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Postpartum Hemorrhage

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Course Description:

When will the next postpartum hemorrhage occur for the patient under your care? Postpartum hemorrhage is a phenomenon that will continue to plague labor and delivery units. This module will help you to understand your knowledge then build upon your base to be better prepared for future hemorrhage encounters.

Approximate Time to Complete: 75 minutes

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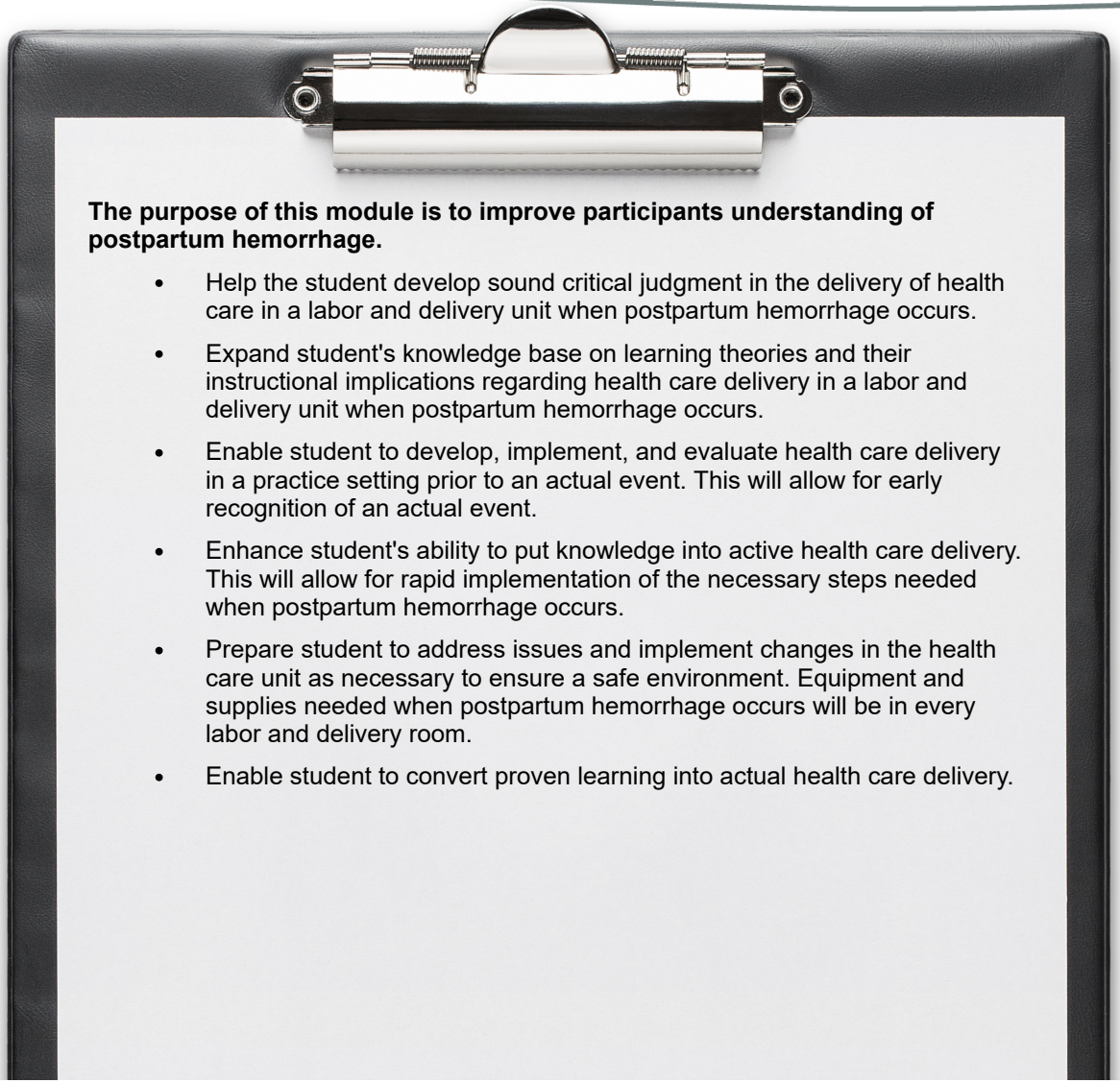

The purpose of this module is to improve participants understanding of postpartum hemorrhage.

- Help the student develop sound critical judgment in the delivery of health care in a labor and delivery unit when postpartum hemorrhage occurs.
- Expand student's knowledge base on learning theories and their instructional implications regarding health care delivery in a labor and delivery unit when postpartum hemorrhage occurs.
- Enable student to develop, implement, and evaluate health care delivery in a practice setting prior to an actual event. This will allow for early recognition of an actual event.
- Enhance student'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 student 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 in every labor and delivery room.
- Enable student to convert proven learning into actual health care delivery.

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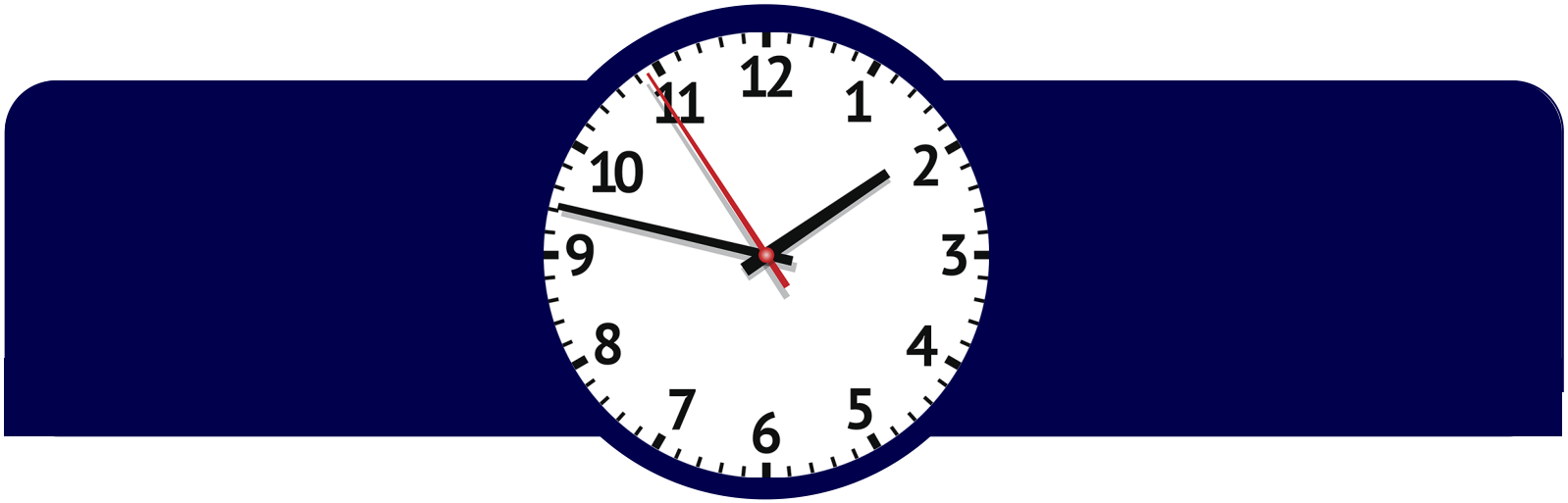
Post Partum Hemorrhage (PPH) is defined as:



Heavy vaginal bleeding is usually noted, but vaginal bleeding may not be abnormal when hemorrhage is internal.

For example, intra-abdominal bleeding related to a cesarean delivery or a broad ligament or vaginal hematoma due to a sulcus laceration.

An international expert panel defined PPH as "active bleeding ≥ 1000 or signs of hypovolemia within the 24 hours following birth that continues despite the use of initial measures including first-line uterotonic agents and uterine massage" [1].

Symptoms related to blood loss with PPH [2]

Blood Loss Percent (mL)	Blood Pressure, mm Hg	Signs and Symptoms
< 500ml vaginal or <1000 ml cesarean	Normal/stable	May have no symptoms or elevated heart rate (HR), no change in blood pressure (BP), pulse pressure or respiratory rate (RR)
> 500 mL vaginal delivery or >1000 mL cesarean delivery or change in vital signs	≤ 85/45 mmHg	HR ≥110 beats/minute, O2 saturation < 95%, RR 20-24, decreased pulse pressure, weakness, and sweating
Continued bleeding with total blood loss remaining < 1500mL	BP continues to be ≤85/45 mmHG	HR > 120 and thread, RR markedly elevated, capillary refill delayed, restlessness, confusion, pallor, and oliguria
> 1500 mL Massive Transfusion protocol and surgical approach to control bleeding	unstable systolic and further decreasing BP	HR > 120, lethargy, air hunger, anuria, and collapse

The incidence of PPH varies widely.

A reasonable estimate is PPH occurs in 1.2 percent of all deliveries [3].

A United States National Inpatient sample identified 2 and 3 percent occurrence in 1994 to 2006, followed by a 3 percent occurrence rate in 2012-2013 [4].

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

1. Readiness to respond to an obstetrical hemorrhage.
2. Recognition and prevention measures in place for all patients
3. A multidisciplinary approach to excessive maternal bleeding
4. De-briefing to learn and improve responsiveness.

Click on the image to see the risk factors for PPH.

In a large series, the most common risk factors associated with need for massive transfusion during hospitalization for delivery were:

- Abnormal placentation
- Abruption
- Severe preeclampsia
- Fetal demise [6]

In addition to the risk factors listed above, placenta previa, personal history of previous PPH, obesity, high parity, Asian or Hispanic race, precipitous labor, first stage of labor longer than 24 hours, uterine over-distention, uterine infection, and some drugs, such as antidepressants, have been associated with PPH [7-18].

Undiagnosed bleeding disorders are rarely the cause of PPH; therefore, PPH by itself is not an indicator to screen for inherited bleeding disorders [22].

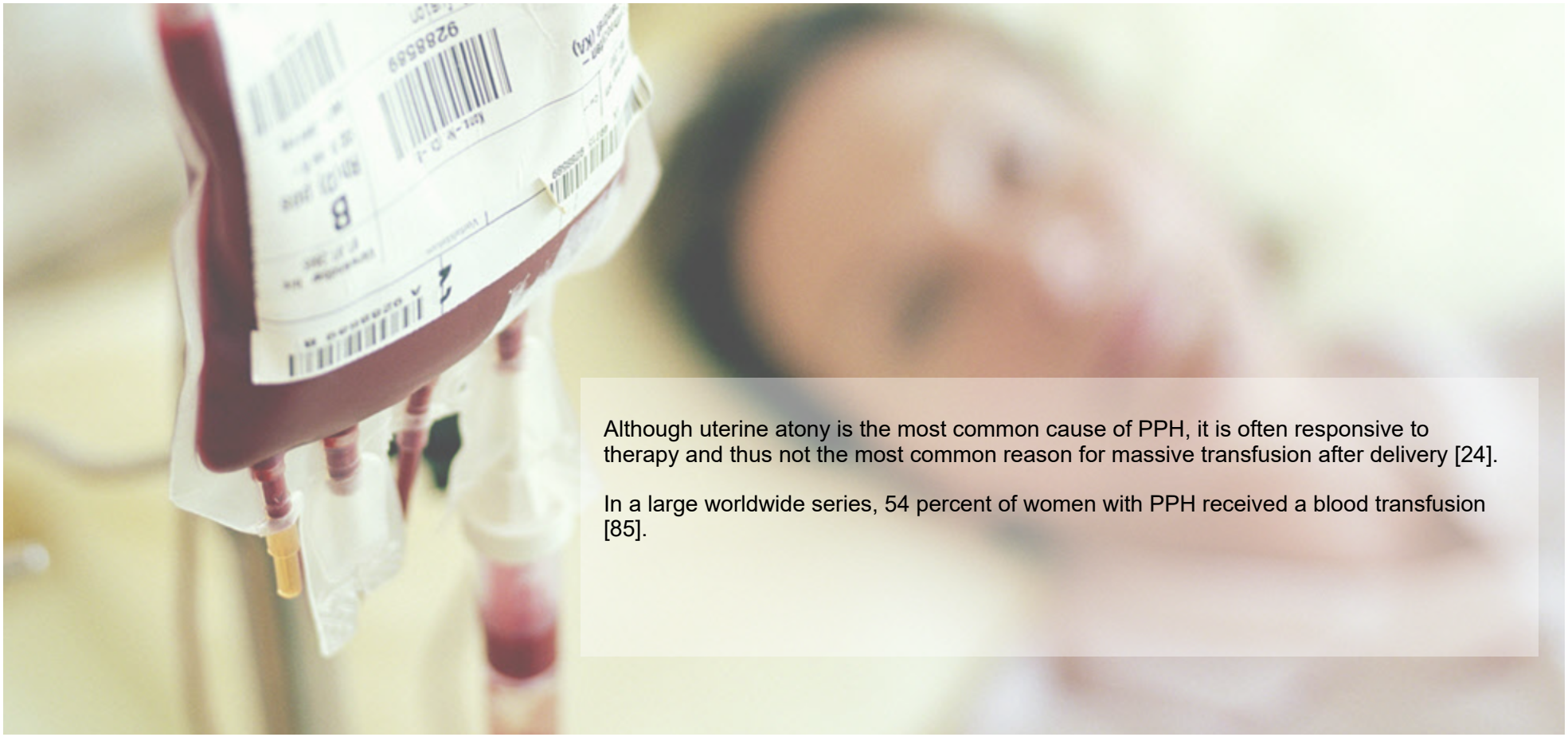
- One of 50 women in a study, who had PPH, had postpartum screening that identified a bleeding disorder.

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 [23].

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 previous placental attachment site.

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

Click on the image to see the types of disturbances.



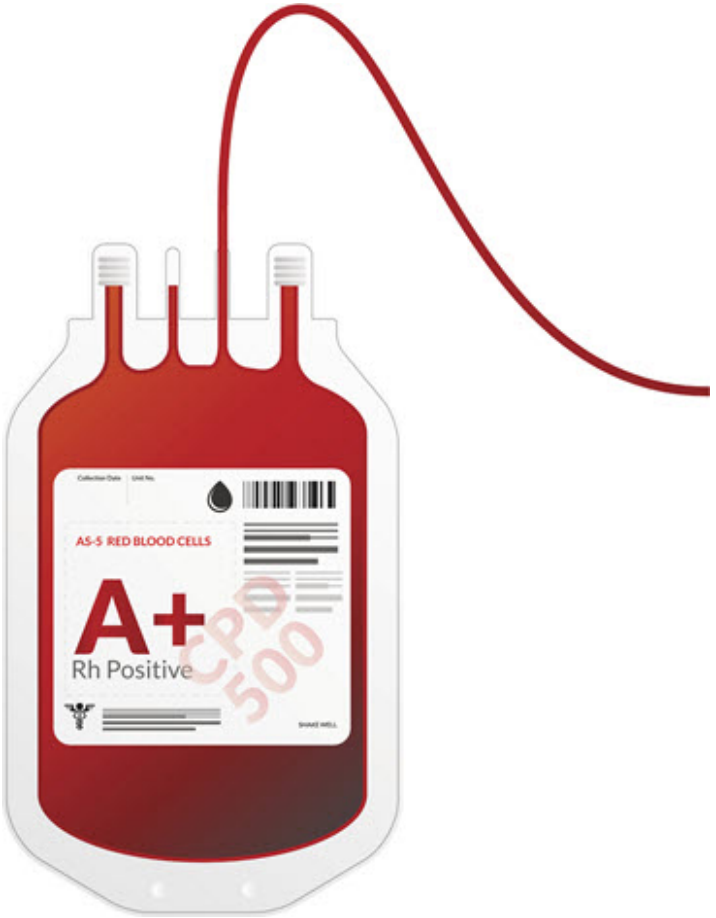
Although uterine atony is the most common cause of PPH, it is often responsive to therapy and thus not the most common reason for massive transfusion after delivery [24].

In a large worldwide series, 54 percent of women with PPH received a blood transfusion [85].

Late pregnancy uterine arterial blood flow is 500-700 mL/min and accounts for approximately 15 percent of cardiac outflow. This increase in blood flow is responsible for 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



Atony	Trauma	Coagulation Defects

Click the tabs to see more information.

To improve outcomes in women who develop PPH, protocol for management should be developed and applied to identify heavy bleeding and hemorrhage before it becomes life threatening [25-27]. Quantifying blood loss (QBL) rather than estimating the blood loss (EBL) is important to help determine the significance of blood loss and maternal health more readily.

The initiation of a PPH protocol was evaluated in an observational study. The findings of the study identified earlier resolution of maternal bleeding before becoming a life threatening event, decreased use of blood products, and a 64 percent reduction in development of DIC [28].

Clinical training programs or simulations encourage a team approach to the early recognition of PPH which may improve outcomes by summoning the appropriate healthcare providers before hypovolemia and uncompensated shock occur.

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

Planning for a PPH event involves review of resources to ensure delivery is in the appropriate level of care facility, adequate staffing, intravenous (IV) access, medication, equipment, blood and blood products is available.

Teamwork and communication failures are responsible for up to 70 percent of obstetric sentinel events [32].

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 [32, 33, 34].

The management of PPH is multifaceted and requires care by several teams within the hospital; obstetricians, midwives, anesthesiologists, nurses, blood bank and laboratory personnel, surgical specialists including vascular and urologists, and interventional radiology [22]. Coordination of these teams is essential in outcomes.

When these teams are summoned to come together in an emergency event, they must work without delay to provide life-saving measures. Delay in healthcare delivery could lead to patient death.

Knowledge, protocols, and simulation training will allow the healthcare team to coordinate their efforts and function well together.

The approach and aggressiveness of interventions will be dependent on the rate and amount of bleeding, vital signs, and laboratory results of complete blood count (CBC), coagulation studies, and level of electrolytes potassium and ionized calcium.

It is important to provide life-saving treatment/measures before the patient terminally declines.

If one treatment option does not adequately control bleeding, the obstetrical provider should promptly select the next treatment option. Non-operative and operative interventions for PPH can be used alone or in combination [36].

Click the target to view the goal.

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

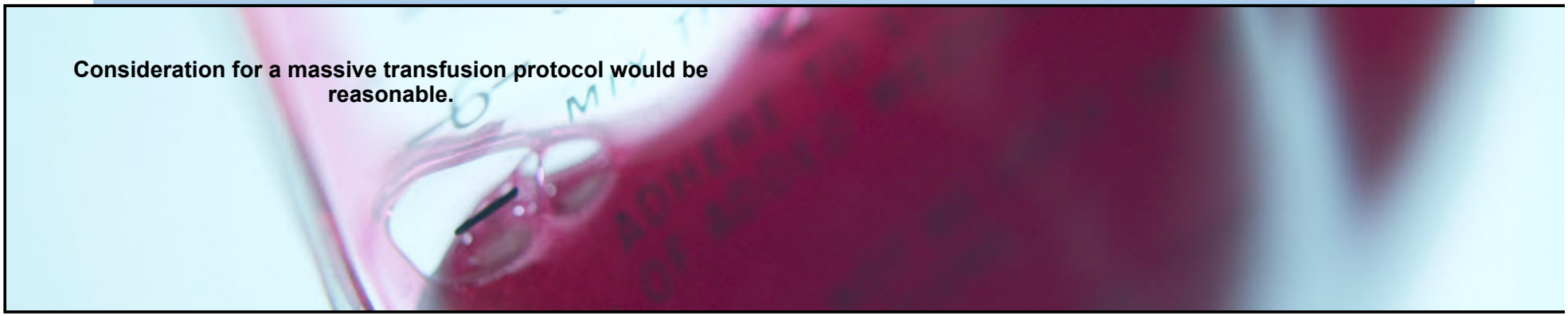
Delayed recognition of condition or uncertainty in treatment may result in further bleeding which may cause dilutional coagulopathy, life-threatening hypovolemia, tissue hypoxia, hypothermia, and acidosis [36].

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

Although there are no data from clinical trials to help guide management of transfusion specifically in PPH, management of blood component therapy is similar to that in other massive hemorrhage [22].

Development of a standardized institutional approach to management of PPH improves outcome.

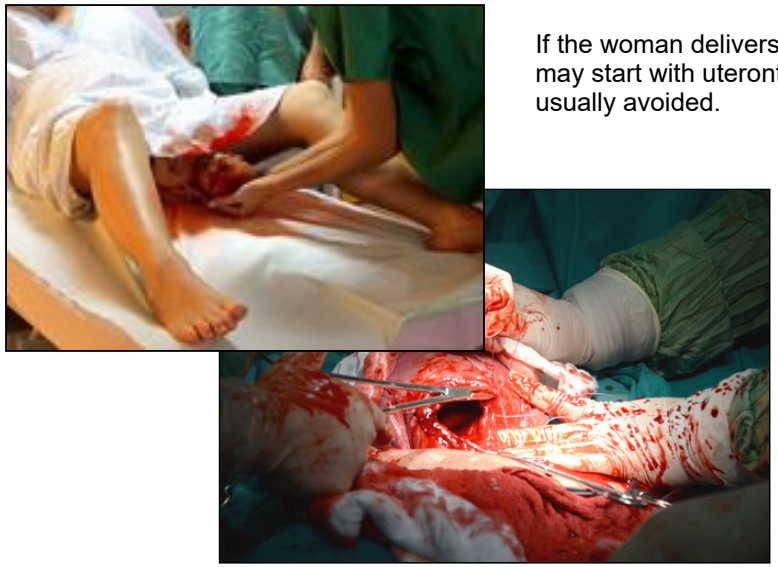
One component of a standardized institutional approach to management of severe PPH is to implement a standardized massive transfusion protocol for the labor and delivery unit.



Consideration for a massive transfusion protocol would be reasonable.

The approach to treatment of PPH differs somewhat depending on the cause and whether hemorrhage occurs after a vaginal birth or after a cesarean delivery.

- Hemorrhaging lacerations caused by trauma will need to be controlled surgically using either the transvaginal or transabdominal approach.
- Coagulation defects will be treated medically with transfusion of blood, blood products or combination of both.
- If hemorrhage is caused by uterine atony, the treatment will be dependent upon the route of delivery.



If the woman delivers vaginally, less invasive treatment should be initiated to control the hemorrhage. This may start with uterontonic drugs and intrauterine balloon tamponade. Using these measures, laparotomy is usually avoided.

The provider will repair vaginal or cervical lacerations. Caution will be used to prevent ureteral ligation when a laceration extends high in the vagina or anteriorly.

- Vaginal hematomas should not be drained unless expanding to reduce likelihood of further blood loss.

Click here to see more information.

Key components of evaluation and treatment

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

- A provider to remain at the bedside for evaluation
- Active management of the third stage of labor with oxytocin and secondary uterotonic drugs such as carboprost, methylergonovine, or misoprostol
- Early IV access so massive transfusion can be administered if needed
- Frequent assessment of BP, HR, RR, peripheral oxygen saturation, and urine output
- Early evaluation of CBC, coagulation studies, potassium, and ionized calcium levels
- Blood cross-match or initiation of a massive transfusion protocol

Initial Interventions

- Women with persistent postpartum vaginal bleeding should be closely monitored, provided good IV access, 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.
- Baseline laboratory studies include hematocrit/hemoglobin, coagulation studies, electrolyte concentrations, and type and crossmatch of blood products.

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

Click the blue squares to see more information.

Oxygenation

- Oxygenation is maximized by administering oxygen (10 to 15 liters/minute) by face mask and transfusion to improve oxygen-carrying capacity and delivery
- An anesthesiologist should assess the patient's airway and breathing, and intubate if indicated
- A high-flow mask with the correct flow rate is important since a low oxygen flow rate may result in carbon dioxide (CO_2) retention and worsen the situation.

Carboprost tromethamine (Hemabate)

Click the droplets to see more information.

Methylergonovine (Methergine)

Methylergonovine 0.2 mg intramuscularly or directly into the myometrium (never intravenously), if:

- No hypertension
- No Raynaud's phenomenon
- No scleroderma

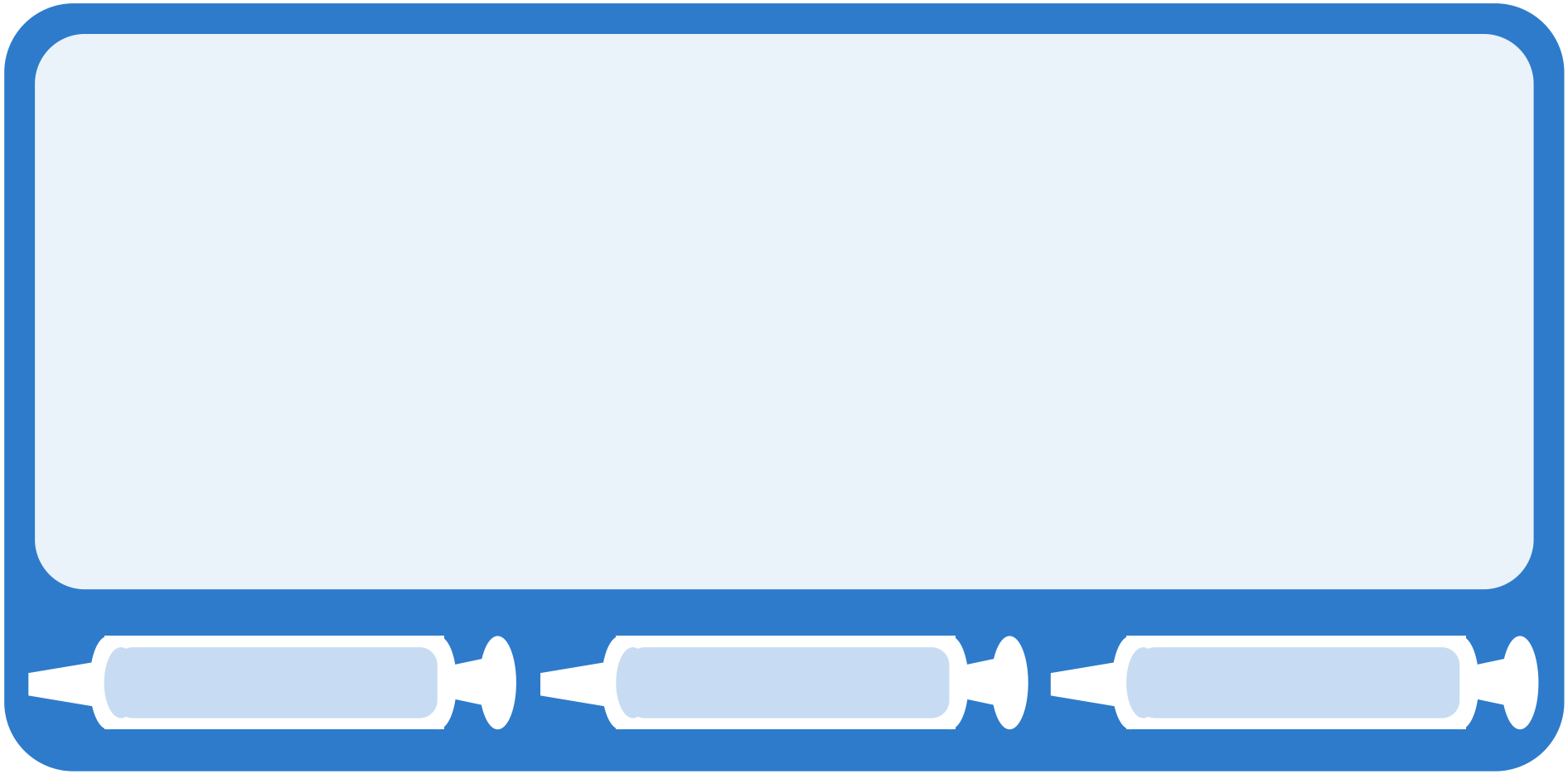
If needed, may be repeated every 2 to 4 hours.

Quickly move on to a different uterotonic agent if there is not a good response following the first dose.

Misoprostol (Cytotec)

Where injectable uterotonics are unavailable or contraindicated Misoprostol (PGE1) 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 [39, 39].



Click each syringe to see more information.

Uterine tamponade

- Uterine tamponade is effective in many 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 because it can be placed quickly, allows some assessment of ongoing hemorrhage, and is probably more effective [59]

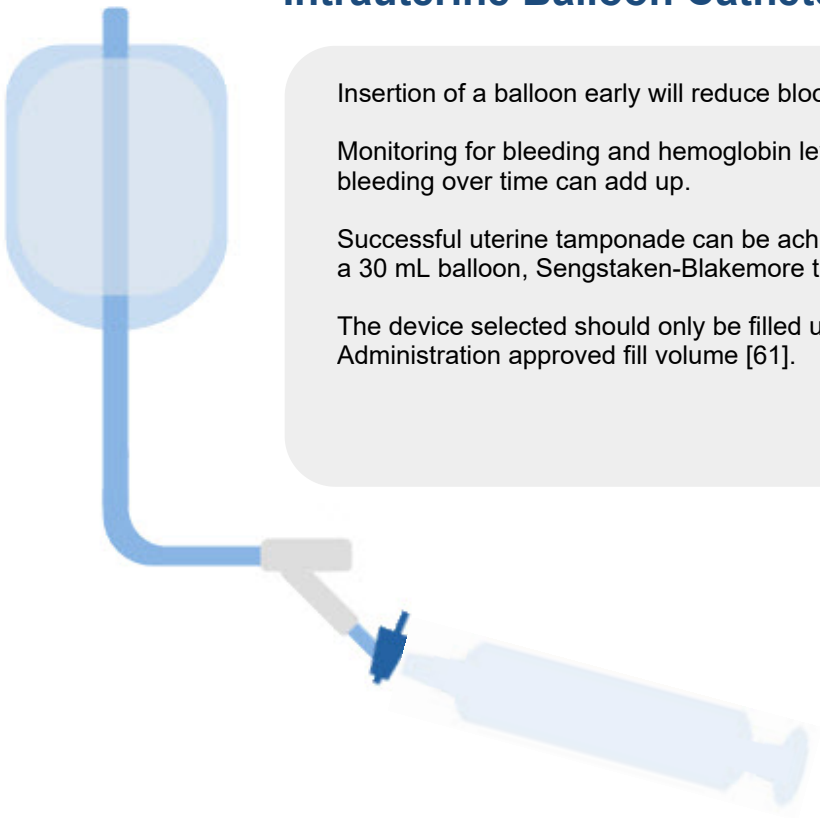
On-going monitoring of hemoglobin, potassium, ionized calcium, urine output, and blood loss is performed regardless of the method used for uterine tamponade [60].

- This is especially important when gauze, such as Kerlix, is used because a moderate amount of blood can be concealed behind the pack.

If gauze packing is not successful in controlling the bleed it is not advised to repack [60].
If successful, the balloon or pack is removed after 24 hours.

Click here to see more information.

Intrauterine Balloon Catheter



Insertion of a balloon early will reduce blood loss while attempting to treat uterine atony [59].

Monitoring for bleeding and hemoglobin levels will evaluate for continued blood loss. A small amount of bleeding over time can add up.

Successful uterine tamponade can be achieved with an improvised tamponade using a #24 Foley catheter, with a 30 mL balloon, Sengstaken-Blakemore tube, or commercially available uterine balloon tamponade devices.

The device selected should only be filled until bleeding is controlled or the United States Food and Drug Administration approved fill volume [61].

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 [61].

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

During treatment with a uterine balloon tamponade, ongoing evaluation of blood loss, blood levels, and outcome of blood replacement is crucial in the event she will require surgery to stabilize her condition.

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

Fluid resuscitation and transfusion

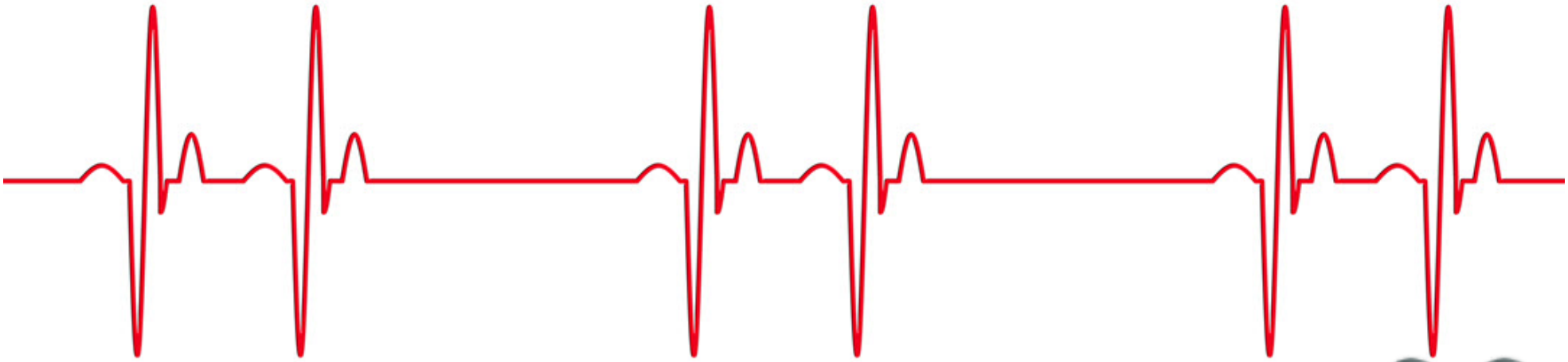
Crystalloid

Click each term to see more information.

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

In the postpartum period, hemoglobin and hematocrit may be poor indicators of acute blood loss since they may not decline immediately after acute bleeding.

Aggressive volume resuscitation with packed red blood cells (PRBC) and other blood products is used for treatment of hypovolemic shock.



To allow time, considering early use of balloon tamponade may be useful to decrease blood loss.

If she has an extremely low fibrinogen level, cryoprecipitate and fibrinogen concentrate are indicated. Fibrinogen level cannot be increased with fresh frozen plasma alone without requiring excessive volume infusion.

A woman with placenta accrete, increta, percreta, or a large uterine rupture may need early hysterectomy to control the hemorrhage.

A hysterectomy should be promptly performed in a woman who is diagnosed or suspected to have DIC to prevent further hemorrhage or death.

However, in a woman with uterine atony, hysterectomy is generally the last resort. These women can usually be managed with medical therapy and less invasive surgical interventions.

If persistent bleeding continues in a hemodynamically stable woman in which capacity of blood replacement has been provided, arterial embolization is an appropriate treatment option.

- This procedure is not to be performed on an unstable patient who has to be transferred to a radiology suite. This patient is managed for uncontrolled PPH with unknown cause.

Generally, an unstable and/or coagulopathic patient should receive bimanual uterine compression, balloon tamponade, aortic compression, transfusion of blood and blood products such as fibrinogen concentrate, prothrombin, and complex concentrations to stabilize for general anesthesia and surgery.

When considering an emergency hysterectomy, the patient should have stable coagulation with adequate IV access for massive transfusion and electrolyte imbalance treatment. Surgery should be in a setting in which treatment can be provided such as management of uncontrolled retroperitoneal hemorrhage and/or myocardial depression.

Baseline laboratory evaluation should include:

- CBC with platelet count
- Type and cross matched for multiple units of PRBC
- Coagulation studies:
- Fibrinogen concentration
- Prothrombin time (PT)
- Activated partial thromboplastin time (aPTT)

In addition, the patient should be typed and crossed for multiple units of packed red blood cells.

Remember, the initial hemoglobin and hematocrit does not reflect the amount of blood loss but upon further evaluation will identify the loss over time.

Click each here to see more information.

Prior to the return of the first set of laboratory studies, a red top tube of 5 mL blood can be observed for clotting.

The patient is likely to have adequate fibrinogen stores if the blood tube clots within 8 to 10 minutes and remains intact.

The patient is likely to have markedly deficient blood clotting factors if the blood in the tube does not clot or the clot dissolves [4].

The fibrinogen level at the time of diagnosis of PPH is predictive of severity and can be used to guide the aggressiveness of management [64-67].

In studies, a fibrinogen level less than 200 mg/dL was predictive of severe PPH. These women needed transfusion of multiple units of blood, blood products, arterial embolization, surgical management of bleeding, or maternal death occurred [64-66, 68].

When PPH occurs, the fibrinogen level is a better predictor of ongoing major blood loss than PT, aPTT, or platelet count [37, 69].

The coagulation panel should be repeated every 30 to 60 minutes until PPH is controlled.

Electrolytes

- In any massive transfusion situation where multiple units of blood are rapidly transfused, electrolytes should be monitored, with prompt treatment of abnormalities
- The most common electrolyte abnormalities are hyperkalemia and low ionized calcium levels
- Both electrolyte disturbances can lead to cardiac arrest or significantly depressed cardiac function that precludes optimal resuscitation

Click each bar to see more information.

Following the transfusion of multiple units of PRBCs, the patient can develop hyperkalemia.

Hyperkalemia occurs at higher levels when the PRBCs are older units. The potassium (K) concentration increase from 2 to approximately 45 mEq/L when a unit of blood ages from 2 to 42 days; therefore, the patient's K level can become dangerously high with massive transfusion.

If time were to allow, hyperkalemia may be prevented by using an in-line K+ filter or using washed units of PRBCs. During a PPH emergency with massive blood transfusion this practice is unlikely.

Continued electrolyte evaluation is necessary for early detection of hyperkalemia.

When hyperkalemia is detected, treatment with 10 to 20 units of regular insulin in 500 mL of 10 percent dextrose IV over 60 minutes can be considered [72].

Repeat bolus doses of regular insulin 10 U may be required [28].

- Another treatment consideration could be 10 U of regular insulin as a bolus dose.
- The action of insulin administration is that it lowers the serum potassium concentration by driving potassium into the cells.
- To monitor for hypoglycemia, the serum glucose should be measured every hour for five to six hours after the administration of insulin.

Massive Transfusion Protocol

Many protocols exist so an institution should implement the one appropriate for their organization.

- Texas Children's Hospital Pavilion for Women
- Stanford University Medical Center: an initial package consisting of 6 units RBCs, 4 units fresh frozen plasma (FFP), and 1 apheresis platelet unit [73]
- Brigham and Women's Hospital: immediate availability of 2 units RBCs and 2 units of FFP followed by 4 units each of RBCs and FFP and thawing of one pool (6 bags) cryoprecipitate
- California Maternal Quality Care Collaborative OB Hemorrhage Protocol: For patients with unstable vital signs, suspicion of DIC, or blood loss >1500 mLs, transfuse pRBC, FFP, and platelets in a ratio of 6:4:1 or 4:4:1. If coagulopathy persists after 8 to 10 units pRBCs and coagulation factor replacement, recombinant activated factor VIIa is a reasonable option

Estimated blood loss (EBL) should occur every 15 to 30 minutes. Laboratory evaluation of blood loss should occur every 30 to 60 minutes. These findings will further guide replacement needs.

To evaluate for dilutional coagulopathy effects of RBC transfusion, monitoring of the PT, aPTT, platelet count or a viscoelastic test should be performed after every 5 to 7 units of RBC.

Blood and blood product replacement should be based on the above stated results.

Transfusing RBCs, platelets, cryoprecipitate, and fresh frozen plasma (FFP) to achieve the following targets are reasonable actions:

- Hemoglobin greater than 7.5 g/dL
- Platelet count greater than 50,000/mm^3
- Fibrinogen greater than 300 mg/dL
- PT less than 1.5 times the control value
- aPTT less than 1.5 times the control value

Stop aggressive massive transfusion of plasma, platelets, cryoprecipitate once hemostasis and hemodynamic stability are achieved.

There are risk associated with further transfusion, such as fluid overload and transfusion complication, once the bleeding is controlled and the patient stable.

The optimal ratio of blood product replacement, RBC:FFP: platelet, is controversial [62, 73. 74].

A sensible and realistic approach may be one unit of FFP for every 2-3 units of RBCs or four units of FFP for every 6 units of RBCs [75-77].

Domestic and foreign trauma centers, a military hospital, and clinical experienced in Iraq and Afghanistan, suggest that until the patient is stable and there is absence of coagulopathy she receive one unit of FFP for every 1-2 units of RBCs [78-81].

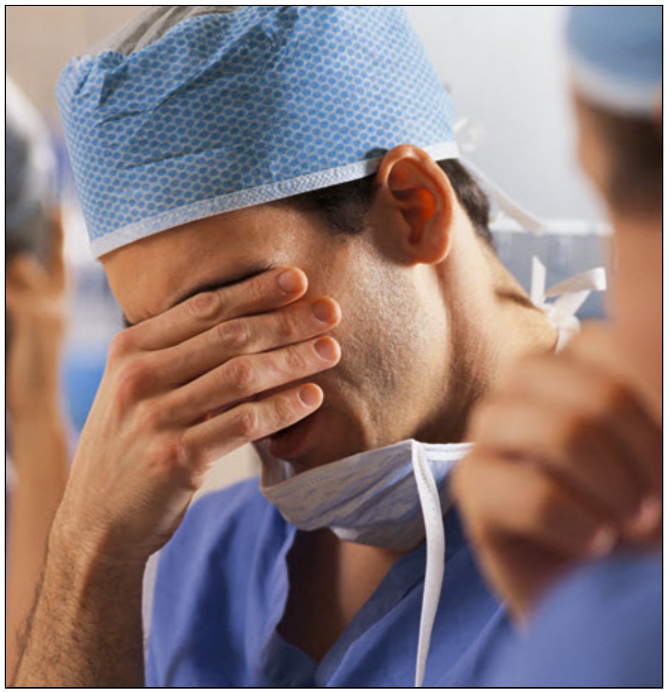
Guidelines for diagnosis, management, and prevention of postpartum hemorrhage have been developed by several organizations and are generally similar and consistent with the approach described in the UpToDate topics.

- California Maternal Quality Care Collaborative (CMQCC) best practices for management of obstetrical hemorrhage (available at **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 (available at **www.rcog.org.uk**)
- World Health Organization (WHO) guideline for prevention and treatment of postpartum haemorrhage (available at **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 (available at **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 (available at **www.health.state.ny.us/professionals/protocols_and_guidelines/maternal_hemorrhage/**)

PPH can cause maternal morbidity and mortality.

This catastrophic event may lead to:

- Death
- Hypovolemic shock and organ failure: renal failure, stroke, myocardial infarction, postpartum hypopituitarism (Sheehan syndrome)
- Fluid overload (pulmonary edema, dilutional coagulopathy)
- Abdominal compartment syndrome
- Anemia
- Transfusion-related complications, including severe electrolyte abnormalities (predominantly hyperkalemia and hypocalcemia).
- 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)



Sheehan syndrome also known as postpartum hypopituitarism

- This is a rare condition but can be life-threatening.
- 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 secretion on 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 following control of hemorrhage and volume replacement she remains hypotensive, she should have evaluation of adrenal function and other hormone deficiencies. This evaluation can be performed 4-6 weeks postpartum but should not be overlooked.

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Congratulations!

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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.

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References

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Links

Title	Link