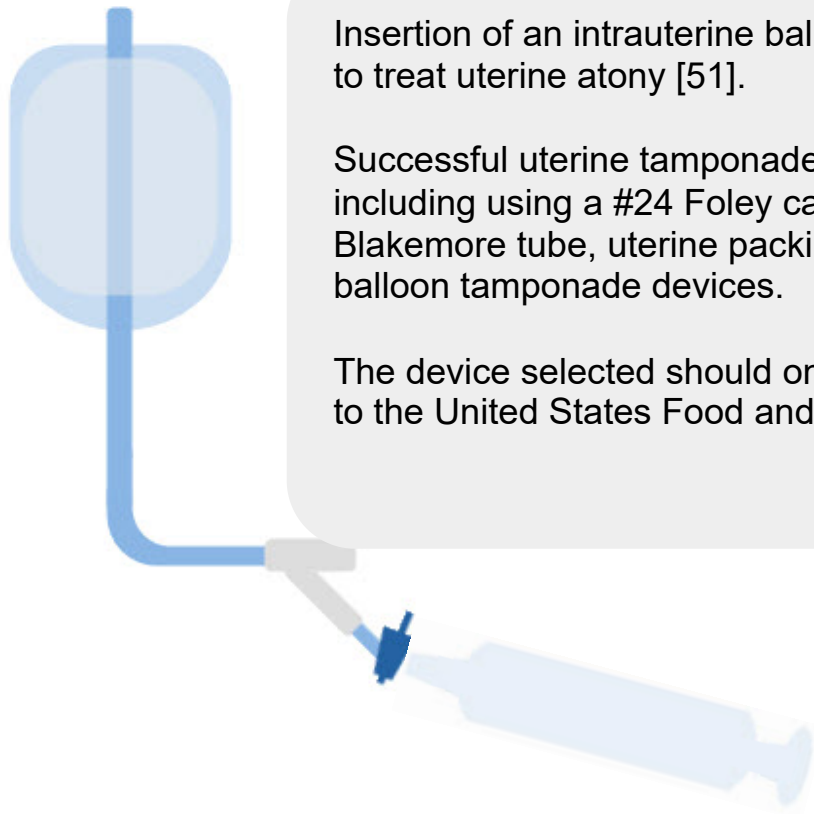


Uterine tamponade

- Uterine tamponade is effective in patients with atony or lower segment bleeding
- Either a balloon or a pack can be used for tamponade, but a balloon device designed for uterine tamponade is preferable over packing because it can be placed quickly and allows some assessment of ongoing hemorrhage [51].



Intrauterine Balloon Catheter



Insertion of an intrauterine balloon early will reduce blood loss while attempting to treat uterine atony [51].

Successful uterine tamponade can be achieved with alternative methods including using a #24 Foley catheter, with a 30mL balloon, Sengstaken-Blakemore tube, uterine packing with gauze, or commercially available uterine balloon tamponade devices.

The device selected should only be filled until bleeding is controlled and only to the United States Food and Drug Administration approved fill volume [52].





Balloon Tamponade Continued

It is believed the mechanism of action is related to a decrease in uterine artery perfusion pressure either by direct compression of the uterine artery or uterine wall conformational changes [52].

A description of these devices and their placement is addressed in the training portion of Maternal 911 in Action Postpartum Hemorrhage.

During treatment with a uterine balloon tamponade, ongoing evaluation of blood loss and preparation for transfer is crucial.

If bleeding continues with the tamponade in place, the provider should promptly recognize that surgery or embolization is necessary.





Administer a broad spectrum antibiotic IV while uterine tamponade is in place, such as:

- Ancef 1 g q 8 hours
- Gentamicin, 1.5mg/kg every eight hours, and either:
 - Metronidazole, 500mg every eight hours
 - Clindamycin, 300mg every six hours
- These medications are generally administered for 24 hours and discontinued when the uterine tamponade device is removed.





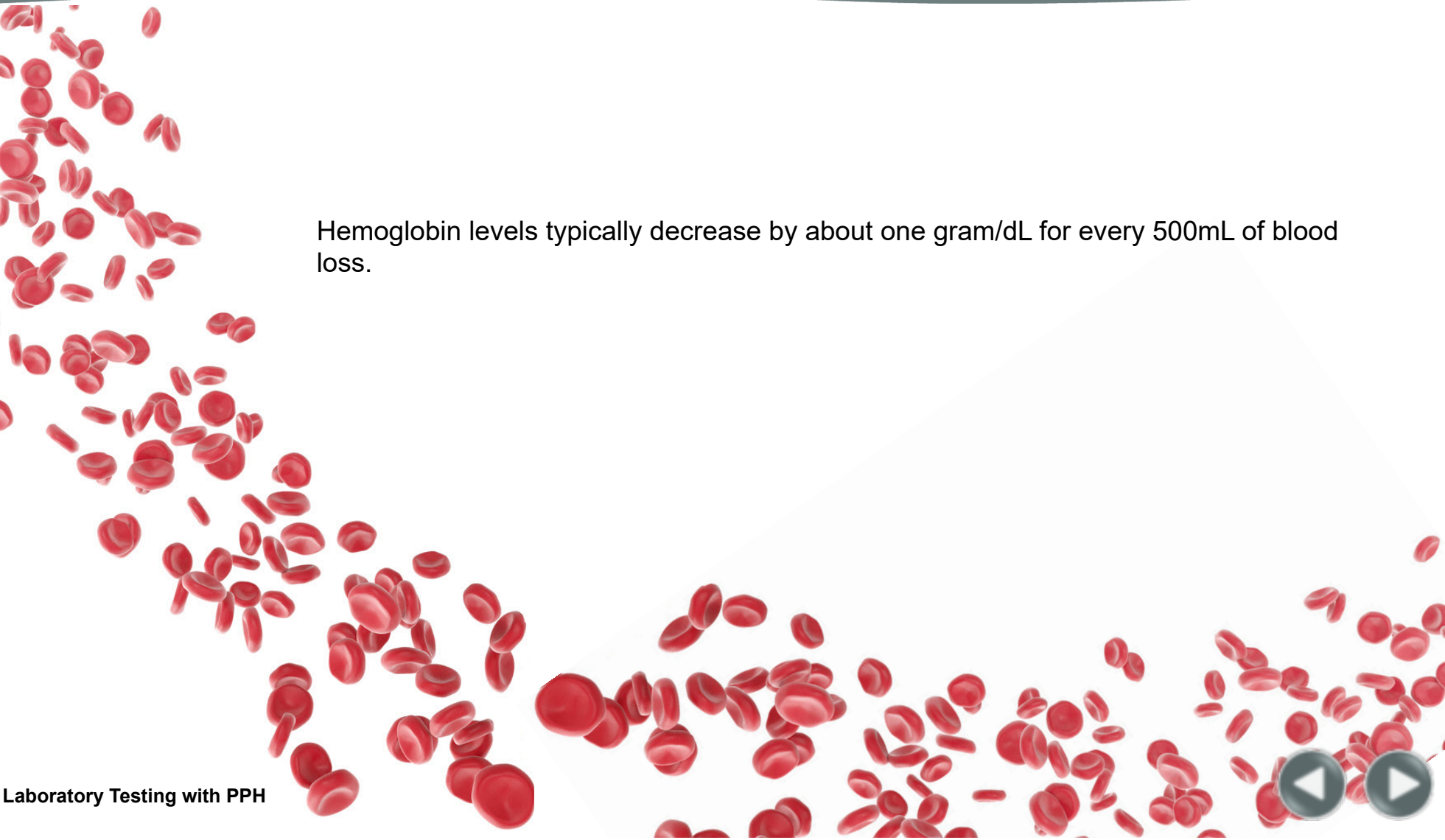
Compensated shock may present in the woman with an increasing HR and tachypnea with a stable BP. When these symptoms present, the PPH protocol should be instituted even if light vaginal bleeding is observed.

Women can lose a substantial amount of blood prior to showing any hemodynamic changes; therefore, an obstetric provider should not wait for vital sign changes prior to treating hemorrhage.



Management and Treatment of PPH





Hemoglobin levels typically decrease by about one gram/dL for every 500mL of blood loss.

Laboratory Testing with PPH





Estimated blood loss (EBL) should be converted to quantitative blood loss (QBL). The loss should be quantified every 15 to 30 minutes. Quantifying the blood loss will likely lead to a more accurate recognition and documentation of blood loss.

Guidelines for diagnosis, management, and prevention of postpartum hemorrhage have been developed by several organizations and are a great resource for development at your facility [32]:

- California Maternal Quality Care Collaborative (CMQCC) best practices for management of obstetrical hemorrhage www.cmqcc.org/ob_hemorrhage/ob_hemorrhage_compendium_of_best_practices)
- Royal College of Obstetricians and Gynaecologists (RCOG) guideline for prevention and management of postpartum hemorrhage www.rcog.org.uk
- World Health Organization (WHO) guideline for prevention and treatment of postpartum haemorrhage http://apps.who.int/iris/bitstream/10665/75411/1/9789241548502_eng.pdf
- Society of Obstetricians and Gynaecologists of Canada (SOGC) guideline for prevention and management of postpartum hemorrhage www.sogc.org
- American College of Obstetricians and Gynecologists (ACOG) practice bulletin for postpartum hemorrhage
- New York health advisory recommendations for reducing the risk of maternal death from hemorrhage https://www.health.ny.gov/professionals/protocols_and_guidelines/maternal_hemorrhage/

PPH is one of the most common causes of maternal morbidity and mortality.

Morbidities associated with PPH include:

- Hypovolemic shock and organ failure: renal failure, stroke, myocardial infarction, postpartum hypopituitarism (Sheehan syndrome)
- Fluid overload (pulmonary edema, dilutional coagulopathy)
- Abdominal compartment syndrome
- Anemia
- Acute respiratory distress syndrome
- Anesthesia-related complications
- Sepsis, wound infection, pneumonia
- Venous thrombosis and embolism
- Unplanned sterilization due to need for hysterectomy
- Asherman syndrome (related to curettage if performed for retained products of conception)



Complications That May Occur with PPH





Sheehan Syndrome aka Postpartum Hypopituitarism

- Rare complication of PPH.
- During pregnancy the pituitary gland becomes enlarged and can infarct when hypovolemic shock occurs.
- Mild to severe pituitary damage can occur with an infarction. This can result in diminished secretion of one, several, or all of its hormones.

Sheehan syndrome should be considered if a woman presents following delivery with lactation failure, amenorrhea, or oligomenorrhea. She may also present with hypotension, hyponatremia, or hypothyroidism, which are manifestations of hypopituitarism. This event can occur in the immediate postpartum period to years following delivery.

If the patient remains hypotensive after adequate resuscitation, she should have evaluation of adrenal function and other hormone deficiencies. This evaluation can be performed 4 to 6 weeks postpartum but should not be overlooked.



Reporting and Systems Learning [26]

- Establish a culture where planning, huddles and post event debriefs occur with identification of successes, opportunities and action plans for future events.
- Monitor process measures and outcomes related to PPH with disaggregation by race and ethnicity due to known racial and ethnic disparities.
- Data reporting and sharing to inform care and change systems as necessary.





Postpartum hemorrhage (PPH) is defined as excessive bleeding that makes the patient symptomatic (i.e. lightheadedness, palpitations, diaphoresis, confusion) and/or results in signs of hypovolemia (i.e. hypotension, tachycardia, oliguria, decreased oxygen saturation).

The most common causes of PPH are atony, trauma, and acquired or congenital coagulation defects.

Although there are many known risk factors for PPH, knowledge of these risk factors is not always clinically useful in prevention of hemorrhage.



Click each box to review the course.





The approach to management of PPH varies depending on the cause.

The treatment of atony depends on the route of delivery, as there is less concern about the morbidity of open operative interventions when the patient's abdomen is already open.



Click each box to review the course.





Because of ease of treatment and a lesser incidence of severe side effects, we recommend that patients with anemia be treated with an oral, rather than a parenteral, iron preparation.

Women with a prior PPH have as much as a 15% risk of recurrence in a subsequent pregnancy. This recurrence rate is dependent on underlying conditions and etiology of PPH.





The Alliance for Innovation on Maternal Health (AIM) has set forth best practices that make birth safer, improves maternal outcomes and saves lives. From this, there are 5 R's set forth regarding PPH [26]:

1. Readiness
2. Recognition and prevention
3. Response
4. Reporting and systems learning
5. Respectful, equitable and supportive care

Full details can be found here: [AIM Safety Bundle - Obstetric Hemorrhage](#)



Readiness [26]

- Develop processes for the management of patients with PPH include:
 - designated rapid response team appropriate for the facility level of maternal care
 - standardized stage based PPH emergency management with checklists and transfer policy



1 of 2 ➡➡



Click the arrow to see more information.



Readiness [26]

- Maintain a hemorrhage kit with supplies, checklists, and instruction cards for devices or procedures in locations where there are antepartum, laboring and postpartum patients.
- Have immediate access to first and second line hemorrhage meds in a kit or equivalent available and in an emergency management plan for PPH.
- Conduct drills with timely debriefs that include use of simulation.





Recognition and Prevention [26]

- Assess and communicate hemorrhage risk to all team members at a minimum on admission, during peripartum period and transition to postpartum care; anytime the clinical conditions change, this risk should be reassessed
- Measure and communicate cumulative blood loss to all involved members using quantitative approaches
- Actively manage the third stage of labor with an active protocol
- Provide ongoing education to all patients with PPH risk, early warning signs and risks for complications



Response [26]

- Utilize a standard PPH emergency management plan with checklists and escalation policies including:
 - advanced preparations
 - evaluate the patient for an etiology of PPH
 - use the rapid response protocol
 - evidence-based medication administration or use of non-pharmacologic interventions
- Appropriate communication to expand the care team and resources as necessary
- Provide trauma-informed support for patient, support network and staff for all PPH including discussions regarding birth event, follow up care, and resources.



Reporting and Systems Learning [26]

- Establish a culture where planning, huddles and post event debriefs occur with identification of successes, opportunities and action plans for future events.
- Review of serious complications to identify system issues.
- Monitor process measures and outcomes related to PPH with disaggregation by race and ethnicity due to known racial and ethnic disparities.
- Data reporting and sharing with rapid response to change systems as necessary.





Respectful, Equitable and Supportive Care [26]

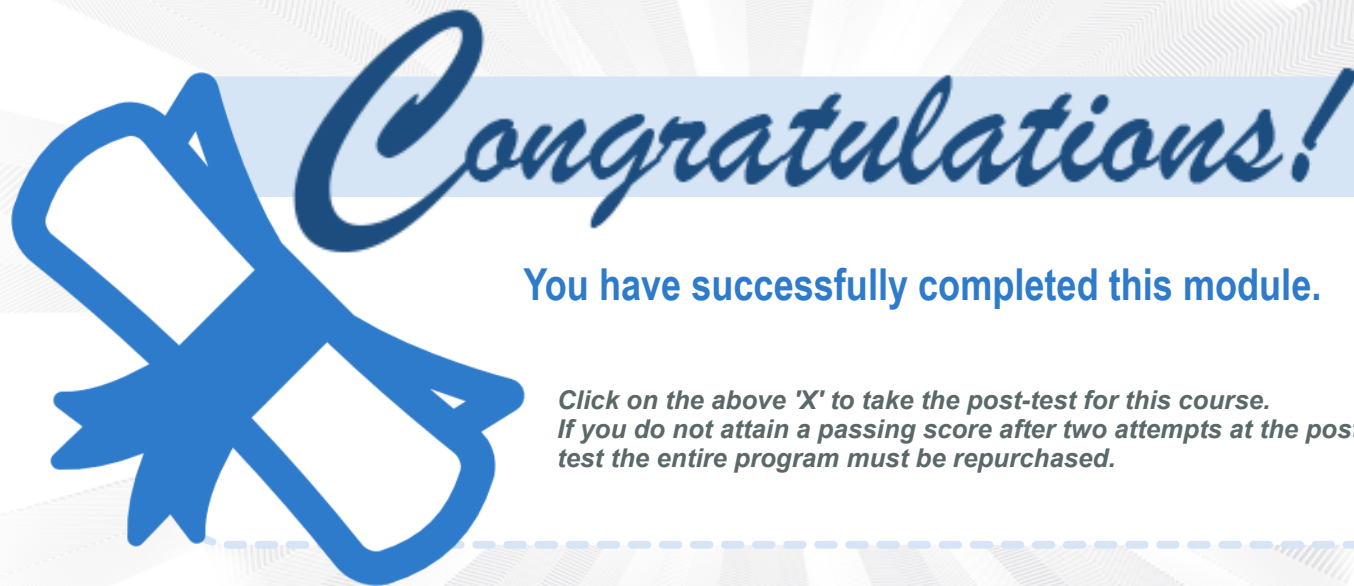
Every person

Every provider

Every team member

- Each patient and their support network should be treated as respected members and contributors to the multidisciplinary care team and as participants in patient-centered huddles and debriefs
- Engage in open, transparent and empathetic communication with pregnant and postpartum people and their support network to understand diagnosis, options and treatment plans.





You have successfully completed this module.

*Click on the above 'X' to take the post-test for this course.
If you do not attain a passing score after two attempts at the post-test the entire program must be repurchased.*

1. Practice Bulletin No. 183: Postpartum Hemorrhage. Committee on Practice Bulletins-Obstetrics Obstet Gynecol. 2017;130(4):e168.
2. Obstetric Hemorrhage | California Maternal Quality Care Collaborative. Available at: <https://www.cmqcc.org/content/obstetric-hemorrhage>.
3. Sheldon WR, Blum J, Vogel JP, Souza JP, Gülmezoglu AM, Winikoff B. WHO Multicountry Survey on Maternal and Newborn Health Research Network. Postpartum haemorrhage management, risks, and maternal outcomes: findings from the World Health Organization Multicountry Survey on Maternal and Newborn Health. BJOG. 2014;121 Suppl 1:5
4. Callaghan WM, Kuklina EV, Berg CJ. Trends in postpartum hemorrhage: United States, 1994-2006. Am J Obstet Gynecol. 2010;202(4):353.e1.
5. Mhyre JM, Shilkrut A, Kuklina EV, Callaghan WM, Creanga AA, Kaminsky S, Bateman BT. Massive blood transfusion during hospitalization for delivery in New York State, 1998-2007. Obstet Gynecol. 2013;122(6):1288.
6. Bateman BT, Berman MF, Riley LE, Leffert LR. The epidemiology of postpartum hemorrhage in a large, nationwide sample of deliveries. Anesth Analg 2010; 110:1368.
7. Rouse DJ, Leindecker S, Landon M, et al. The MFMU Cesarean Registry: uterine atony after primary cesarean delivery. Am J Obstet Gynecol 2005; 193:1056.
8. Cheng YW, Delaney SS, Hopkins LM, Caughey AB. The association between the length of first stage of labor, mode of delivery, and perinatal outcomes in women undergoing induction of labor. Am J Obstet Gynecol 2009; 201:477.e1.
9. Blomberg M. Maternal obesity and risk of postpartum hemorrhage. Obstet Gynecol 2011; 118:561.
10. Wetta LA, Szychowski JM, Seals S, et al. Risk factors for uterine atony/postpartum hemorrhage requiring treatment after vaginal delivery. Am J Obstet Gynecol 2013; 209:51.e1.
11. Kramer MS, Berg C, Abenhaim H, et al. Incidence, risk factors, and temporal trends in severe postpartum hemorrhage. Am J Obstet Gynecol 2013; 209:449.e1.
12. Sharp GC, Saunders PT, Greene SA, et al. Intergenerational transmission of postpartum hemorrhage risk: analysis of 2 Scottish birth cohorts. Am J Obstet Gynecol 2014; 211:51.e1.

13. Bruning AH, Heller HM, Kieviet N, et al. Antidepressants during pregnancy and postpartum hemorrhage: a systematic review. *Eur J Obstet Gynecol Reprod Biol* 2015; 189:38.
14. Oberg AS, Hernández-Díaz S, Frisell T, et al. Genetic contribution to postpartum haemorrhage in Swedish population: cohort study of 466,686 births. *BMJ* 2014; 349:g4984.
15. Giannella L, Mfuta K, Pedroni D, et al. Delays in the delivery room of a primary maternity unit: a retrospective analysis of obstetric outcomes. *J Matern Fetal Neonatal Med* 2013; 26:593.
16. Grzeskowiak LE, McBain R, Dekker GA, Clifton VL. Antidepressant use in late gestation and risk of postpartum haemorrhage: a retrospective cohort study. *BJOG* 2016; 123:1929.
17. Nyfløt LT, Sandven I, Oldereid NB, et al. Assisted reproductive technology and severe postpartum haemorrhage: a case-control study. *BJOG* 2017; 124:1198.
18. Zehnder JL, Leung LL. Development of antibodies to thrombin and factor V with recurrent bleeding in a patient exposed to topical bovine thrombin. *Blood*. 1990;76(10):2011.
19. Kadir RA, Kingman CE, Chi C, et al. Is primary postpartum haemorrhage a good predictor of inherited bleeding disorders? *Haemophilia* 2007; 13:178.
20. Kadir RA, Aledort LM. Obstetrical and gynaecological bleeding: a common presenting symptom. *Clin Lab Haematol* 2000; 22 Suppl 1:12.
21. Marshall AL, Durani U, Bartley A, Hagen CE, Ashrani A, Rose C, Go RS, Pruthi RK. The impact of postpartum hemorrhage on hospital length of stay and inpatient mortality: a National Inpatient Sample-based analysis. *Am J Obstet Gynecol*. 2017;217(3):344.e1.
22. Rizvi F, Mackey R, Barrett T, et al. Successful reduction of massive postpartum haemorrhage by use of guidelines and staff education. *BJOG* 2004; 111:495.
23. Shields LE, Wiesner S, Fulton J, Pelletreau B. Comprehensive maternal hemorrhage protocols reduce the use of blood products and improve patient safety. *Am J Obstet Gynecol* 2015; 212:272.
24. Skupski DW, Brady D, Lowenwirt IP, et al. Improvement in Outcomes of Major Obstetric emorrhage Through Systematic Change. *Obstet Gynecol* 2017; 130:770.

25. Shields LE, Smalarz K, Reffigee L, et al. Comprehensive maternal hemorrhage protocols improve patient safety and reduce utilization of blood products. *Am J Obstet Gynecol* 2011; 205:368.e1.
26. Obstetric Hemorrhage | AIM. Safebirth.org 31, May 2022; saferbirth.org/psbs/obstetric-hemorrhageem
27. Maslovitz S, Barkai G, Lessing JB, Ziv A, Many A. Recurrent obstetric management mistakes identified by simulation. *Obstet Gynecol*. 2007;109(6):1295
28. Deering SH, Chinn M, Hodor J, Benedetti T, Mandel LS, Goff B. Use of a postpartum hemorrhage simulator for instruction and evaluation of residents. *J Grad Med Educ*. 2009 Dec;1(2):260-3.
29. Joint Commission on Accreditation of Healthcare Organizations. JCAHO sentinel event alert #30. 2004.
30. Kohn, LT, Corrigan, JM, Donaldson, MS, Eds; Committee on Quality of Health Care in America, Institute of Medicine. *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 1999.
31. ACOG Committee Opinion No. 447: Patient safety in obstetrics and gynecology. American College of Obstetricians and Gynecologists Committee on Patient Safety and Quality Improvement. *Obstet Gynecol*. 2009;114(6):1424.
32. Dahlke JD, Mendoz-Figueroa H, Maggio L, et al. Prevention and management of postpartum hemorrhage: a comparison of 4 national guidelines. *Am J Obstet Gynecol* 2015; 213.e1
33. James, AH, McLintock, C., Lockhart, E. Postpartum hemorrhage: when uterotonics and sutures fail. *Am J Hematol* 2012; 87 Suppl 1:S16.
34. Munn, M.B., Owen, J., Vincent, R., et al. Comparison of two oxytocin regimens to prevent uterine atony at cesarean delivery: a randomized controlled trial. *Obstet Gynecol* 2001; 98:386.
35. Mousa, H. A., Blum, J., Abou, E., Senoun, G., et al. Treatment for primary postpartum haemorrhage. *Cochrane Database Syst Rev* 2014; :CD003249.
36. Hofmeyr, G. J., Gulmezoglu, A. M., Novikova, N., Lawrie, T. A. Postpartum misoprostol for preventing maternal mortality and morbidity. *Cochrane Database Syst Rev* 2013; :CD 008982.
37. Hofmeyr GJ, Walraven G, Gülmezoglu AM, et al. Misoprostol to treat postpartum haemorrhage: a systematic review. *BJOG* 2005; 112:547.

38. O'Brien P, El-Refaey H, Gordon A, et al. Rectally administered misoprostol for the treatment of postpartum hemorrhage unresponsive to oxytocin and ergometrine: a descriptive study. *Obstet Gynecol* 1998; 92:212.
39. Lokugamage AU, Sullivan KR, Niculescu I, et al. A randomized study comparing rectally administered misoprostol versus Syntometrine combined with an oxytocin infusion for the cessation of primary post partum hemorrhage. *Acta Obstet Gynecol Scand* 2001; 80:835.
40. Hofmeyr GJ, Ferreira S, Nikodem VC, et al. Misoprostol for treating postpartum haemorrhage: a randomized controlled trial [ISRCTN72263357]. *BMC Pregnancy Childbirth* 2004; 4:16.
41. Blum J, Winikoff B, Raghavan S, et al. Treatment of post-partum haemorrhage with sublingual misoprostol versus oxytocin in women receiving prophylactic oxytocin: a double-blind, randomised, non-inferiority trial. *Lancet* 2010; 375:217.
42. Winikoff B, Dabash R, Durocher J, et al. Treatment of post-partum haemorrhage with sublingual misoprostol versus oxytocin in women not exposed to oxytocin during labour: a double-blind, randomised, non-inferiority trial. *Lancet* 2010; 375:210.
43. Hofmeyr GJ, Gülmezoglu AM, Novikova N, et al. Misoprostol to prevent and treat postpartum haemorrhage: a systematic review and meta-analysis of maternal deaths and dose-related effects. *Bull World Health Organ* 2009; 87:666.
44. Tang OS, Schweer H, Seyberth HW, et al. Pharmacokinetics of different routes of administration of misoprostol. *Hum Reprod* 2002; 17:332.
45. Anandakrishnan S, Balki M, Farine D, et al. Carbetocin at elective Cesarean delivery: a randomized controlled trial to determine the effective dose, part 2. *Can J Anaesth* 2013; 60:1054.
46. Chandler WL, Ferrell C, Trimble S, Moody S. Development of a rapid emergency hemorrhage panel. *Transfusion* 2010; 50:2547.
47. de Lloyd L, Bovington R, Kaye A, et al. Standard haemostatic tests following major obstetric haemorrhage. *Int J Obstet Anesth* 2011; 20:135.
48. Hiippala ST, Myllylä GJ, Vahtera EM. Hemostatic factors and replacement of major blood loss with plasma-poor red cell concentrates. *Anesth Analg* 1995; 81:360.
49. Su LL, Chong YS, Samuel M. Oxytocin agonists for preventing postpartum haemorrhage. *Cochrane Database Syst Rev* 2007; :CD005457.

50. Anandakrishnan S, Balki M, Farine D, et al. Carbetocin at elective Cesarean delivery: a randomized controlled trial to determine the effective dose, part 2. *Can J Anaesth* 2013; 60:1054.
51. Howard TF, Grobman WA. The relationship between timing of postpartum hemorrhage interventions and adverse outcomes. *Am J Obstet Gynecol* 2015; 213:239.e1.
52. Belfort MA, Dildy GA, Garrido J, White GL. Intraluminal pressure in a uterine tamponade balloon is curvilinearly related to the volume of fluid infused. *Am J Perinatol* 2011; 28:659.
53. Spahn DR, Rossaint R. Coagulopathy and blood component transfusion in trauma. *Br J Anaesth* 2005; 95:130.
54. Fuller AJ, Bucklin B. Blood component therapy in obstetrics. *Obstet Gynecol Clin North Am* 2007; 34:443.
55. Charbit B, Mandelbrot L, Samain E, et al. The decrease of fibrinogen is an early predictor of the severity of postpartum hemorrhage. *J Thromb Haemost* 2007; 5:266.
56. Cortet M, Deneux-Tharaux C, Dupont C, et al. Association between fibrinogen level and severity of postpartum haemorrhage: secondary analysis of a prospective trial. *Br J Anaesth* 2012; 108:984.
57. Collins PW, Lilley G, Bruynseels D, et al. Fibrin-based clot formation as an early and rapid biomarker for progression of postpartum hemorrhage: a prospective study. *Blood* 2014; 124:1727.
58. van der Bom JG. Viscoelastometric testing, fibrinogen and transfusion during post-partum haemorrhage. *Br J Anaesth* 2017; 119:352.
59. Gayat E, Resche-Rigon M, Morel O, et al. Predictive factors of advanced interventional procedures in a multicentre severe postpartum haemorrhage study. *Intensive Care Med* 2011; 37:1816.
60. Lousquy R, Morel O, Soyer P, et al. Routine use of abdominopelvic ultrasonography in severe postpartum hemorrhage: retrospective evaluation in 125 patients. *Am J Obstet Gynecol* 2011; 204:232.e1.
61. Elmer J, Wilcox SR, Raja AS. Massive transfusion in traumatic shock. *J Emerg Med* 2013; 44:829.

62. Ho KM, Leonard AD. Concentration-dependent effect of hypocalcaemia on mortality of patients with critical bleeding requiring massive transfusion: a cohort study. *Anaesth Intensive Care* 2011; 39:46.
63. Mount DB, Zandi-Nejad K. Disorders of potassium balance. In: Brenner and Rector's *The Kidney*, 8th ed, Brenner BM (Ed), WB Saunders Co, Philadelphia 2008. p.547.
64. Burtelow M, Riley E, Druzin M, et al. How we treat: management of life-threatening primary postpartum hemorrhage with a standardized massive transfusion protocol. *Transfusion* 2007; 47:1564.
65. Gonzalez EA, Moore FA, Holcomb JB, et al. Fresh frozen plasma should be given earlier to patients requiring massive transfusion. *J Trauma* 2007; 62:112.
66. Holcomb JB, Jenkins D, Rhee P, et al. Damage control resuscitation: directly addressing the early coagulopathy of trauma. *J Trauma* 2007; 62:307.
67. Ketchum L, Hess JR, Hiippala S. Indications for early fresh frozen plasma, cryoprecipitate, and platelet transfusion in trauma. *J Trauma* 2006; 60:S51.
68. Davenport R, Curry N, Manson J, et al. Hemostatic effects of fresh frozen plasma may be maximal at red cell ratios of 1:2. *J Trauma* 2011; 70:90.
69. Pasquier P, Gayat E, Rackelboom T, et al. An observational study of the fresh frozen plasma: red blood cell ratio in postpartum hemorrhage. *Anesth Analg* 2013; 116:155.
70. Abdel-Razeq SS, Campbell K, Funai EF, et al. Normative postpartum intraabdominal pressure: potential implications in the diagnosis of abdominal compartment syndrome. *Am J Obstet Gynecol* 2010; 203:149.e1.
71. Geerts WH, Code KI, Jay RM, et al. A prospective study of venous thromboembolism after major trauma. *N Engl J Med* 1994; 331:1601.
72. Pacheco LD, Saade GR, Gei AF, Hankins GD. Cutting-edge advances in the medical management of obstetrical hemorrhage. *Am J Obstet Gynecol* 2011; 205:526.
73. WOMAN Trial Collaborators. Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. *Lancet*. 2017.
74. WOMAN Trial Collaborators. 2017. Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum

haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. *Lancet*. 389(10084):2105-2116. doi: 10.1016/S0140-6736(17)30638-4.

75. D'Alton MD, Rood K, Smid MC, et al. Intrauterine Vacuum-Induced Hemorrhage Control Device for Rapid Treatment of Postpartum Hemorrhage. *Obstet Gynecol* 2020;00:1–10