

Postpartum hemorrhage

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ABSTRACT

Postpartum hemorrhage is the leading cause of maternal morbidity and mortality worldwide, and incidence in the United States, although lower than in some resource-limited countries, remains high. Women of color are at a disproportionate risk of developing a life-threatening postpartum hemorrhage. Risk assessment tools are available but because they lack specificity and sensitivity, all pregnant women are considered at risk. Early identification of and intervention in a hemorrhage requires an interdisciplinary team approach to care and can save the lives of thousands of women each year.

Keywords: postpartum hemorrhage, pregnancy, complications in pregnancy, labor and delivery, uterine atony

Learning objectives

- Understand the risk factors and common causes of postpartum hemorrhage.
- Describe the initial management of postpartum hemorrhage.

A 23-year-old woman is brought to the ED after delivering a baby at home with a doula within the past hour. She is pale and unable to answer questions. Her nightgown is blood-soaked, and her vital signs include a BP of 94/60 mm Hg and pulse of 110 beats/minute.

GENERAL FEATURES

Postpartum hemorrhage is defined as a blood loss of 1,000 mL or more or signs and symptoms of hypovolemia within the first 24 hours after delivery and up to 12 weeks postpartum, regardless of method of delivery (vaginal or

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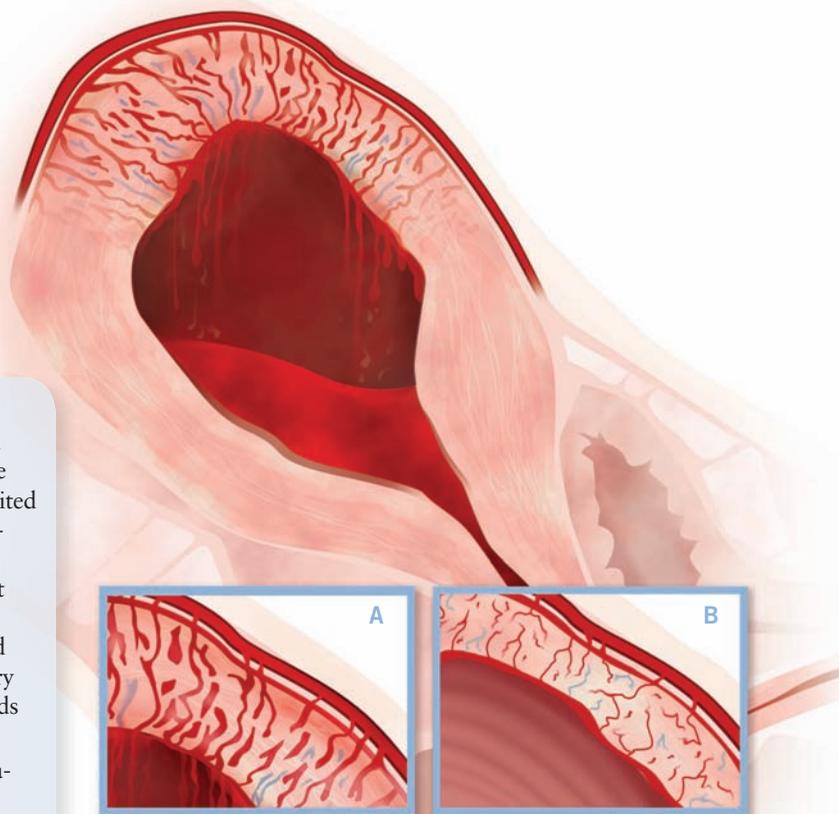


FIGURE 1. Uterine atony (A) is failure of the uterus to contract normally (B) following delivery and is a common cause of postpartum hemorrhage.

cesarean).¹ Early or primary postpartum hemorrhage, the most common type, occurs within the first 24 hours of delivery; secondary postpartum hemorrhage occurs after the first 24 hours. In the United States, maternal mortality has more than doubled over the past 30 years, and postpartum hemorrhage accounts for 11% of these pregnancy-related deaths.² Other common causes of maternal deaths include infection and complications due to cardiovascular events. Racial disparities persist, as black women in the United States have more than a threefold risk of dying due to pregnancy complications compared with white women.^{2,3} Postpartum hemorrhage is the leading cause of maternal mortality globally, causing almost 25% of all pregnancy-related deaths.⁴ Women living in low-income countries are particularly at risk for dying of a postpartum hemorrhage.⁴

CAUSES

The causes of postpartum hemorrhage can be classified by the 4 Ts mnemonic: tone, trauma, tissue, and thrombin (Table 1). Uterine atony is the most common cause of postpartum hemorrhage, causing up to 80% of all cases.¹ Uterine atony is caused by dysfunctional hypocontractility of the myometrium during the immediate puerperium. Uterine atony can develop in women with leiomyomata,

Key points

- Postpartum hemorrhage is the leading cause of maternal morbidity and mortality, particularly in low-income countries.
- Women of color are at higher risk for postpartum hemorrhage than white women.
- Because risk assessment tools only identify 85% of women with postpartum hemorrhage, consider all pregnant women at risk.

multifetal gestations, polyhydramnios, and fetuses who are large for gestational age (fetal macrosomia, defined as a weight of 8 lb, 13 oz [4,000 g] or greater).⁵ Potential pharmacologic causes of uterine atony include magnesium sulfate (used for neuroprotection in patients with preeclampsia with severe features and in patients with eclampsia) and nifedipine (used for hypertension in pregnancy). Chorioamnionitis, placental abruption, and a placenta that implants into the lower uterine segment can cause uterine atony and subsequent postpartum hemorrhage.^{1,6}

Trauma from instrumentation to assist with delivery also can cause postpartum hemorrhage.⁷ Patients who experience prolonged labor, particularly when uterine stimulants such as IV oxytocin and vaginal prostaglandins are used, can develop postpartum hemorrhage.⁸ Uterine rupture can occur in patients undergoing a trial of labor after cesarean delivery, and the risk is significantly increased if the patient has had a low-vertical or high-vertical uterine incision with previous cesarean deliveries.⁸

Placental anomalies also can place a patient at increased risk for postpartum hemorrhage.⁷ These factors include retained placental fragments as well as the spectrums of placenta previa and placenta accreta.⁸ In placenta previa spectrum, the placenta is attached to the uterine wall either partially or completely covering the internal cervical os. Placenta accreta spectrum is a condition in which the placenta abnormally invades the uterine wall; this condition is divided into three categories: accreta, increta, and percreta, depending on the depth of invasion into the myometrium. Placenta percreta, the most invasive type, is characterized by the placenta growing through the uterine wall and potentially invading nearby organs.⁹

Coagulopathies may be another cause of postpartum hemorrhage and can be either inherited or acquired.¹⁰ Von Willebrand disease is one of the more common inherited coagulopathies that can cause postpartum hemorrhage.¹¹ Acquired coagulopathies include HELLP syndrome (hemolysis, elevated liver enzymes, and low platelets) and disseminated intravascular coagulopathy (DIC).¹² Placental abruption, amniotic fluid embolism, sepsis, fetal demise, and HELLP syndrome can cause DIC.¹³

In a patient who presents with an acute disorder of coagulation and postpartum hemorrhage, the two most

TABLE 1. Risk factors for postpartum hemorrhage¹

Medical or surgical history

- Previous postpartum hemorrhage
- Leiomyomata
- Previous cesarean delivery or other uterine instrumentation

Fetal issues

- Multifetal gestation
- Polyhydramnios
- Large-for-gestational-age fetus
- Fetal macrosomia (birthweight greater than 8 lb, 13 oz [4,000 g])

Maternal issues

- Hypertensive disorders of pregnancy
- Anemia
- Inherited coagulopathy such as von Willebrand disease
- Acquired coagulopathy such as HELLP syndrome
- Trial of labor after cesarean delivery
- Prolonged labor
- Induction and augmentation of labor
- Arrest of progress during the second stage of labor
- Prolonged third stage of labor
- Instrumentation during delivery (forceps)

Placental/uterine issues

- Placental abruption
- Placenta previa
- Retained placenta
- Chorioamnionitis
- Acute uterine inversion
- Subinvolution of the uterus

common causes are placental abruption and amniotic fluid embolism.¹³ Patients with placental abruption will have pelvic pain. Vaginal bleeding may not always be present if bleeding is intrauterine, and if the patient is being monitored with a tocodynamometer, uterine tachysystole (rapid contractions) will be evident. Patients with an amniotic fluid embolism develop rapid respiratory and hemodynamic compromise and DIC. Morbidity and mortality from an amniotic fluid embolism remain high.¹⁴

Other common primary causes include cervical and vaginal lacerations and uterine inversion.⁸ Uterine inversion is a medical emergency and requires prompt attention by a trained healthcare provider. Uterine inversion occurs when the fundus of the uterus is pulled into the uterine cavity causing the uterus to be turned inside-out.¹⁵ The inversion may only be palpable in the vaginal canal or it can protrude through the introitus. A common secondary cause is subinvolution of the uterus or placental site.¹ Subinvolution occurs when the uterus does not return to its normal size and can be caused by retained placental fragments or endometritis.

RISK FACTORS

Risk factors for postpartum hemorrhage include being a woman of color, a previous history of postpartum hemor-

rhage, hematocrit less than 30%, retained placenta, arrest of progress during the second stage of labor, a prolonged third stage of labor (defined as more than 30 minutes for the placenta to separate from the uterus), fetal macrosomia, hypertensive disorders, and induction and augmentation of labor.^{3,8} A general classification of risk factors may be organized according to the following classifications: medical or surgical history, fetal issues, maternal issues, and placental/uterine issues (Table 1). However, many women develop postpartum hemorrhage without any known risk factors.

CLINICAL ASSESSMENT

Although risk assessment tools can help identify women who may experience a postpartum hemorrhage, they may only identify up to 85% of women with postpartum hemorrhage. As such, all pregnant women should be considered at risk for postpartum hemorrhage.¹

The initial assessment must focus on the patient's hemodynamic status; intervene immediately if the patient has signs of hemodynamic compromise. When a postpartum hemorrhage is suspected, emergency intervention with a rapid response team to ensure coordinated care and to prevent cardiovascular collapse is essential. In addition, ascertain if the placenta has been delivered. If the placenta has been delivered, examine it for missing fragments. If the placenta is still intact, use controlled cord traction to deliver it. Physical assessment of the patient may reveal a boggy uterus. The fundus may be palpable above the level of the umbilicus.

Visual estimation of blood loss and the weighing of blood-soaked products have historically been used when caring for women during labor and delivery. However, visual estimation is associated with a significant underestimation of actual blood loss and should only be used when other objective measures are not available.¹⁶ Calibrated drapes have been developed to help objectively quantify blood loss and are readily available at most US hospitals. The American College of Obstetricians and Gynecologists recently published recommendations on using tools to accurately quantify blood loss and underscoring the importance of objective measurements to help reduce morbidity and mortality.¹⁶

Heart rate and BP are the two most commonly used vital signs to help diagnose a hemorrhage, but they lack specificity.¹⁷ In addition, women who are experiencing a hemorrhage may not develop tachycardia or hypotension until significant blood loss (greater than 1,000 mL) has occurred. Signs of a hemorrhage include heart rate greater than 110 beats/minute, BP of 85/45 mm Hg or less, SpO₂ less than 95%, delayed capillary refill, decreased urine output, and pallor. Often these changes will not be apparent until the patient develops shock.¹⁷ The ratio of the heart rate over the systolic BP is called the shock index and may be helpful in assessing patients with significant bleeding events. A shock index greater than 1 requires immediate management.^{6,17}

TABLE 2. Laboratory testing in postpartum hemorrhage

| Test | Clinical correlation |
|---------------------------|---|
| Blood urea nitrogen | <ul style="list-style-type: none"> Elevated in renal failure Elevation after resuscitation could indicate hemolysis |
| D-dimer | Elevated in hemorrhage |
| Fibrinogen | <ul style="list-style-type: none"> Low or normal if coagulopathy is present Very low in amniotic fluid embolism and placental abruption |
| Hemoglobin and hematocrit | May not initially be low in acute hemorrhage |
| Liver enzymes | Elevated in HELLP syndrome |
| Lactate | Elevated in septic shock |
| Serum calcium | Can be low in hemorrhage |
| Serum magnesium | Can be low in hemorrhage |
| Serum potassium | Can be low in hemorrhage |

TABLE 3. Pharmacologic agents used in the prevention and treatment of postpartum hemorrhage

| Drug | Use and dosage | Notes |
|------------------|---|---|
| Oxytocin | <ul style="list-style-type: none"> Prevention and treatment 10 to 40 units IV or 10 units intramyometrially | <ul style="list-style-type: none"> Used in the third stage of labor to help prevent postpartum hemorrhage, and used first-line in treatment. Can be administered IV or intramyometrially. |
| Tranexamic acid | <ul style="list-style-type: none"> Treatment 1 g IV | Must be used early in the treatment protocol. |
| Methylergonovine | <ul style="list-style-type: none"> Treatment 0.2 mg | <ul style="list-style-type: none"> Contraindicated in patients with hypertensive disorders or cardiovascular disease. Can be given IM, IV, or intramyometrially. |
| Carboprost | <ul style="list-style-type: none"> Treatment 0.25 mg | <ul style="list-style-type: none"> Can be given IM or intramyometrially. Contraindicated in patients with asthma. |
| Misoprostol | <ul style="list-style-type: none"> Treatment 600 to 1,000 mcg | <ul style="list-style-type: none"> Can be given orally, sublingually, or rectally as a suppository. |

Other signs and symptoms associated with hypovolemia include lightheadedness, palpitations, confusion, syncope, fatigue, air hunger, and diaphoresis.

DIAGNOSIS

The diagnosis of postpartum hemorrhage is based on the patient's physical assessment and the clinician's clinical acumen, because many of the objective measures independently lack specificity and sensitivity. A baseline complete blood cell count, coagulation studies (including fibrinogen), and blood type and antibody screen, if not already known, should be ordered. Hemoglobin and hematocrit levels are not generally useful in the initial diagnosis unless a previous hemoglobin or hematocrit is available for comparison. Order a metabolic panel to assess for electrolyte abnormalities and renal compromise; also order D-dimer, fibrinogen, liver enzymes, and serum lactate levels (Table 2).

Identifying the probable cause of hemorrhage is imperative; thoroughly inspect and palpate the patient's perineum, vaginal vault, and uterine cavity. Ultrasonography is a quick and effective tool that can be used to assess the pelvis for retained placenta, hematomas, or peritoneal blood.

TREATMENT

Early diagnosis and intervention are essential in reducing mortality from postpartum hemorrhage and a coordinated team effort must be used. Simultaneously, clinicians must manage the patient's hypovolemia and shock and identify the cause of the hemorrhage. If the patient has a massive hemorrhage, notify the rapid response team and use life support measures.

Two essential initial interventions for postpartum hemorrhage are oxytocin and uterine massage. Bimanual compression of the uterus also can be performed. Ensure that the patient has an indwelling urinary catheter to monitor urinary output, because anuria is associated with massive hemorrhage. Implement resuscitation measures including elevating the patient's legs, administering oxygen, and infusing 0.9% sodium chloride solution or Ringer lactate via a 14-gauge catheter.

Early administration of the antifibrinolytic tranexamic acid has been shown to reduce maternal mortality from postpartum hemorrhage.^{1,18} When hemorrhage occurs, tranexamic acid should be given within 3 hours of delivery. Rapid transfusion of 2 to 4 units of packed red blood cells is recommended.¹ Type-specific is preferred, but type O Rh-negative blood may be used. Monitor for a coagulopathy; 4 units of fresh frozen plasma are initially used to help correct a coagulation defect. If the patient's fibrinogen levels are significantly decreased, administer cryoprecipitate. If significant thrombocytopenia persists, administer platelet concentrates. The usual ratio of packed red blood cells to fresh frozen plasma to platelets is 1:1:1.

Further management is undertaken depending on the cause of the hemorrhage.¹⁹ Uterine atony, the most common

cause of postpartum hemorrhage, is managed as described above, with the addition of ergonovine, carboprost, and misoprostol (Table 3).¹ Carboprost is contraindicated in patients with a history of asthma, and hypertension is a contraindication for methylergonovine.¹ Other interventions for uterine atony include intrauterine tamponade with a uterine balloon or gauze, B-Lynch suturing of the uterus, arterial ligation, and uterine artery embolization.¹⁹ Definitive surgical management with hysterectomy may be necessary. The management of other causes of postpartum hemorrhage is beyond the scope of this article.

CONCLUSION

Identifying patients at risk of developing postpartum hemorrhage is advised, but all pregnant women should be considered at risk, as many without known risk factors will develop postpartum hemorrhage. Early identification and intervention are critical to help reduce morbidity and mortality. The use of oxytocin, uterine massage, and controlled umbilical cord traction are three crucial components of the active management of the third stage of labor and may help reduce the incidence of postpartum hemorrhage. Using a team-based approach to the care of a laboring woman and implementing hospital-specific protocols will help reduce the mortality associated with postpartum hemorrhage. **JAAPA**

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