به نام آرامش دهنده قلبها


جمهوری اسلامی ایران
دانشگاه علوم پزشکی و خدمات بهداشتی درمانی ایران
مرکز آموزشی و درمانی شهید اکبر آبادی

Management of postpartum hemorrhage at vaginal delivery

Dr.Afsaneh Ghasemi
Assistant professor of OB & GYN
IRAN University of Medical Science
Shahid Akbarabadi Hospital

DEFINITIONS

PPH is described as primary or secondary:

Primary:

occurs in the first 24 hours after delivery : **early PPH**

Secondary:

occurs 24 hours to 12 weeks after delivery **: late or delayed PPH**

Volume of blood loss:

≥500 mL after vaginal birth or **≥1000 mL** after cesarean delivery.

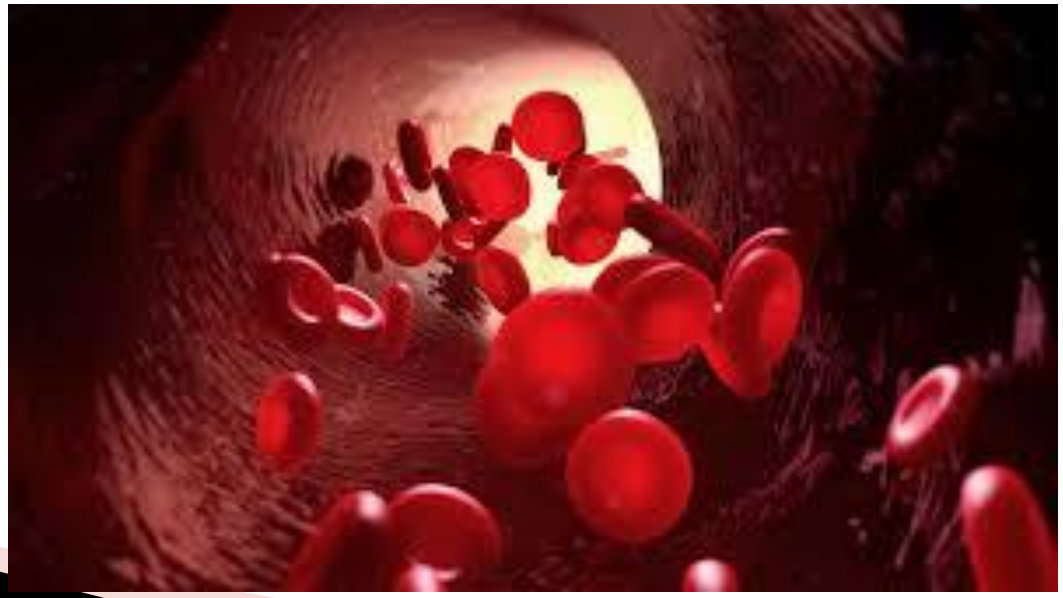
RISK FACTORS

- **Retained placenta/membranes** odds ratio [OR] 3.5, 95% CI 2.1-5.8
- **Failure to progress during the second stage of labor** OR 3.4, 95% CI 2.4-4.7
- **Morbidly adherent placenta** OR 3.3, 95% CI 1.7-6.4
- **Lacerations** OR 2.4, 95% CI 2.0-2.8
- **Instrumental delivery** OR 2.3, 95% CI 1.6-3.4
- **Large for gestational age newborn** (eg, >4000 g) OR 1.9, 95% CI 1.6-2.4
  Hypertensive disorders (preeclampsia, eclampsia, HELLP) OR 1.7, 95% CI 1.2-2.1
- **Induction of labor** OR 1.4, 95% CI 1.1-1.7
- **Prolonged first or second stage of labor** OR 1.4, 95% CI 1.2-1.7

PATHOGENESIS

in late pregnancy uterine artery blood flow is 500 to 700 mL/min and accounts for about 15 % of cardiac output

The potential for massive hemorrhage after delivery is high



PATHOGENESIS

Local decidual hemostatic factors

(tissue factor type-1 plasminogen activator inhibitor systemic coagulation factors [eg, platelets, circulating clotting factors]),

- **clotting**

Contraction of the myometrium, which compresses the blood vessels supplying the placental bed

- **mechanical hemostasis**

INITIAL EVALUATION

Evaluate blood pressure, heart rate, respiratory rate, peripheral oxygen saturation, and urine output.

Tachypnea,tachycardia, hypotension, low oxygen saturation, and air hunger are signs of hypovolemia, which may be due to both inadequate hemoglobin level and circulatory volume.

Symptoms related to blood loss with postpartum hemorrhage

Blood loss, percent (mL)	Blood pressure, mm Hg	Signs and symptoms
10 to 15 (500 to 1000)	Normal	Palpitations, lightheadedness, mild increase in heart rate
15 to 25 (1000 to 1500)	Slightly low	Weakness, sweating, tachycardia (100 to 120 beats/minute)
25 to 35 (1500 to 2000)	70 to 80	Restlessness, confusion, pallor, oliguria, tachycardia (120 to 140 beats/minute)
35 to 45 (2000 to 3000)	50 to 70	Lethargy, air hunger, anuria, collapse, tachycardia (>140 beats/minute)

Adapted from: Bonnar J. Baillieres Best Pract Res Clin Obstet Gynaecol 2000; 14:1.

INITIAL EVALUATION

Assess the source and amount of bleeding

ask for clinical assistance, as appropriate.Iit is not sufficient to only look for obvious vaginal or incisional bleeding because significant hemorrhage can occur in to the retroperitoneum or into a vaginal/vulval hematoma without visible blood loss.

Perform a thorough abdominal, vaginal, and rectal examination.

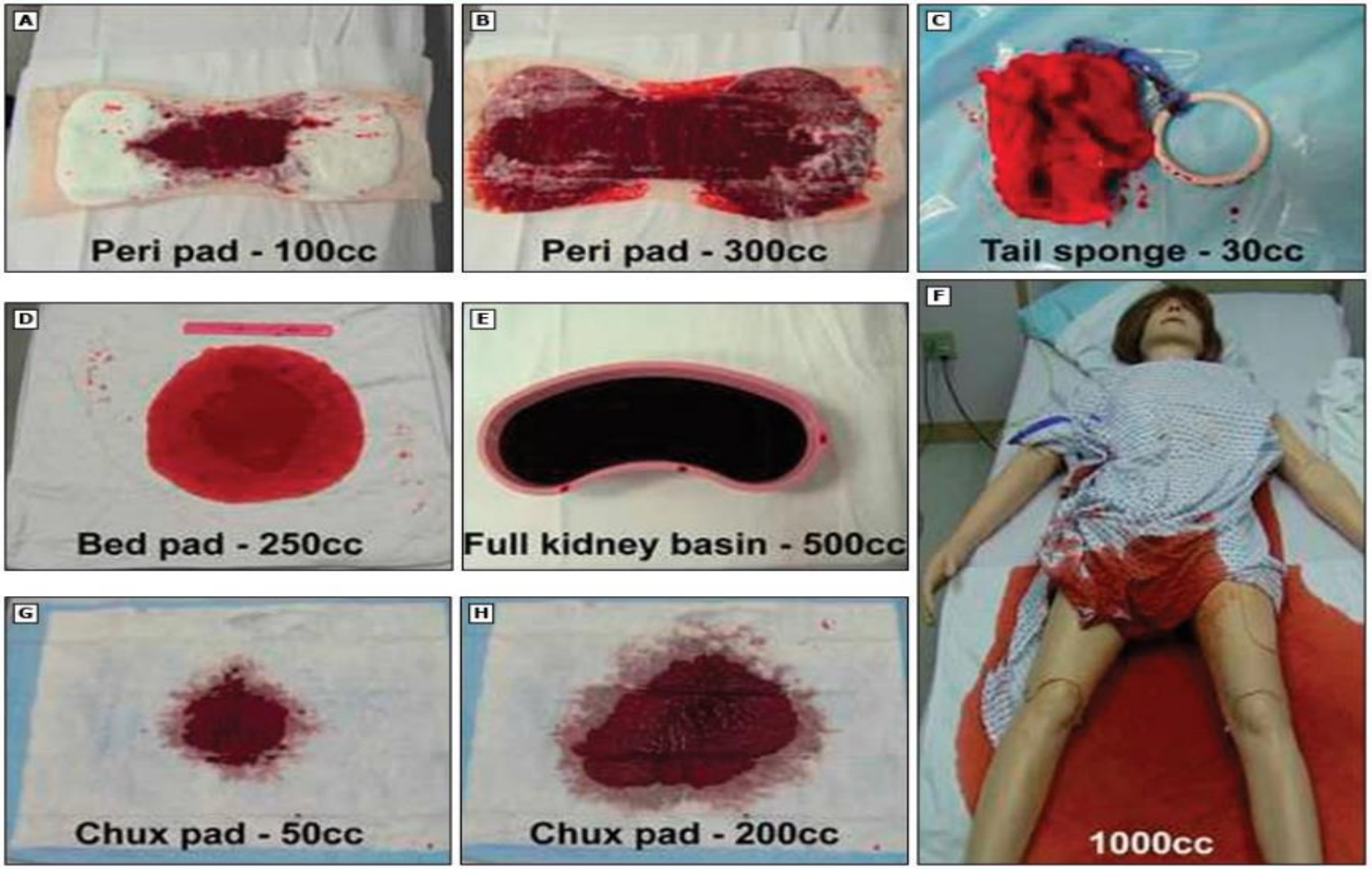
Rapidly assess uterine tone, but be aware that there can still be significant bleeding from a poorly contracted and dilated lower segment despite adequate upper segment contraction.

INITIAL EVALUATION

If uterine rupture and/or poor contraction of the lower segment are suspected, gentle digital exploration of the lower segment of the uterus is reasonable.

In an operating room

Visual aid for estimating intrapartum blood loss



Visual aid. Pocket card with images of measured volumes of artificial blood.

INITIAL EVALUATION

Check for non-clotting blood or very anemic-appearing vaginal bleeding; if present, this should prompt blood and blood product replacement and evaluation for coagulopathy.

Review drugs the patient has received as some drugs can have unanticipated hemodynamic side effects that may confound the situation.

INITIAL INTERVENTIONS

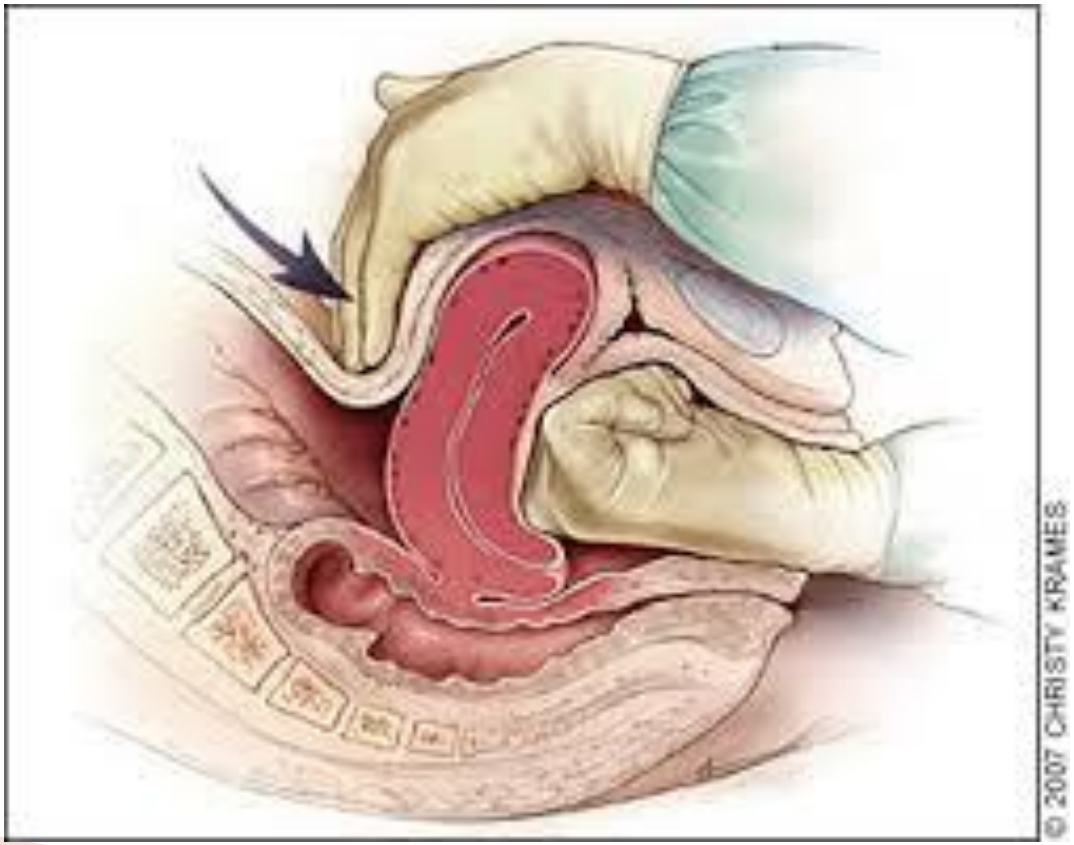
Although the initial interventions described below are often successful, in the setting of cardiovascular instability it is important to avoid prolonged, futile attempts at conservative therapy before proceeding to **laparotomy** and, if necessary, **hysterectomy**.

INITIAL INTERVENTIONS

Uterine massage and compression

INITIAL INTERVENTIONS

Uterine massage and compression



INITIAL INTERVENTIONS

Intravenous access

It should be provided, preferably with two large bore catheters (at least 16 or 18 gauge, ideally 14 gauge), for administration of fluids and blood

Oxygenation

It is maximized by administering oxygen (10 to 15 liters/minute) by face mask and transfusion to improve oxygen-carrying capacity and delivery.

INITIAL INTERVENTIONS

Laboratory tests

Baseline laboratory evaluation should include a **complete blood count** and **coagulation studies** (fibrinogen concentration, prothrombin time, activated partial thromboplastin time).

the patient should be typed and crossed for multiple units of packed red blood cells. The coagulation panel should be repeated every 30 to 60 minutes to observe trends until PPH is controlled. **Fibrinogen** falls before other coagulation factors.

INITIAL INTERVENTIONS

Laboratory tests

- Clot observation test
- TEG and ROTEM
- Fibrinogen as a predictor of worsening hemorrhage/coagulopathy
- Electrolytes

INITIAL INTERVENTIONS

Laboratory tests

Fibrinogen as a predictor of worsening hemorrhage/coagulopathy

Fibrinogen falls to critically low levels earlier than other coagulation factors during PPH, thus the fibrinogen level is a more sensitive indicator of ongoing major blood loss than the prothrombin time, activated partial thromboplastin time,or platelet

INITIAL INTERVENTIONS

Laboratory tests

Electrolytes

- The most common electrolyte abnormalities ar hyperkalemia and low ionized calcium levels
- An ionized calcium level <1 mmol/L (normal 1.1 to 1.3 mmol/L) impairs coagulation and places the patient at risk of cardiac arrest
- Potassium – Hyperkalemia may result from the rapid transfusion of multiple units of pRBCs, especially if they are older units

INITIAL INTERVENTIONS

Uterotonic drugs

Since uterine atony is the most common cause of PPH, uterotonic drugs are administered for presumed atony until a therapeutic effect is observed or until it is obvious that these drugs are ineffective.

The important point is not the sequence of drugs, but the prompt initiation of uterotonic therapy and the prompt assessment of its effect.

It should be possible to determine within 30 minutes whether pharmacologic treatment is reversing uterine atony. If it does not,prompt invasive intervention is usually warranted.

INITIAL INTERVENTIONS

Uterotonic drugs

Oxytocin 40 units in 1 L of normal saline intravenously at a rate sufficient to control uterine atony or 10 units intramuscularly (including directly into the myometrium).

While higher doses of oxytocin have been used intravenously for a short duration to manage atony (eg, up to 80 units in 500 mL over 30 minutes).

INITIAL INTERVENTIONS

Uterotonic drugs

- If no asthma, carboprost tromethamine (15 methyl-PGF2alpha, Hemabate) 250 mcg intramuscularly every 15 to 90 minutes, as needed, to a total cumulative dose of 2 mg (eight doses).

- About 75 percent of patients respond to a single dose; move on to a different uterotonic agent if no response after one or two doses. Carboprost tromethamine may be injected directly into the myometrium either transabdominally (with or without ultrasound guidance) or vaginally

INITIAL INTERVENTIONS

Uterotonic drugs

- If no hypertension or other significant arterial disease (eg, Raynaud's phenomenon, coronary artery disease), methylergonovine 0.2 mg intramuscularly or directly into the myometrium (never intravenously).

- May repeat at two - to four-hour intervals, as needed. If there has not been a good response to the first dose, quickly move on to a different uterotonic agent.

INITIAL INTERVENTIONS

Uterotonic drugs

Misoprostol (PGE1) is most useful for reducing blood loss in settings where injectable uterotonics are unavailable or contraindicated (eg, hypertension, asthma). There is no strong evidence that misoprostol is more effective than other uterotonics either for primary therapy of PPH or as an adjunctive treatment to oxytocin infusion . If used, we suggest 400 mcg sublingually.

Sublingual misoprostol is rapidly absorbed, achieving a peak concentration within 30 minutes. The peak concentration is higher and sustained longer (about three hours) than with oral administration due to avoidance of first-pass hepatic metabolism; thus, sublingual administration is probably the optimal route of administration for PPH

INITIAL INTERVENTIONS

Uterotonic drugs

- Rectal administration takes longer to reach peak concentration compared with oral or sublingual administration(up to an hour versus within 30 minutes), which is disadvantageous in the hemorrhaging patient.

- Unlike methylergonovine and carboprost, misoprostol can be given to women with hypertension or asthma. Maternal temperature should be monitored closely, as pyrexia ≥40 degrees Celsius can occur at these doses and should be treated (eg, acetaminophen). The frequency of pyrexia increases with increasing misoprostol dose.

INITIAL INTERVENTIONS

Uterotonic drugs

- **Dinoprostone** (PGE2) 20 mg vaginal or rectal suppository is an alternative prostaglandin to misoprostol (PGE1). It can be repeated at two-hour intervals.

- **Carbetocin**, a long-acting analog of oxytocin it appears to be as effective as oxytocin. Carbetocin 100 mcg is given by a single slow intravenous injection. It seems reasonable to use this drug as an alternative to oxytocin in countries where it is available

INITIAL INTERVENTIONS

Tranexamic acid

- Tranexamic acid is an anti-fibrinolytic drug that has been useful for prevention and treatment of bleeding.

- The World Health Organization considers use of tranexamic acid for the treatment of PPH a reasonable approach if oxytocin and other uterotonics do not stop bleeding or if bleeding is partly due to trauma.

INITIAL INTERVENTIONS

Explore uterine cavity

- The uterus should be explored to exclude uterine rupture and retained productions of conception.
- Maternal symptoms of hypovolemia that appear to be out of proportion to the observed blood loss and abdominal distention should also prompt consideration of intra-abdominal hemorrhage.
- rupture is not readily visualized upon entering the abdomen so the entire uterus needs to be inspected carefully. Intra-abdominal blood without an obvious uterine rupture also may be due to hepatic or splenic rupture

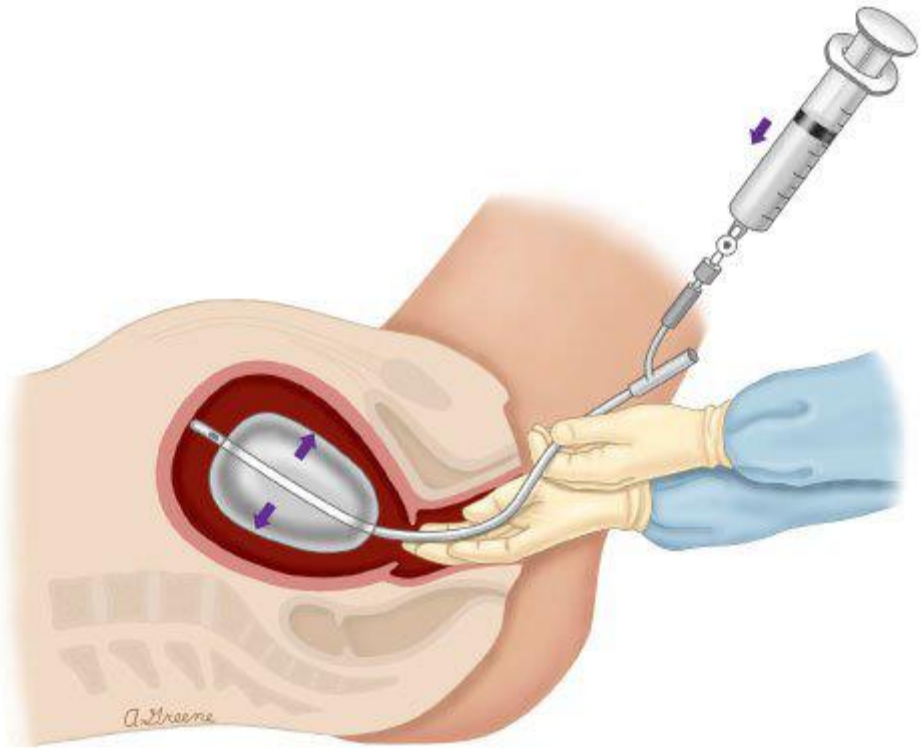
INITIAL INTERVENTIONS

Uterine tamponade

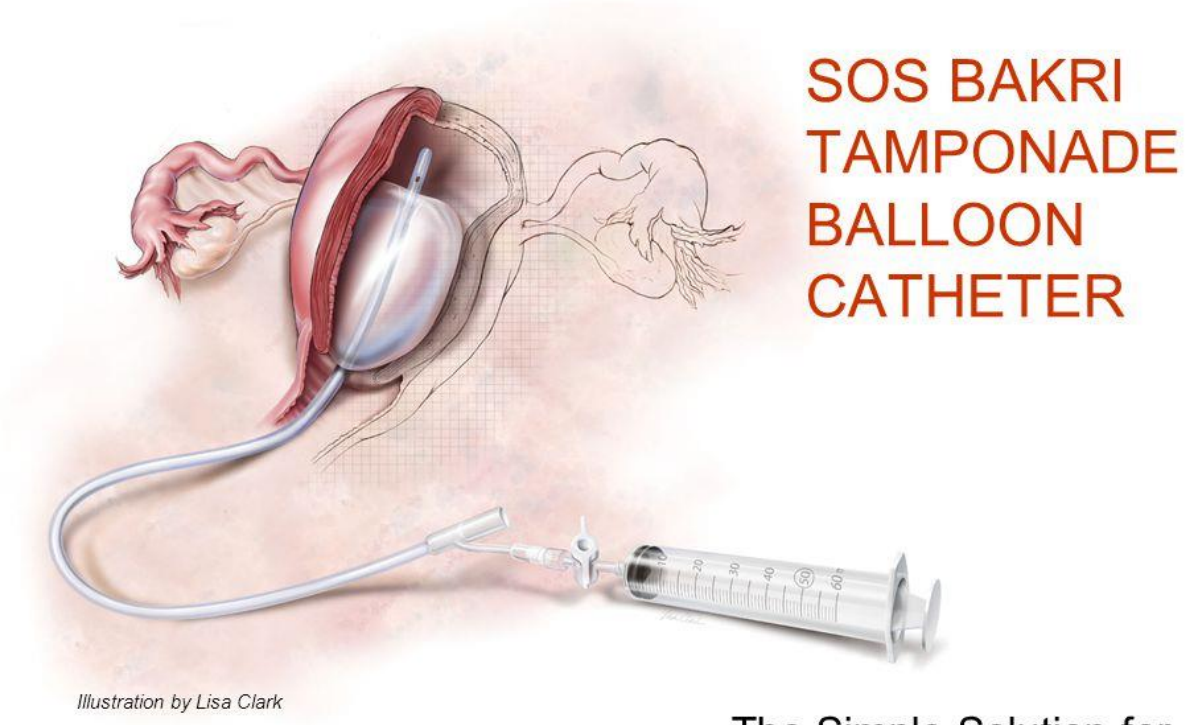
- Uterine tamponade
- Bakri tamponade
- BT_Cath
- Ebb Complete tomponade
- Sengstaken- Blakemore tube
- Single or multiple foley catheter
- Condom catheter
- Size 8 surgical glove

Uterine tamponade

Placement of an intrauterine balloon catheter

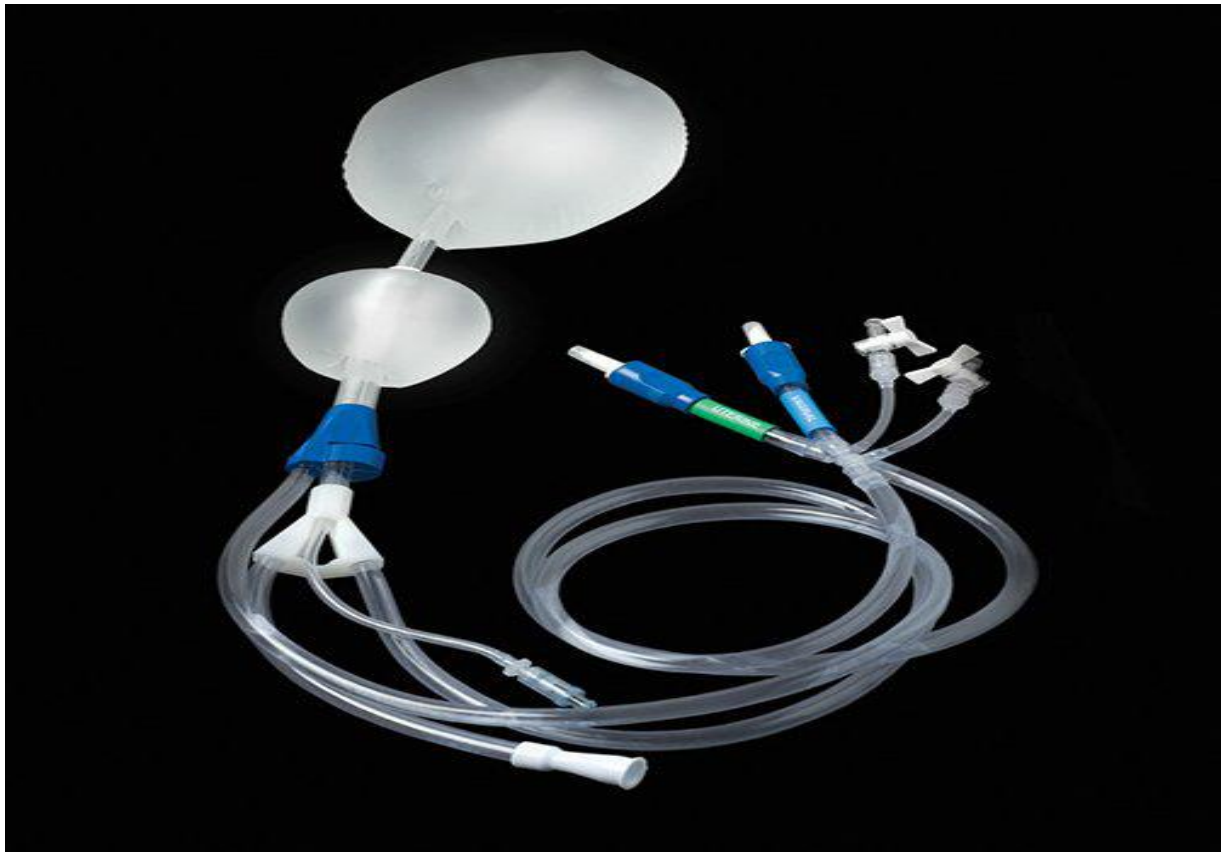


Uterine tamponade



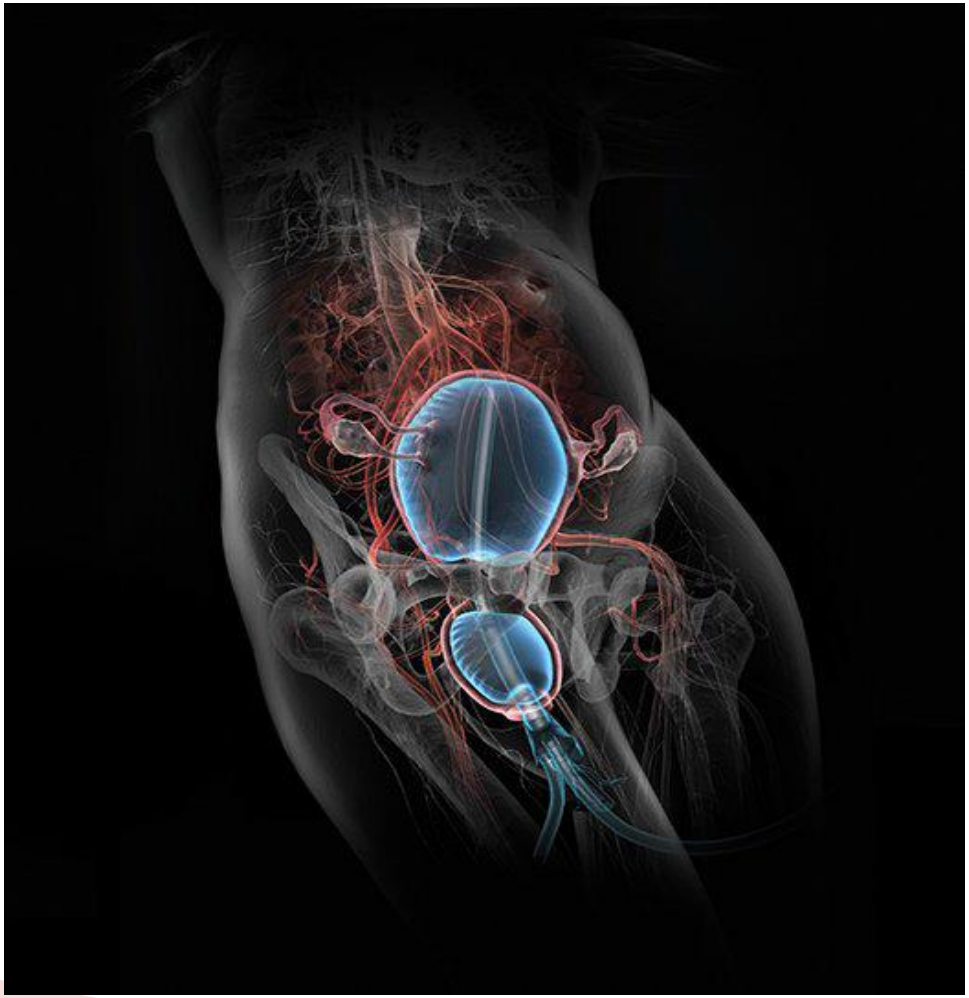
Uterine tamponade

ebb Complete Tamponade System designed by Belfort-Dildy



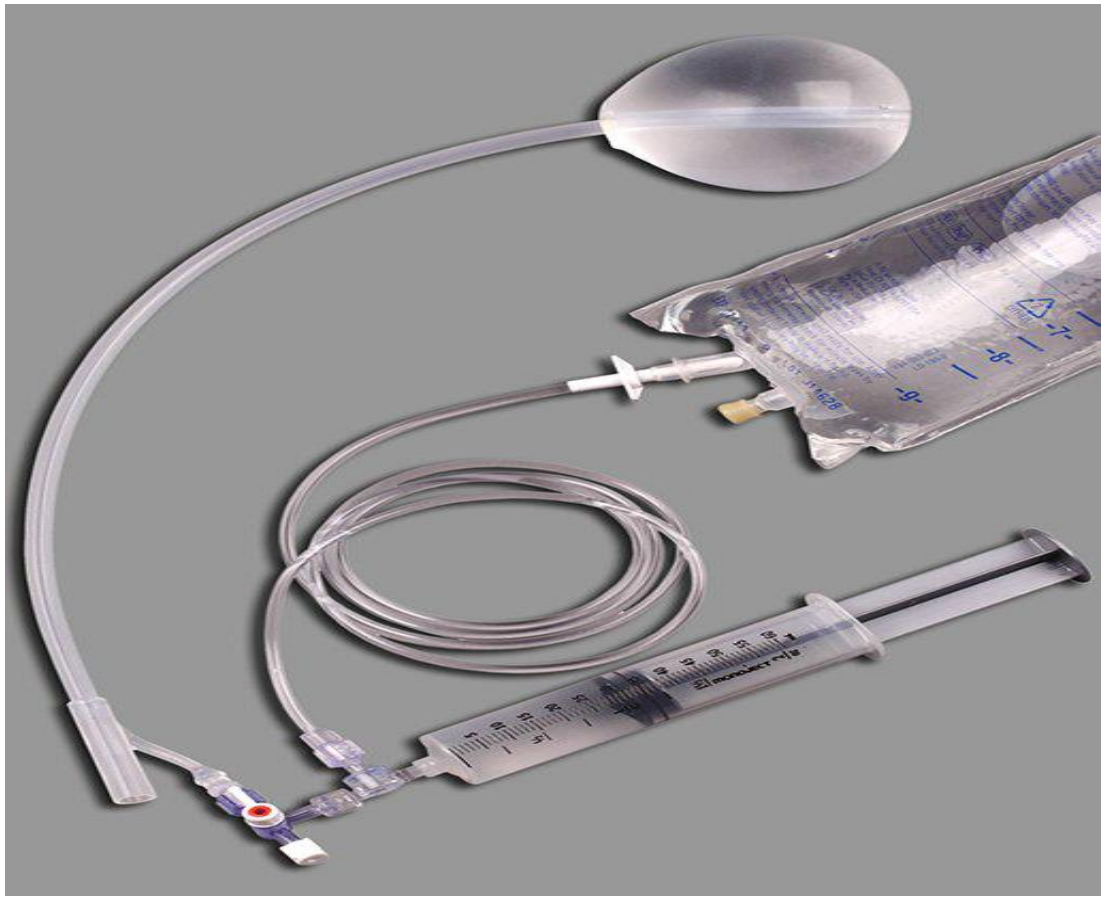
Uterine tamponade

Belfort-Dildy duel balloon tamponade system



Uterine tamponade

BT-Cath



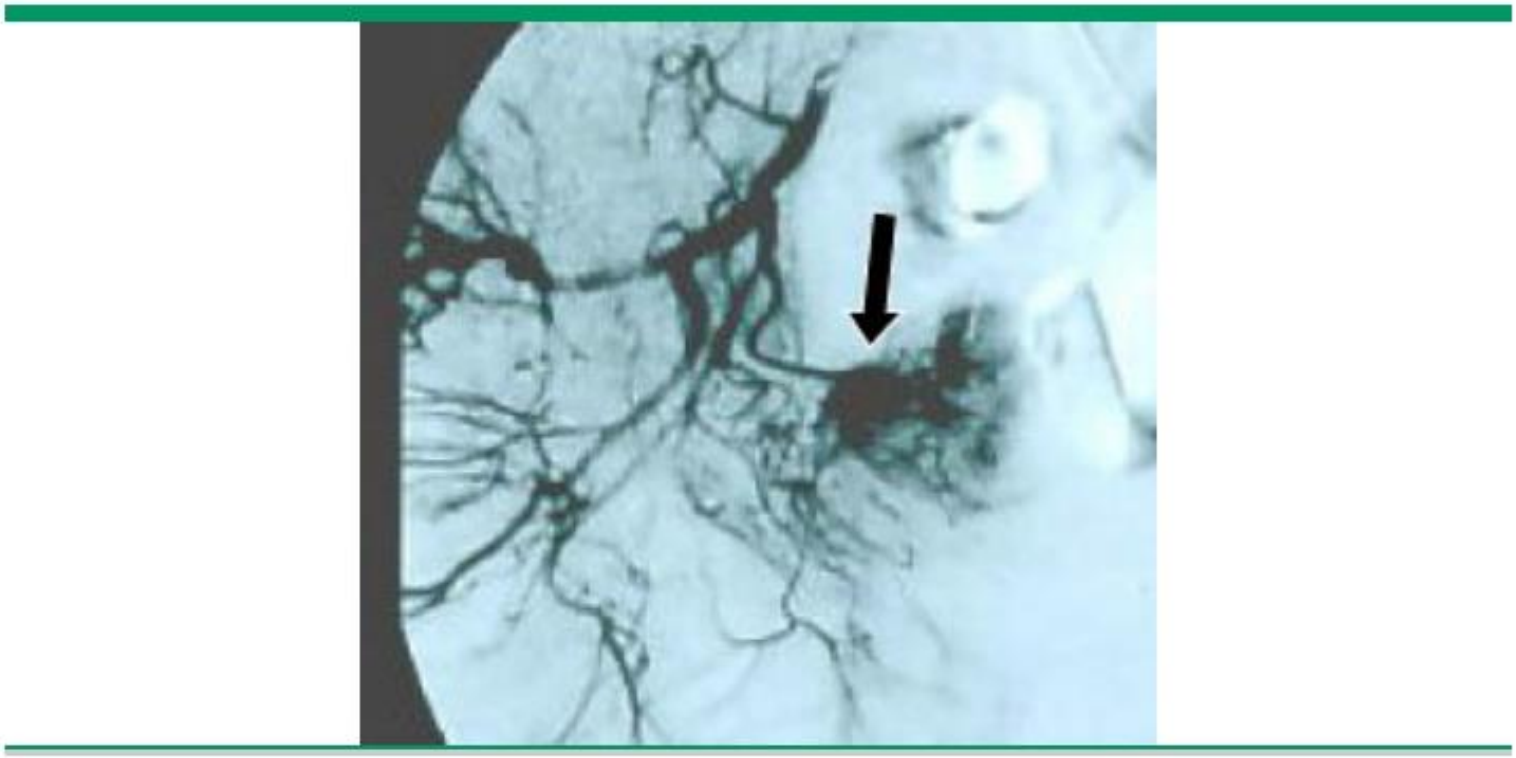
Uterine tamponade

Uterine tamponade

Uterine tamponade

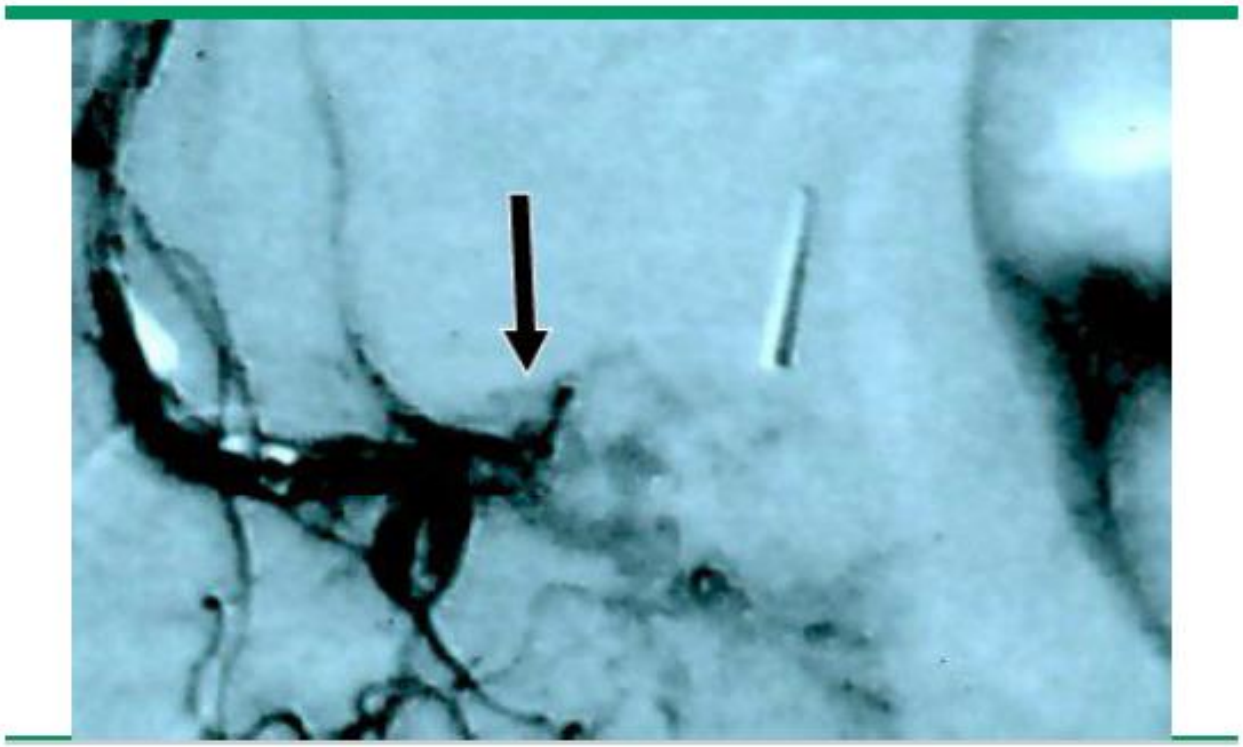
Uterine tamponade

Right hypogastric angiogram



Right hypogastric angiogram on a 34-year-old woman with postpartum hemorrhage shows an area of extravasation (arrow).

Right uterine angiogram



Right uterine angiogram reveals occlusion of the right uterine artery (arrow) after superselective uterine artery embolization. The procedure successfully stopped the bleeding.

Potential interventions for treatment of PPH

Pharmacologic interventions	
Drug	**Dosing**
Oxytocin	10 to 40 units in 500 to 1000 mL saline infused at a rate sufficient to control atony or 10 units IM
Ergots	Methyl-ergonovine 0.2 mg IM every two to four hours or ergometrine 0.5 mg IV or IM or ergonovine 0.25 mg IM or IV every two hours
Carboprost	0.25 mg IM every 15 to 90 minutes up to eight doses or 500 mcg IM incrementally up to 3 mg or 0.5 mg intramyometrial
Misoprostol	800 to 1000 mcg rectally
Dinoprostone	20 mg vaginally or rectally every two hours
Recombinant human Factor VIIa	50 to 100 mcg/kg every two hours

Potential interventions for treatment of PPH

Surgical interventions
Repair lacerations
Curettage
Uterine compression suture (eg, B-Lynch suture)
Uterine artery ligation
Utero-ovarian artery ligation or cross clamp
Pelvic packing
Uterine tourniquet
Focal myometrial excision
Use of fibrin glues and patches to cover areas of oozing and promote clotting
Placement of figure 8 sutures or other hemostatic sutures directly into the placental bed
Internal iliac artery (hypogastric artery) ligation
Aortic compression
Hysterectomy, supracervical
Hysterectomy, total

Potential interventions for treatment of PPH

Interventional radiology
Selective arterial embolization
Intermittent aortic balloon occlusion
Common iliac artery balloon occlusion
Blood bank
Packed red blood cells
Platelets
Fresh frozen plasma
Cryoprecipitate
Nonsurgical interventions
Uterine massage
Intravenous fluids
Tamponade
Intrauterine tamponade with an intrauterine balloon or alternative device (eg, bladder catheter bulb, Sengstaken-Blakemore tube)
Uterine packing (eg, 4 inch gauge packing)

Potential interventions for treatment of PPH

Consultations
General surgery
Trauma surgery
Anesthesia team
Interventional radiology
Gynecologic oncology
Urology

IV: intravenous; IM: intramuscular; mcg: micrograms; kg: kilogram.

Fluid resuscitation and transfusion

Crystalloid

While blood and blood products are being obtained, isotonic crystalloid should be infused to prevent hypotension (target systolic pressure 90 mmHg) and maintain urine output at >30 mL/hour .

Rapid infusion of large volumes of crystalloid (eg, >3 to 4 liters) may promote dilutional coagulopathy and electrolyte imbalances, so appropriate monitoring of hematocrit, coagulation status, and electrolytes is essential.

Fluid resuscitation and transfusion

Red blood cells, platelets, plasma

- Before laboratory studies are available, we suggest transfusing 2 units of pRBCs if hemodynamics do not improve after the administration of 2 to 3 liters of normal saline.
- One guideline suggests 4 units pRBCs followed by 4 units fresh frozen plasma (FFP) if no laboratory results are available, bleeding is ongoing, and bleeding is due to atony; the 1:1 pRBC:FFP ratio is maintained until tests of hemostasis are available

Fluid resuscitation and transfusion

Red blood cells, platelets, plasma

California Maternal Quality Care Collaborative OB Hemorrhage Protocol: For patients with unstable vital signs, suspicion of disseminated intravascular coagulation, 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

Fluid resuscitation and transfusion

Red blood cells, platelets, plasma

We continue to transfuse RBCs, platelets, cryoprecipitate, and FFP in women with ongoing bleeding to achieve the following targets:

- Hemoglobin greater than 7.5 g/dL
- Platelet count greater than 50,000/mm3
- Fibrinogen greater than 200 mg/dL
- Prothrombin time less than 1.5 times the control value
- Activated partial thromboplastin time less than 1.5 times the control value

As an example, 4 units of FFP are given if the prothrombin time is more than 1.5 times the control value, one apheresis platelet pack is given if the platelet count is less than 50,000/mm3, and 10 bags of cryoprecipitate are given if the fibrinogen is less than 100 mg/dL

Fluid resuscitation and transfusion

Repletion of clotting factors

Cryoprecipitate is primarily used for correcting fibrinogen deficiency, but also contains other clotting factors. The dose depends on the measured and target fibrinogen levels; dosing is described in the table (table 4).

If no laboratory results are available and 8 units of pRBCs and 8 units of FFP have been transfused, one guideline advises infusion of two pools of cryoprecipitate.

Fluid resuscitation and transfusion

Cryoprecipitate

- **Advantages** of cryoprecipitate are that large amounts of fibrinogen can be administered in a low-volume product and it is less costly than the commercial products described below.

- **Disadvantages** are that it takes time to thaw and prepare for transfusion, and it carries a risk of transmissible infections since it is a pooled product

Fluid resuscitation and transfusion

Repletion of clotting factors

Fibrinogen Concentrate (RiaSTAP), a heat-treated, lyophilized fibrinogen (Factor I) powder made from pooled human plasma, may be available in some institutions.

Each vial of RiaSTAP contains 900 to 1300 mg fibrinogen and 400 to 700 mg human albumin, and can be used in combination with cryoprecipitate. It may be used when fibrinogen levels are critically low (ie, <100 mg/dL), and FFP and cryoprecipitate are not available.

Fluid resuscitation and transfusion

Repletion of clotting factors

Recombinant factor VIIa

Recombinant human activated factor VII (rFVIIa) is used for treatment of individuals with bleeding related to hemophilia A and B inhibitors, acquired inhibitors, and congenital factor VII deficiency.

It has also been used successfully off-label for control of bleeding in other situations, such as intractable bleeding associated with postpartum uterine atony, placenta accreta, or uterine rupture

Fluid resuscitation and transfusion

Repletion of clotting factors

Recombinant factor VIIa

In addition, patient temperature, pH, and calcium levels should be adequate:

- Platelet count >50,000/mm3
- Fibrinogen level >50 to 100 mg/dL
- pH ≥7.2
- Absence of hypothermia
- Absence of hypocalcemia

Fluid resuscitation and transfusion

Repletion of clotting factors

Prothrombin complex concentrate

Three factor (II, IX, X) and four factor (II, VII, IX, X) prothrombin complex concentrates (PCC) are available and have been suggested as an alternative to FFP. The perceived advantages are a reduced risk of volume overload, no need for thawing or blood group typing, and a reduced risk for transfusion-related acute lung injury and allergic reactions. Disadvantages include very high cost and increased risk of thrombosis.

Fluid resuscitation and transfusion

Repletion of clotting factors

Prothrombin complex concentrate

The FDA-approved indication for four factor PCCs is for urgent reversal of acquired coagulation factor deficiency induced by vitamin K antagonist therapy in adult patients with acute major bleeding or need for an urgent surgery/invasive procedure.

We caution those using PCC off-label in women with postpartum hemorrhage to have evidence (or strong suspicion) of a specific factor deficiency that would be alleviated by PCC because of the risk of thrombosis, the lack of data of efficacy in this population, and the concern that deficiencies in factors II, VII, IX, and X are not common in this setting .

The most likely scenario where PCC might be of benefit is in a massive transfusion situation with ongoing DIC unresponsive to all of the usual therapies.

Blood components: Indications and dosing in adults

Component (volume)	Contents	Indications and dose
Whole blood (1 unit = 500 mL)	RBCs, platelets, plasma	Rarely required. May be appropriate when massive bleeding requires transfusion of more than 5 to 7 units of RBCs.
Red blood cells (RBCs) in additive solution, also called packed RBCs (1 unit = 350 mL)	RBCs	Anemia, bleeding. One unit increases the hemoglobin by approximately 1 g/dL and the hematocrit by approximately 3 percentage points.
Fresh Frozen Plasma (FFP)* (1 unit = 200 to 300 mL)	All soluble plasma proteins and clotting factors	Bleeding or expected bleeding (eg, emergency surgery) in individuals with deficiencies of multiple coagulation factors (eg, DIC, liver disease, massive transfusion, anticoagulation with warfarin or other vitamin K antagonist, warfarin overdose); therapeutic plasma exchange in TTP. One unit of FFP increases the plasma fibrinogen by 7 to 10 mg/dL. A usual dose is 10 to 15 mL/kg. May also be used in individuals with isolated factor deficiencies if a factor concentrate or recombinant factor is unavailable.

Blood components: Indications and dosing in adults

Cryoprecipitate, also called "cryo" (1 unit = 10 to 20 mL)	Fibrinogen; factors VIII and XIII; VWF	Bleeding or expected bleeding with low fibrinogen: one unit of cryoprecipitate per 10 kg body weight will raise the plasma fibrinogen by approximately 50 mg/dL. Bleeding or expected bleeding in individuals with deficiencies of factor XIII or factor VIII (hemophilia A) if a recombinant product or factor concentrate is unavailable. Bleeding or expected bleeding in individuals with VWD if DDAVP is ineffective and recombinant VWF or a VWF concentrate is unavailable. Cryoprecipitate is generally provided patients receive two pools.
Platelets (derived from whole blood or apheresis) (1 unit = 200 to 300 mL)	Platelets	Six units of whole blood-derived platelets or one unit of apheresis-derived platelets will raise the platelet count by approximately 30,000/microL in an average sized adult.

Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

Step 1: Before delivery
■ Screen all women admitted to Labor and Delivery for risk factors for obstetric hemorrhage. ■ Draw blood and hold clot, type and screen, or type and crossmatch, depending on level of hemorrhage risk. ■ Ensure intravenous access with intravenous catheter(s) or heparin lock, as appropriate for level of hemorrhage risk.
Step 2: At delivery
■ Give oxytocin for active management of the third stage.

Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

Step 3: After delivery

- Quantify blood loss.
- Initiate additional measures to control bleeding based on severity of obstetric hemorrhage.
  - Blood loss >500 mL and <1000 mL at vaginal delivery or >1000 mL and <1500 mL at cesarean delivery with ongoing excessive bleeding and/or mild tachycardia and/or hypotension.
    - Get help and notify obstetric hemorrhage team.
    - Continue to monitor vital signs and quantify blood loss.
    - Ensure intravenous access with a large gauge catheter(s).
    - Begin bimanual uterine massage.
    - Increase oxytocin flow rate (avoid direct intravenous injection of undiluted oxytocin).
    - Volume resuscitation, preferably with blood and blood products if bleeding is heavy and coagulopathy is imminent.
    - Give a second uterotonic (eg, methylergonovine, carboprost tromethamine).
    - Examine for lacerations, retained products of conception, uterine inversion, and other causes of bleeding. Consider bedside ultrasound of uterus. Treat as appropriate (eg, repair lacerations, curettage, reposition uterus, etc).

Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

- If cesarean delivery: Apply conservative surgical interventions to control bleeding (eg, uterine artery/ovarian artery ligation, uterine compression sutures).

- Blood loss >1000 mL and <1500 mL at vaginal delivery or >1500 mL at cesarean delivery with ongoing excessive bleeding and/or hemodynamic instability.
  - Do all of the above.
  - Draw blood for baseline labs (complete blood count, coagulation studies) and clot observation test.
  - Insert intrauterine balloon for tamponade.
  - Transfuse two units packed red cells and one to two units fresh frozen plasma. Activate a massive transfusion protocol if bleeding is heavy and transfusion of four or more units of blood is likely.

Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

- If vaginal delivery: Move the patient to an operating room to perform conservative surgical interventions to control bleeding.
- Consider selective arterial embolization only if patient is hemodynamically stable. This should preferably be performed in an operating room or hybrid suite if available. Bleeding patients should only be moved to a radiology suite for embolization if they are hemodynamically stable and blood products are being replaced at a rate that can exceed that of the bleeding. Arterial embolization outside of an operating room is not an option in situations where there is catastrophic bleeding in a decompensating patient.
- If cesarean delivery: Continue to apply conservative surgical interventions to control bleeding (eg, uterine artery/ovarian artery ligation, uterine compression sutures).

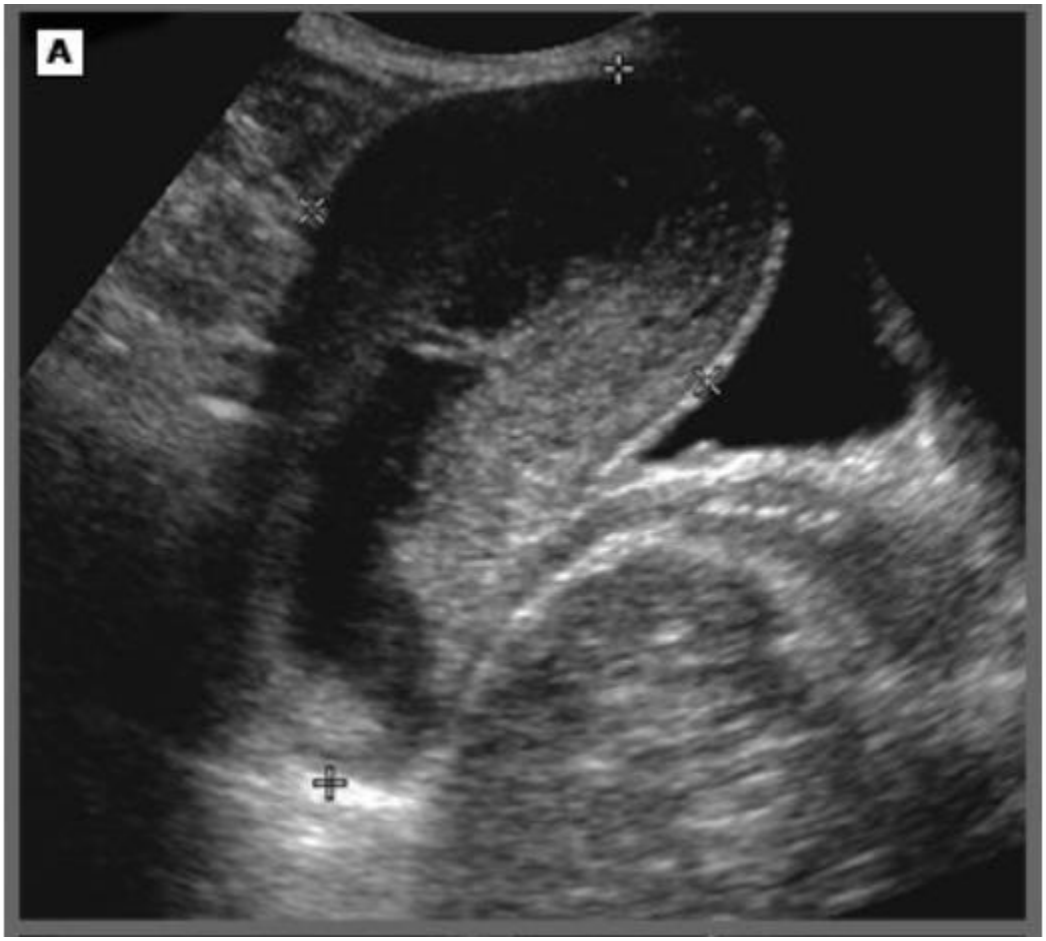
Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

- Blood loss >1500 mL, ongoing excessive bleeding, and hemodynamic instability despite initial therapy.
  - Initiate massive transfusion protocol (transfuse appropriate ratio of red cells, fresh frozen plasma/cryoprecipitate, and platelets).
  - If conservative surgical interventions are not successful, perform hysterectomy. Hysterectomy should not be delayed in women who require prompt control of uterine hemorrhage to prevent death.
  - Keep patient warm.

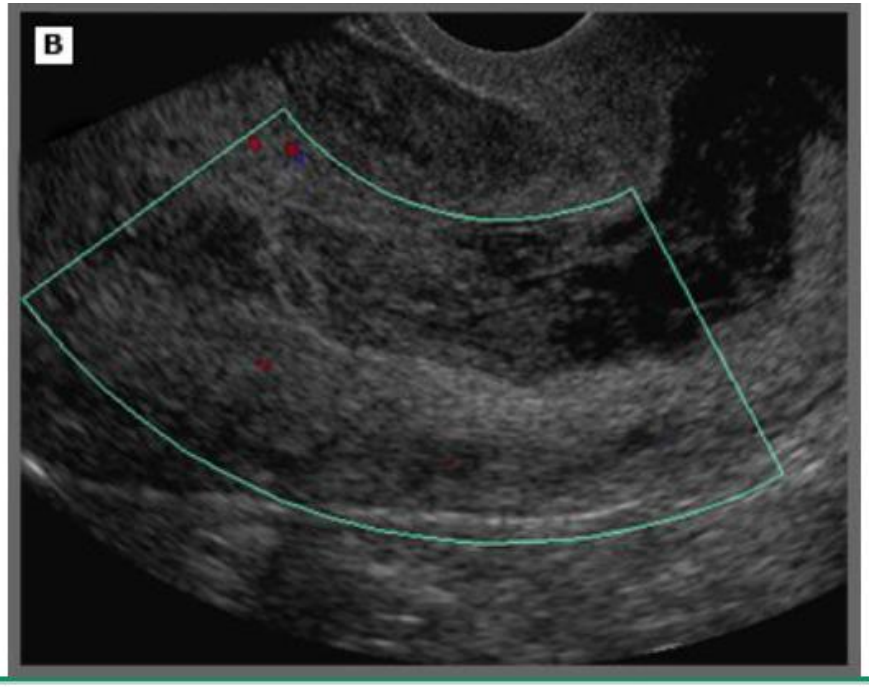
Overview of management of postpartum hemorrhage based on estimated blood loss and hemodynamic stability

- Treat acidosis.
- Check ionized calcium and potassium levels every 15 minutes once a massive transfusion protocol has been initiated and treat hypocalcemia and hyperkalemia aggressively. Continue until the emergency has been contained and the protocol for massive transfusion has been stopped.
- Maintain oxygen saturation $>95\%$.

Fluid and debris in postpartum uterus



Fluid and debris in postpartum uterus



(A) Transabdominal sagittal greyscale image and (B) transvaginal color Doppler image from a 35-year-old woman two weeks postpartum with vaginal bleeding. Note the fluid and debris in the uterus. The color Doppler image shows no flow within the debris.

Courtesy of Deborah Levine, MD.

Sample algorithm of approach to PPH due to atony

Nursing workflow

Stage 0

All women receive:

Oxytocin 15 units/250 mL lactated ringers (LR)

OR

Oxytocin 10 units IM during third stage of labor

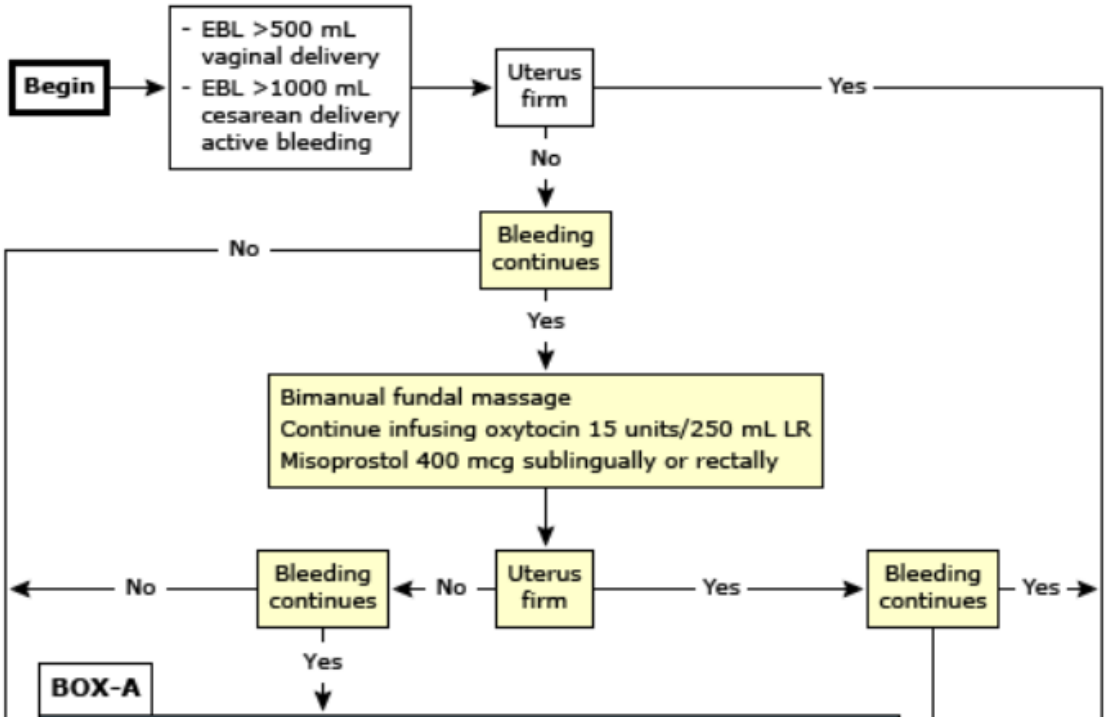
Stage 1

Communicate ongoing significant bleeding and signs of hemodynamic instability to team

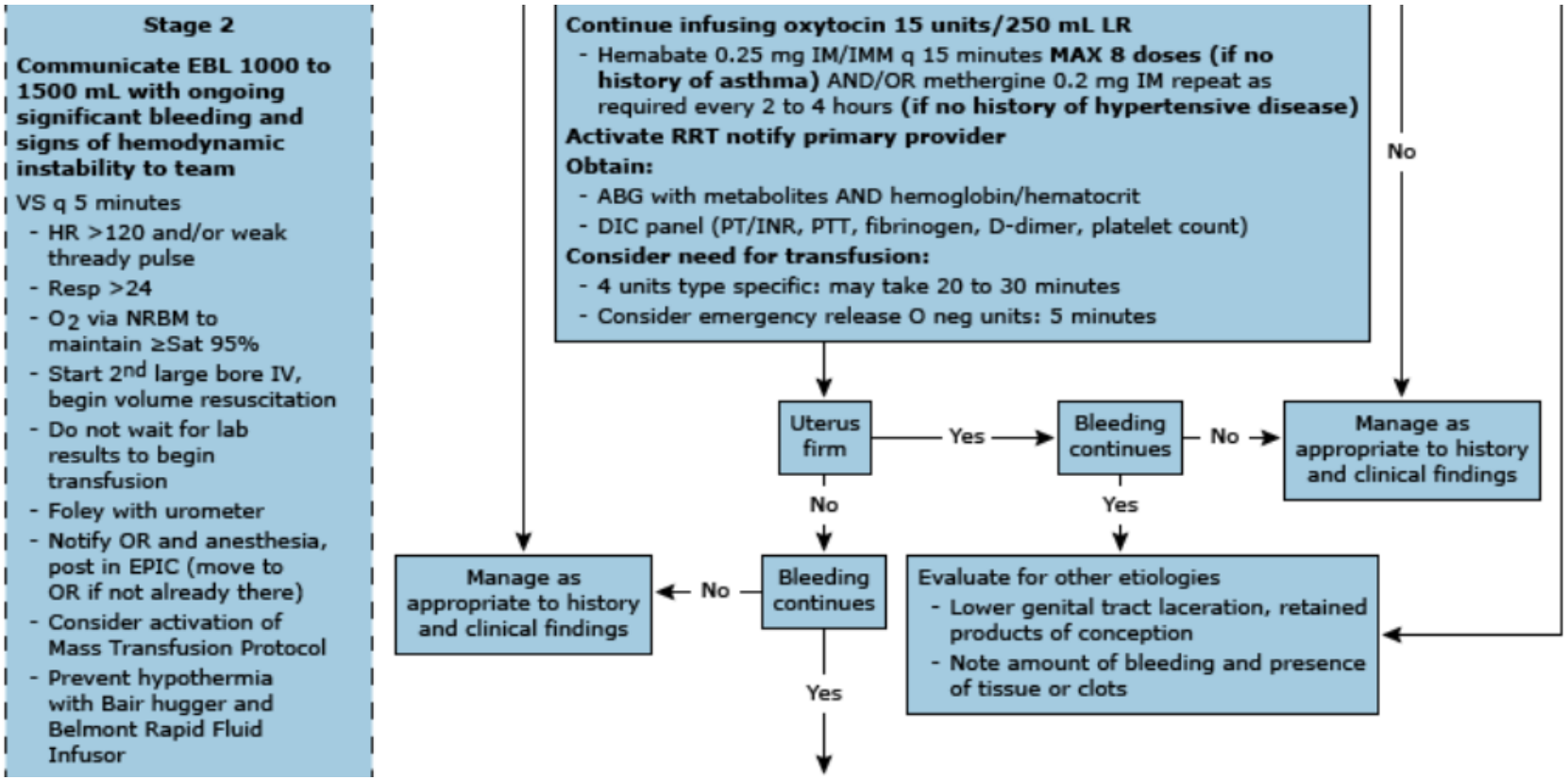
VS q 5 minutes

- O_2 via NRBM to maintain Sat ≥95%
- Notify charge nurse for additional RN
- LR volume resuscitation
- Empty bladder
- Keep patient warm

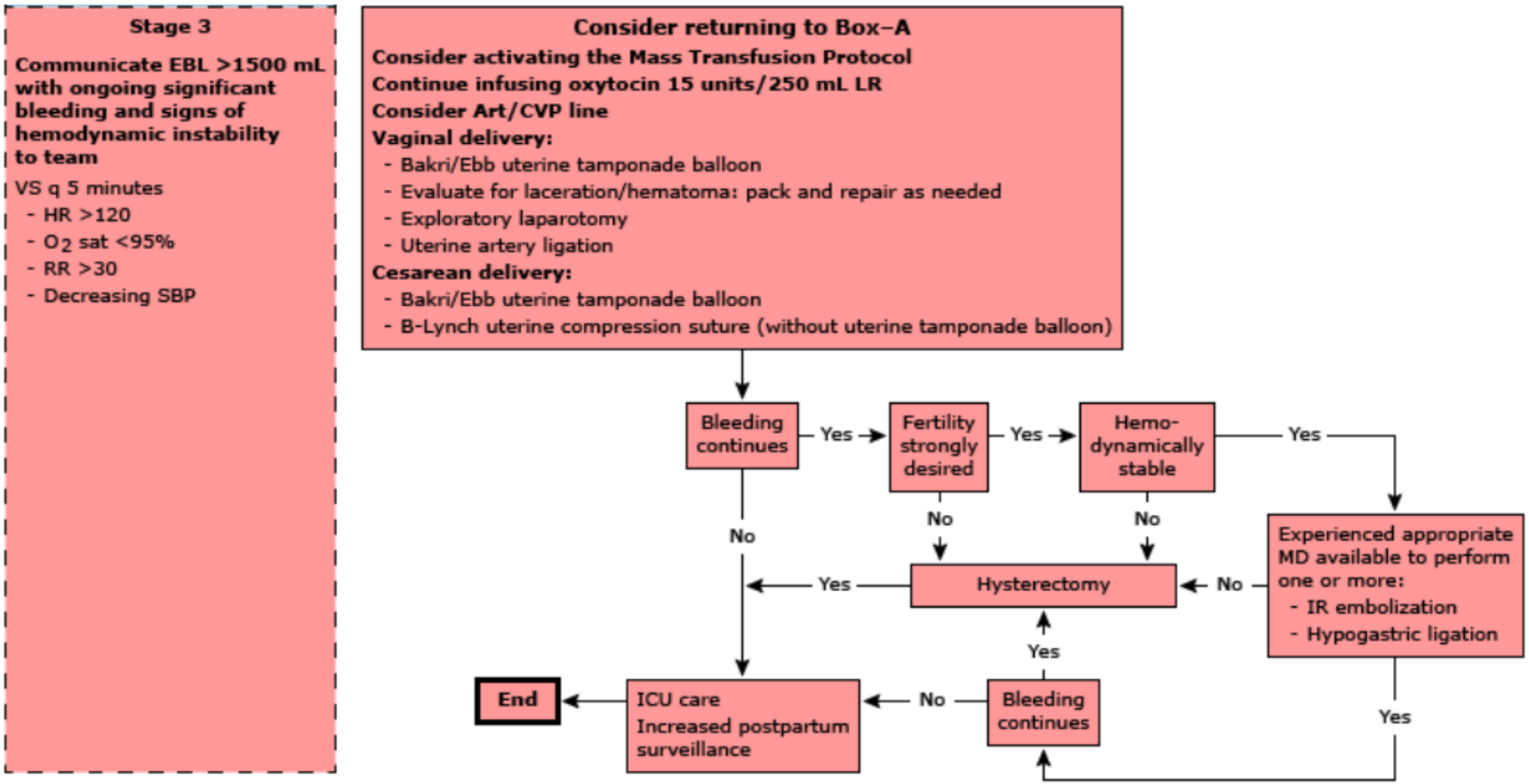
Physician workflow



Sample algorithm of approach to PPH due to atony



Sample algorithm of approach to PPH due to atony



exas Children's Hospital Evidence-Based Outcomes Center clinical algorithm for primary postpartum hemorrhage due to uterine atony.

سپاس از توجه شما