

PPH · Postpartum Hemorrhage

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THE STORY IN ONE SENTENCE

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“After the baby is born, the uterus should clamp down tight like a fist to stop bleeding from the spot where the placenta was stuck. When it does not squeeze hard enough, blood pours out fast. Most postpartum bleeding (hemorrhage) comes from a soft, baggy uterus (atony). Check the 4 Ts: Tone (uterus not squeezing), Tissue (placenta pieces left inside), Trauma (tears in the cervix or vagina), and Thrombin (clotting problems). First, massage the uterus and give medicines (oxytocin, then methergine or misoprostol) to make it contract. If that fails, try a balloon inside the uterus to press on the bleeding, then move to surgery. Replace blood fast with transfusions and fluids to keep mom's heart and brain alive.”

Normal anatomy — the body's job

After delivery, the uterus clamps down tight like a fist, the placenta peels off and comes out, and the open blood vessels where the placenta was stuck close off so bleeding stops. This squeeze-and-seal is called hemostasis, and it is the normal job that keeps blood loss under 500 mL for vaginal birth and under 1000 mL for cesarean birth.

BODY'S JOB

The uterus is a thick muscle bag that holds the baby and placenta during pregnancy. After the baby is born, the uterus must squeeze down hard to push out the placenta and pinch shut the spiral arteries (the blood vessels that fed the placenta). When the muscle fibers contract, they act like living clamps around those vessels, stopping the bleeding. The blood itself also starts to clot at the open spots, forming plugs. This double system — muscle squeeze plus clot — is what prevents bleeding (hemorrhage).

1. Baby is born, and the uterus is still stretched and soft.
2. The uterus begins to contract (squeeze) in waves, peeling the placenta off the uterine wall.

3. The placenta slides down and is delivered, leaving behind open blood vessels where it was attached.
4. The uterus continues to contract hard, clamping down on those vessels like a fist closing tight.
5. Blood clotting factors in mom's blood form plugs at the open spots, sealing them off.
6. Bleeding slows to a normal trickle, and the uterus stays firm and small.

What breaks

The uterus stays soft and baggy instead of squeezing down, so the open blood vessels keep pouring out blood. This is called uterine atony, and it causes most postpartum bleeding (hemorrhage). Other causes include tears in the vagina or cervix from delivery, pieces of placenta or membranes left stuck inside the uterus, or problems with the blood's clotting system that stop plugs from forming.

CLINICAL TERM

Postpartum bleeding (hemorrhage) is cumulative blood loss greater than or equal to 1000 mL or blood loss with signs of hypovolemia (low blood pressure, fast heart rate, dizziness, weakness) within 24 hours of birth. The four main causes are remembered as the 4 Ts: Tone (uterine atony, accounting for about 70–80% of cases), Trauma (lacerations of the cervix, vagina, or perineum), Tissue (retained placenta, placenta accreta, or retained clot), and Thrombin (coagulopathy from conditions like disseminated intravascular coagulation, dilutional impaired blood clotting (coagulopathy), or inherited bleeding disorders). Atony means the myometrium (uterine muscle) fails to contract adequately after delivery, leaving the spiral arteries open and bleeding. Risk factors for atony include overdistended uterus (twins, polyhydramnios, macrosomia), prolonged labor, rapid labor, chorioamnionitis, use of magnesium sulfate or general anesthesia, and multiparity.

How the body compensates

When mom starts losing blood, her body tries to keep oxygen reaching the brain and heart by speeding up the heart, squeezing smaller blood vessels tight, and shifting blood away from the skin and gut. For the first 1000–1500 mL of blood loss, her blood pressure may stay normal because of these tricks — but this hides how bad things really are. Once she loses about 30–40% of her blood volume (roughly 1500–2000 mL), the system crashes suddenly: blood pressure drops, heart rate climbs above 120, and shock sets in. The job is to recognize

bleeding (hemorrhage) early — before the crash — by watching the bleeding amount, checking for a soft uterus, and noticing early signs like rising heart rate, pale skin, and anxiety.

1. Heart rate rises (tachycardia) as the heart tries to pump the smaller blood volume faster to keep oxygen delivery steady.
2. Peripheral blood vessels squeeze tight (vasoconstriction), shunting blood away from skin, hands, and feet toward the core organs — mom's skin looks pale, cool, and sweaty.
3. Blood pressure may stay near normal for the first 1000–1500 mL of loss because the heart is beating faster and vessels are tight — this is compensated shock, and it can fool the team into thinking she is stable.
4. Mom feels anxious, dizzy, or thirsty as her brain senses the blood volume dropping.
5. Once blood loss reaches about 30–40% of total volume (around 1500–2000 mL in an average adult), the compensation fails: blood pressure drops sharply (hypotension), heart rate climbs above 120, urine output falls, and confusion or loss of consciousness follows — this is decompensated shock.
6. If bleeding continues without transfusion, organs stop getting enough oxygen (hypoxia), lactic acid builds up, and multi-organ failure or death can follow within minutes to hours.
7. A late, rare complication is Sheehan syndrome: if mom goes into severe shock, the pituitary gland (a pea-sized hormone control center at the base of the brain) does not get enough blood, dies, and stops making hormones — months later she cannot breastfeed, has no period, and feels tired all the time.
8. Disseminated intravascular coagulation (DIC) can also develop: the body uses up all its clotting factors trying to stop the bleeding, then switches to bleeding everywhere (clotting and bleeding at the same time) because no factors are left.

Domino effect

1. The uterus stays soft and does not squeeze down after the placenta comes out. — Without muscle contraction, the spiral arteries (the blood vessels that fed the placenta) stay wide open like garden hoses, and blood pours freely into the uterine cavity and out through the vagina — this is uterine atony, the most common cause.
2. Blood loss climbs past 1000 mL fast, sometimes in just minutes. — The placental bed has huge, high-pressure vessels, so when they are not clamped by muscle, the bleeding is heavy and continuous — like a faucet left wide open.
3. Mom's heart starts racing (tachycardia) and her blood pressure may still look okay at first. — Her body is in compensated shock: the heart beats faster and blood vessels squeeze tight to keep blood reaching the brain and heart, so vital signs hide how much blood she has really lost — this middle stage is dangerous because it can fool the team.

4. If bleeding continues, blood pressure suddenly drops, heart rate climbs above 120, skin turns cold and pale, and mom feels dizzy or confused. — She has crossed into decompensated shock: the body can no longer keep up, and there is not enough blood left to fill the vessels and deliver oxygen to organs — this is the crash point.
5. Without fast transfusion and source control, organs begin to fail — kidneys stop making urine, brain function drops, and the heart may not have enough blood to pump. — When oxygen delivery falls below the critical threshold, cells switch to anaerobic metabolism (burning fuel without oxygen), lactic acid piles up, and tissue starts to die — this spiral leads to multi-organ failure and death.
6. If shock is severe and prolonged, the pituitary gland (the brain's hormone control center) can die from lack of blood, causing Sheehan syndrome months later. — The pituitary sits in a bony cup at the base of the skull and swells during pregnancy, making it extra vulnerable when blood pressure crashes — once it dies, mom loses the hormones that control breastfeeding, menstruation, and energy.
7. Massive bleeding can also trigger disseminated intravascular coagulation (DIC), where the body uses up all its clotting factors and then bleeds from everywhere. — The body tries so hard to clot the open vessels that it exhausts its supply of clotting proteins and platelets — then it cannot form clots anywhere, and bleeding becomes unstoppable without replacement of factors through transfusion.
8. The only way to stop the spiral is to make the uterus contract (with massage and medicines like oxytocin), replace lost blood with transfusions, and if needed, use a balloon or surgery to physically stop the bleeding. — Treating shock with fluids alone will not work if the source keeps pouring — you must close the faucet (stop the bleeding) and refill the tank (replace blood volume) at the same time, or mom will die from bleeding-driven (hemorrhagic) shock.

Symptoms · what the patient feels, and why

- Heavy bleeding that soaks one pad in under an hour or big clots the size of a lemon or larger: After delivery, if the uterus (the womb) stays soft and floppy instead of clamping down hard, the raw wound inside where the placenta was attached keeps bleeding freely because open blood vessels cannot seal off.
- A soft, puffy, or "boggy" uterus when the doctor or nurse presses on the belly: Normally the uterus muscle bundles squeeze down tight right after birth to pinch shut the torn vessels; when those muscle fibers stay relaxed (called uterine atony), the uterus feels soft and does not form a firm ball, so bleeding continues.
- Bright red blood that keeps flowing in a steady stream: Fresh arterial blood pouring from the placenta site or from a tear in the cervix, vagina, or perineum has not had time to clot, so it looks bright red and flows continuously rather than oozing slowly.

- **Fast heartbeat (tachycardia):** As blood volume drops, the heart tries to pump faster to keep enough oxygen reaching the brain and vital organs, compensating for the lost blood like a water pump working harder when the tank runs low.
- **Low blood pressure (hypotension):** Less blood in the body means less pressure in the blood vessels, the same way a garden hose loses pressure when you drain water out of it; if bleeding continues, blood pressure can fall dangerously low.
- **Feeling dizzy, weak, or light-headed:** The brain is not getting enough oxygen because there is less blood to carry it; this signals that blood volume has dropped and the body is struggling to keep up.
- **Pale, cool, or clammy skin:** The body shunts blood away from the skin and toward the core organs to protect the heart and brain; this survival response makes the skin look pale and feel cold and sweaty.
- **Visible tears in the vagina, cervix, or perineum (the area between the vagina and anus):** During delivery, especially if the baby is large or comes out fast, the tissues can rip; torn blood vessels in these wounds bleed steadily until they are stitched closed.
- **Retained placenta or pieces of placenta still inside the uterus:** If the entire placenta does not deliver or bits remain stuck to the uterine wall, the uterus cannot contract fully around the leftover tissue, leaving vessels open and bleeding.

Focused exam

- **Measure vaginal blood loss** — soak pads, weigh them, or use a calibrated drape to count exactly how much came out: PPH is defined as blood loss $\geq 1,000$ mL after vaginal birth or ≥ 500 mL after cesarean birth (ACOG 2017). You cannot treat what you do not measure. The amount tells you how fast the body is bleeding and how much danger the patient is in right now.
- **Palpate the uterus through the abdomen** — soft, boggy, high above the belly button means the uterus is not squeezing down: A uterus that refuses to contract (called uterine atony) is the cause of 70–80% of all PPH. The muscle fibers in the uterine wall normally squeeze tight like a fist after birth to clamp shut the open blood vessels where the placenta was attached. If the uterus is soft and boggy, those vessels stay open and pour blood. Massage the uterus by hand and feel if it gets hard — that tells you if uterotonic medicine will work.
- **Check heart rate and blood pressure** — fast heart (> 100 bpm) and low blood pressure (systolic < 90 mmHg) mean bleeding-driven (hemorrhagic) shock from blood loss: PPH causes hypovolemia (the blood volume in the body drops). The heart speeds up (tachycardia) and pressure drops (hypotension) to try to keep enough blood flowing to the brain and heart. These changes are the body's alarm that blood loss is severe and urgent.

- Inspect the cervix, vagina, and perineum under good light — long tears or deep lacerations mean bleeding from rips in tissue, not from the uterus: Genital tract trauma (tears) is the second most common cause of PPH. If you see a tear and the uterus is firm, the tear is your target to repair with sutures. If the uterus is soft, fix atony first because it kills faster.
- Inspect the placenta — missing pieces, ragged edges, or incomplete delivery mean retained placental fragments stuck inside: Retained placenta or placental fragments prevent the uterus from contracting fully because tissue still stuck to the uterine wall keeps the muscle from closing tight. Manual removal or curettage scoops out the pieces so the uterus can squeeze down and stop bleeding.
- Assess mental status, skin color, capillary refill — pale skin, cold hands, confusion, or restlessness mean severe blood loss and shock: PPH can kill within minutes to hours. Pale skin, cold extremities, and altered mental status mean the brain and organs are not getting enough oxygen-rich blood. This is bleeding-driven (hemorrhagic) shock — you are in a race against the clock.
- Look for oozing from IV sites, gums, or widespread pinpoint bleeding spots (petechiae) — bleeding from multiple sites at once signals DIC (disseminated intravascular coagulation): Severe PPH can trigger DIC, a clotting system collapse where clots form everywhere and use up all clotting factors, then bleeding happens everywhere at once. This is a sign you need fibrinogen concentrate or cryoprecipitate, fresh frozen plasma, and platelets fast.

Diagnostics · every test answers a question

- Complete blood count (CBC) with hemoglobin and hematocrit → How much red blood cell mass has the patient lost?
- Type and crossmatch (blood bank hold) → What is the patient's blood type, and is crossmatched blood ready if transfusion is needed?
- Prothrombin time (PT), partial thromboplastin time (PTT), international normalized ratio (INR) → Are the clotting pathways working, or is impaired blood clotting (coagulopathy) (clotting failure) present?
- Fibrinogen level → Is there enough fibrinogen (the protein that forms blood clots) left in the blood?
- Platelet count → Are there enough platelets (tiny cell fragments that plug holes in blood vessels) to form clots?
- Bedside clot observation test (if lab unavailable) → Can the blood clot at all right now?
- Arterial blood gas (ABG) or venous blood gas (VBG) with lactate → Is the body in shock with poor oxygen delivery to tissues?

Treatment logic

- Bimanual uterine massage + IV oxytocin 10 units slow push or 10–40 units/L continuous infusion → Your hand compresses the uterus like a fist from outside (and sometimes inside through the vagina), and oxytocin binds to receptors on uterine smooth muscle cells to trigger strong, sustained contractions. The muscle fibers squeeze tight and clamp shut the spiral arteries (the open blood vessels where the placenta was attached). This stops bleeding at the source. Uterine atony is the cause of 70–80% of PPH, so this is the most common fix.
- IV tranexamic acid (TXA) 1 gram over 10 minutes, given within 3 hours of birth → TXA blocks plasmin (the enzyme that breaks down fibrin clots), so clots stay glued in place and do not dissolve too early. This buys time for the uterus to contract and for you to replace lost blood. The WOMAN trial (2017) showed TXA reduces death from PPH by 19% if given within 3 hours.
- Massive transfusion protocol (MTP): packed red blood cells, fresh frozen plasma, platelets in 1:1:1 ratio → You are replacing the whole blood the mother lost — red cells to carry oxygen, plasma to restore clotting factors (fibrinogen, prothrombin, and others), and platelets to plug bleeding vessel walls. This keeps her heart pumping something with oxygen in it and prevents impaired blood clotting (coagulopathy) from dilution and consumption. The 1:1:1 ratio mimics whole blood and prevents the spiral of bleeding → clotting failure → more bleeding.
- Add methylergonovine 0.2 mg IM or carboprost 250 µg IM if oxytocin alone does not work → Methylergonovine (an ergot alkaloid) and carboprost (a prostaglandin F2-alpha analog) both trigger strong uterine contractions through different receptor pathways than oxytocin. This gives you a second and third chemical squeeze when oxytocin is not enough. Methylergonovine is contraindicated in high blood pressure (hypertension) (it raises blood pressure). Carboprost is contraindicated in asthma (it can trigger bronchospasm).
- Manual exploration of the uterus to remove retained placental fragments; repair all lacerations with sutures under good light → Manual removal scoops out any placental tissue still stuck to the uterine wall so the muscle can contract fully and close off bleeding vessels. Suturing tears closes the ripped blood vessels in the cervix, vagina, or perineum so blood stops leaking from those sites.
- Intrauterine balloon tamponade (Bakri balloon) inflated with 300–500 mL sterile saline → The balloon presses against the entire inner surface of the uterus like a tight sponge, applying direct pressure to all bleeding points at once. This gives the uterine muscle time to strengthen its contraction and closes off small bleeding vessels by compression. Success rate is 80–90% when placed correctly.

- Uterine artery embolization (interventional radiology) or surgical ligation of uterine arteries; emergency hysterectomy if all else fails → Embolization or ligation cuts off the main blood supply (uterine arteries) feeding the uterus, so no more blood can pour out. Hysterectomy removes the bleeding uterus entirely when it cannot be saved. These are life-saving when all medical and balloon measures fail.

Medications

Oxytocin · Uterotonic (drug that makes the uterus squeeze)

Oxytocin is a natural hormone that tells the muscle wall of the uterus to squeeze tight and stay tight. After birth, the uterus needs to clamp down hard to pinch off the open blood vessels where the placenta peeled away. If it stays soft and floppy, those vessels keep bleeding. Oxytocin binds to receptors on the smooth muscle cells in the uterus wall and triggers them to contract, shrinking the uterus and closing off the bleeding spots like tightening a drawstring on a bag.

1. Binds to oxytocin receptors on muscle cells in the uterus wall
2. Triggers calcium to rush into the muscle cells
3. Calcium makes the muscle fibers slide together and squeeze
4. The uterus contracts and stays firm, pinching shut the open blood vessels

SAFETY WATCH

Can cause nausea or low blood pressure if given too fast as a big IV push · Rare water retention if very large doses are given over many hours

Methylergonovine (Methergine) · Ergot alkaloid uterotonic

Methylergonovine is a synthetic cousin of a natural fungus chemical. It makes the uterus squeeze even harder and for a longer time than oxytocin by locking onto different receptors on the muscle cells. It causes a sustained, powerful contraction that keeps the uterus firm and the bleeding vessels shut. Think of it as turning up the strength and duration of the squeeze.

1. Binds to serotonin and alpha-adrenergic receptors on uterus muscle cells
2. Triggers a strong, prolonged contraction of the muscle
3. Also tightens smooth muscle in small blood vessels, which helps reduce blood flow to the uterus

SAFETY WATCH

Can raise blood pressure dangerously—do NOT give if the mother has high blood pressure, preeclampsia, or heart disease · Can cause nausea, vomiting, or headache · Never give as a fast IV push; give slowly over at least 60 seconds or as an intramuscular injection

Carboprost (Hemabate) · Prostaglandin F2-alpha analog uterotonic

Carboprost is a lab-made version of prostaglandin F2-alpha, a natural signal that tells the uterus muscle to contract. It works on yet another set of receptors and causes very strong, rhythmic squeezing of the uterus. It is especially helpful when oxytocin alone is not enough. The uterus clamps down hard and stays tight, shutting off bleeding vessels.

1. Binds to prostaglandin F receptors on uterus muscle cells
2. Activates calcium pathways inside the cells
3. Causes strong, repeated contractions of the uterus muscle

SAFETY WATCH

Can trigger bronchospasm (tightening of the airways)—do NOT give if the mother has asthma or active wheezing · Common side effects: diarrhea, nausea, vomiting, fever, flushing · Rarely can raise blood pressure or lower oxygen levels

Misoprostol (Cytotec) · Prostaglandin E1 analog uterotonic

Misoprostol is a synthetic prostaglandin E1 that makes the uterus contract by binding to prostaglandin E receptors on the muscle cells. It is often used when an IV line is not available or as an add-on when other drugs have not fully stopped the bleeding. It can be given by mouth, under the tongue, or rectally, making it flexible in an emergency.

1. Binds to prostaglandin E receptors on uterus muscle cells
2. Triggers muscle contraction pathways
3. Causes the uterus to squeeze and stay firm

SAFETY WATCH

Can cause shivering, fever, nausea, diarrhea, and cramping · Less predictable absorption when given rectally or sublingually, so effect may vary

Tranexamic acid (TXA) · Antifibrinolytic (drug that stops clot breakdown)

Tranexamic acid does NOT make the uterus squeeze. Instead, it stops the body from dissolving clots too early. When you bleed, your body forms clots to plug the leak. But the body also releases plasmin, an enzyme that breaks down clots once healing starts. In heavy bleeding, too

much plasmin can dissolve clots before the vessels are sealed, making bleeding worse. Tranexamic acid blocks plasmin, letting clots stay in place and giving the body time to heal the torn vessels.

1. Binds to plasminogen (the inactive form of the clot-dissolving enzyme)
2. Blocks plasminogen from turning into plasmin
3. Prevents plasmin from breaking down fibrin strands in the clot
4. Clots stay intact longer, reducing ongoing bleeding

SAFETY WATCH

Very safe in postpartum bleeding (hemorrhage) when given within 3 hours of birth · Rarely can cause nausea or dizziness · Theoretical risk of clots forming in the wrong place (thrombosis), but this is extremely rare in postpartum use at guideline doses

Fibrinogen concentrate or cryoprecipitate · Clotting factor replacement

Fibrinogen is the raw material the body uses to build clots. When massive bleeding happens, fibrinogen levels drop because it gets used up faster than the liver can make new supply. Without enough fibrinogen, clots cannot form properly—like trying to build a wall without enough bricks. Giving fibrinogen concentrate or cryoprecipitate (frozen plasma rich in fibrinogen) restores the supply so the clotting system can work again.

1. Fibrinogen is infused into the bloodstream
2. Thrombin (a clotting enzyme) cuts fibrinogen into fibrin strands
3. Fibrin strands weave together to form a stable mesh that traps blood cells and plugs the bleeding vessel

SAFETY WATCH

Very safe when given to replace documented low fibrinogen · Rare allergic reaction · Cryoprecipitate carries a tiny risk of infection because it comes from donor blood; fibrinogen concentrate is virus-inactivated and safer

Red flags

- Bleeding that soaks more than one pad per hour or produces clots bigger than a golf ball
- Blood pressure dropping below 90/60 or heart rate climbing above 110 beats per minute
- Confusion, severe dizziness, fainting, or trouble staying awake
- The uterus stays soft and will not firm up even with massage
- Signs of shock: cold clammy skin, rapid weak pulse, very pale face, gasping for air

Nursing priorities

1. Start two large-bore IV lines (18-gauge or bigger) and give lactated Ringer's or normal saline wide open. — The heart and brain need fluid volume fast to replace lost blood and keep blood pressure up. Large IVs allow rapid fluid and blood product delivery.
2. Perform firm continuous uterine massage by placing one hand on the lower belly and rubbing the uterus in circles until it feels hard like a grapefruit. — A soft boggy uterus (atony) has open blood vessels inside. Massage makes the muscle squeeze tight and clamps down those vessels to stop bleeding.
3. Measure and record all blood loss by weighing pads and chux (1 gram equals 1 mL) and checking for pooled blood under the patient's bottom every 15 minutes. — Accurate measurement tells you if bleeding is getting better or worse and when to activate the massive transfusion protocol at 1000 mL total loss.
4. Give IV oxytocin (Pitocin) 10 units in 500 mL normal saline running fast, or 10 units IM if no IV yet. — Oxytocin (a hormone that makes the uterus contract) is the first-line medication to treat atony and stop uterine bleeding within minutes.
5. Continuously monitor vital signs every 5 to 15 minutes: blood pressure, heart rate, oxygen saturation, and skin color. — Rising heart rate above 100, falling blood pressure below 90 systolic, and pale cold skin mean shock (not enough blood reaching organs) is starting.
6. Call for help immediately and notify the provider, anesthesia, and blood bank to activate the massive transfusion protocol if bleeding continues. — Postpartum bleeding (hemorrhage) can cause death in minutes. The patient needs packed red blood cells, plasma, and platelets in a 1-to-1-to-1 ratio to replace clotting factors and oxygen-carrying cells.
7. Keep the patient flat or in Trendelenburg position (feet higher than head) if blood pressure drops below 90 systolic. — This position uses gravity to push blood from the legs back to the heart and brain, buying time until transfusion arrives.
8. Prepare for possible procedures: have a Foley catheter ready to empty the bladder, set up for bimanual compression, and gather the Bakri balloon kit. — A full bladder prevents the uterus from contracting. Bimanual compression (one hand inside the vagina, one on the belly) and the Bakri balloon (inflated inside the uterus) apply direct pressure to bleeding vessels when massage and medication fail.

Sources

- ACOG Practice Bulletin No. 183, 2017 (Postpartum Hemorrhage)
- WHO recommendations for prevention and treatment of postpartum hemorrhage, 2012
- FIGO Safe Motherhood and Newborn Health Committee guidelines
- American College of Nurse-Midwives (ACNM) clinical practice guideline

Last reviewed: 2026-07-07