# POSTPARTUM HEMORRHAGE

29th Aug. 2023
ABEER ANNAB

# Findings of the 2021 National Maternal Mortality


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## Date: Nov 23, 2022

## Venue: Ministry of Health

**Disclaimer**

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**Acknowledgement:**

Jordan's Maternal Mortality Surveillance and Response System was made possible by the generous support of the American people through the United States Agency for International Development (USAID).


Jordan's Maternal Mortality Surveillance & Response System

النظام الوطني للرصد والإستجابة لوفيات الأمهات

| Year | Number of Live Births | Total Number of Deaths | Non COVID-19 Deaths | MMR | Non COVID-19 MMR |
|---|---|---|---|---|---|
| **2021** | **187,722** | **160** | **56** | **85.2** | ***29.8*** |
| 2020 | 176,557 | 68 | 53 | 38.5 | *30.0* |
| 2019 | 194,643 | 63 | 63 | 32.4 | *32.4* |
| 2018 | 207,917 | 62 | 62 | 29.8 | *29.8* |

| *Maternal Deaths by Direct and Indirect Causes of Death* | | | |
|---|---|---|---|
| **Cause of Death** | **Number** | **Percent** | **Non-COVID Percent*** |
| **Direct Causes of Death** | **34** | **21.3** | **60.7** |
| ***Obstetric hemorrhage*** | **13** | **8.1** | **23.2** |
| • Postpartum hemorrhage | **12** | 7.5 | 21.4 |
| • Antepartum Hemorrhage (Abruptio Placenta) | 1 | 0.6 | 1.8 |
| ***Other obstetric complications*** | **10** | **6.3** | **17.9** |
| • Obstetric embolism | 8 | 5.0 | 14.3 |
| ○ Pulmonary Embolism | 6 | 3.8 | 10.7 |
| ○ Amniotic Fluid Embolism | 2 | 1.3 | 3.6 |
| • Venous complications in pregnancy- Sagittal Sinus Thrombosis | *1* | *0.6* | 1.8 |
| • Complications of the puerperium- peripartum cardiomyopathy | *1* | *0.6* | 1.8 |
| **Hypertensive disorders in pregnancy, childbirth, and the puerperium** | **4** | **4.5** | **7.1** |

*Definition of PPH*

*Management of PPH by FIGO 2022*

*WHO DRILL for postpartum hemorrahge*

***Postpartum hemorrhage definitions from high-quality guidelines around the world:***

- ***American College of Obstetricians and Gynecologists (2017)***
- ***Dutch Society of Obstetrics and Gynecology (2012)***

***Definition of PPH:***

Any blood loss that causes hemodynamic instability
>1000 ml regardless of route of delivery

- ***Federation of Obstetric and Gynaecological Societies of India (2015)***
- ***French College of Gynaecologists and Obstetricians/French Society of Anesthesiology and Intensive Care (2016)***
- ***The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2017)***
- ***World Health Organization (2012)***

***Definition of PPH:***

>500 ml regardless of route of delivery

Severe PPH >1000 ml

- ***International Federation of Gynecology and Obstetrics (2012)***
- ***Society of Obstetricians and Gynaecologists of Canada (2018)***

***Definition:***

- Vaginal delivery >500 ml, cesarean delivery >1000 ml
- Any blood loss that has the potential to produce hemodynamic instability

- ***Royal College of Obstetricians and Gynaecologists (2016)***

***Definition:***

- >500 ml regardless of the route of delivery
- PPH mild: 500–1000 ml, moderate: 1000–2000 ml, severe: >2000 ml

# *Incidence*

PPH is generally reported to occur in 1 to 3% of births

When blood loss is measured quantitatively, prospective studies have reported PPH rates as high as 10%

# *Physiologic mechanisms that limit postpartum blood loss*

***Uterine bleeding is controlled by a combination of two mechanisms:***

*1-Mechanical hemostasis,* whereby contraction of the myometrium compresses the blood vessels supplying the placental bed, resulting in severely reduced blood flow

***2-Local thrombosis;*** whereby the presence or release of local decidual hemostatic factors (tissue factor and type-1 plasminogen activator inhibitor), and systemic coagulation factors (e.g. platelets, circulating clotting factors) lead to thrombosis of damaged blood vessels supplying the placental bed, resulting in severely reduced blood flow

The potential for **massive hemorrhage from pathology in these normal physiologic mechanisms is high because, in late pregnancy, uterine artery blood flow is 500 to 700 mL/min** and accounts for approximately 15% of cardiac output

***Risk factors* :**

- Uterine atony can be anticipated after prolonged labor particularly with the use of oxytocin
- In pregnancies complicated with chorioamnionitis
- High parity
- General anesthesia
- Uterine over distension such as multiple fetal gestation, polyhydramnios, and fetal macrosomia
- Previous history
- Instrumental delivery

- Coagulation problems can be divided into inherited, such as von willebrand diseases, hemophilia
- Idiopathic thrombocytopenic purpura, and acquired such as the use of anticoagulant therapy.
- Disseminated intravascular coagulopathy after placental abruption, pre-eclampsia with severe features, intrauterine fetal demise, sepsis, or amniotic fluid embolism
- Other etiologies include uterine inversion and abnormal placentation

# *Early recognition is vital*

- After each delivery make sure uterus is well contracted
- Apply active management of 3rd stage of labor for prevention of PPH
- Check for excessive vaginal bleeding either using vital signs or quantitative blood loss using visual estimation using pictorial reference guide
- Check maternal pads and bed sheets, measure weight of bloody materials dry and wet
- There is insufficient evidence to recommend proper way of estimation of blood loss quantitative or clinical estimation
- Shock index might be used

# A Pictorial Reference Guide to Aid Visual Estimation of Blood Loss at Obstetric Haemorrhage: Accurate Visual Assessment is Associated with Fewer Blood Transfusions

Dr Patrick Bose, Dr Fiona Regan, Miss Sara-Paterson Brown

a

Soiled Sanitary Towel
**30ml**

b

Soaked Sanitary Towel
**100ml**

c

Small Soaked Swab 10x10cm
**60ml**

d

Incontinence Pad
**250ml**

e

Large Soaked Swab 45x45cm
**350ml***

f

100cm Diameter Floor Spill
**1500ml***

g

PPH on Bed only
**1000ml**

h

PPH Spilling to Floor
**2000ml**

i

Full Kidney Dish
**500ml**

***Multidisciplinary observations of estimated blood loss revealed that scenarios (e-f) are grossly underestimated (> 30%)**

**For Further Information please contact Miss Sara Paterson-Brown**
**Delivery suite, Queen Charlottes Hospital, London**

# SHOCK INDEX

SI is defined as the ratio of heart rate to systolic blood pressure

The SI may improve the predictive capability of individual clinical signs, which aids early identification of women at risk of hypovolemia as the result of obstetric causes.

FIGO recommends use of the shock index in the diagnosis and management of PPH.

FIGO considers that the shock index can be a marker of the severity of PPH and can alert teams to hemodynamic instability when its value is greater than 0.9

# Maternal early warning criteria

| | |
|---|---|
| Systolic BP (mmHg) | <90 or >160 |
| Diastolic BP (mmHg) | >100 |
| Heart rate (beats per minute) | <50 or >120 |
| Respiratory rate (breaths per minute) | <10 or >30 |
| Oxygen saturation on room air, at sea level, % | <95 |
| Oliguria, mL/hour for ≥ 2 hours | <35 |
| Maternal agitation, confusion, or unresponsiveness; patient with preeclampsia reporting a non-remitting headache or shortness of breath. | |

# *FIGO recommendations for treatment of postpartum hemorrhage 2022*

1. Intravenous oxytocin alone is the recommended first-line uterotonic drug for the treatment of PPH

2. If intravenous oxytocin is unavailable, or if the bleeding does not respond to oxytocin, the use of intramuscular ergometrine, oxytocin–ergometrine fixed dose, or a prostaglandin drug (including sublingual misoprostol, 800 μg) is recommended.

3. There is no evidence about the safety and efficacy of an additional 800-μg dose of misoprostol for treatment of PPH when given to women who have already received 600 μg of prophylactic misoprostol orally.

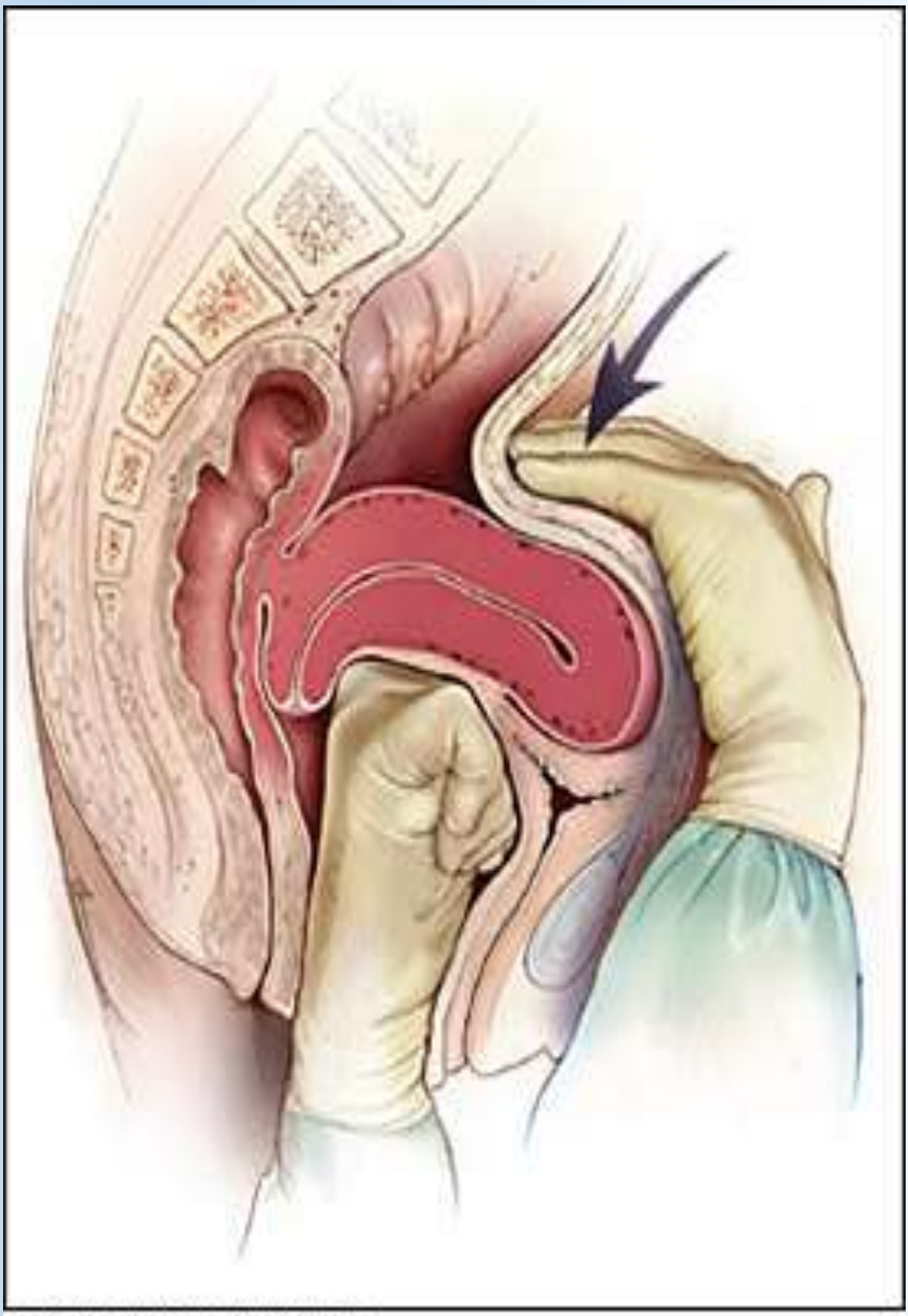
4. The use of isotonic crystalloids is recommended in preference to the use of colloids for the initial intravenous fluid resuscitation of women with PPH.

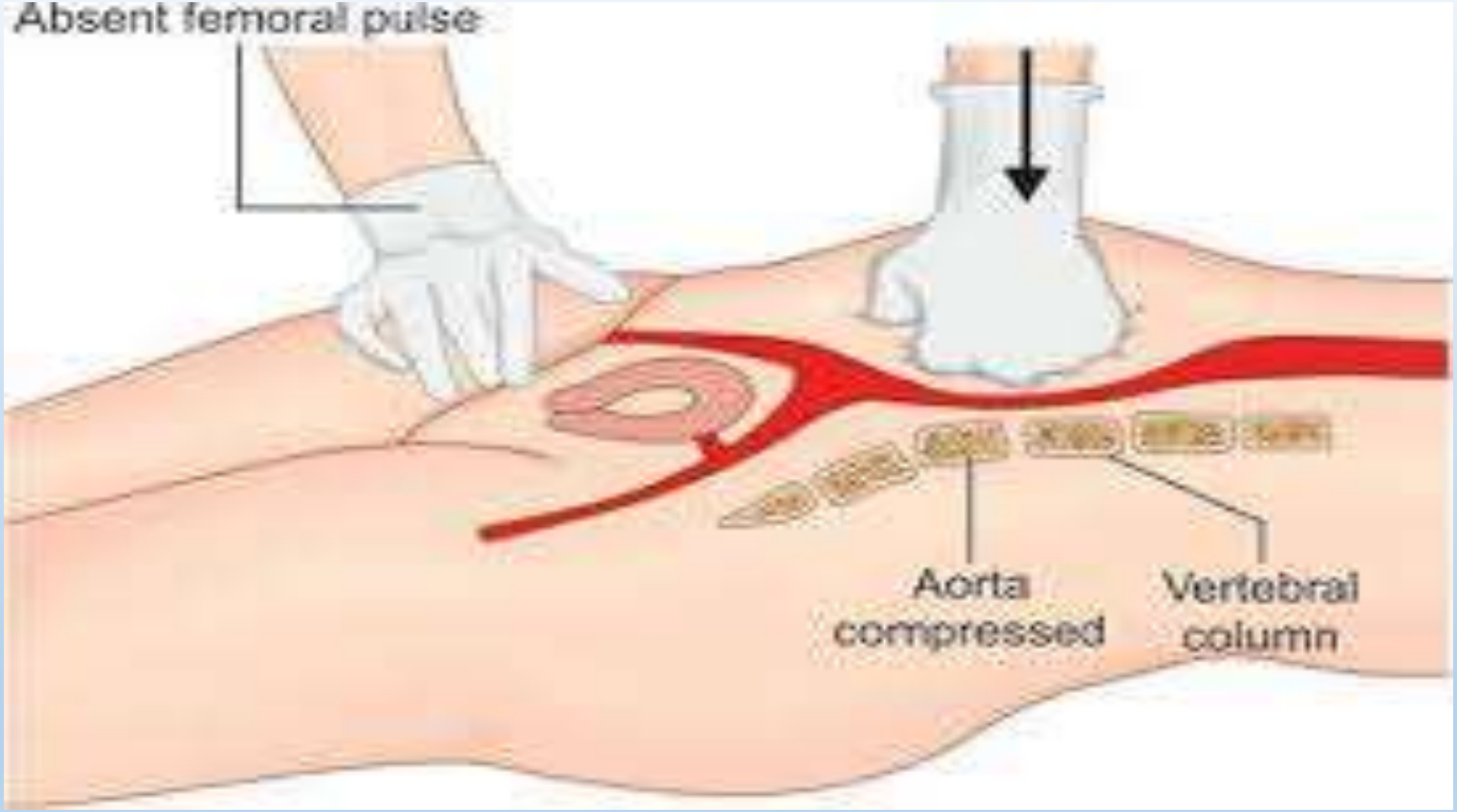
5. Early use of intravenous tranexamic acid as soon as PPH is diagnosed but within 3hours of birth in addition to standard care is recommended for women with clinically diagnosed PPH following vaginal birth or cesarean delivery.

6. Administration of 1gm (100 mg/ml) tranexamic acid intravenously at 1 ml/min (i.e. administered over 10 min), with a second dose of 1gm intravenously if bleeding continues after 30 min, or if bleeding restarts within 24 h of completing the first dose.
7. Reducing maternal deaths due to bleeding through scaling up of tranexamic acid for PPH treatment could have a positive impact on health equity and improve outcomes among disadvantaged women, especially in LMICs.

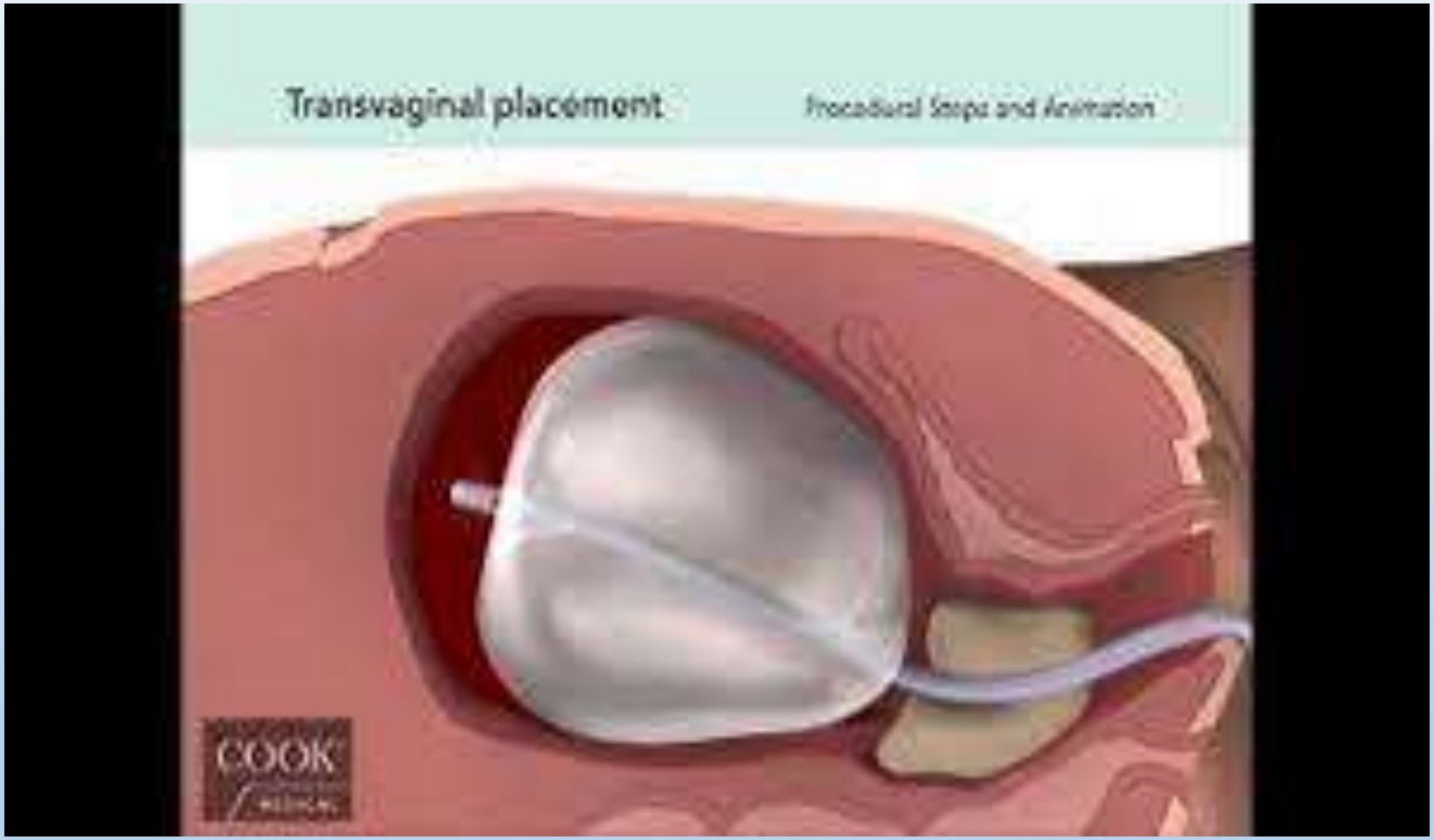
7. Uterine massage is recommended for the treatment of PPH.

8. The use of bimanual uterine compression or external aortic compression for the treatment of PPH due to uterine atony after vaginal birth is recommended as a temporizing measure until appropriate care is available.




Absent femoral pulse
Aorta compressed
Vertebral column

9. If women do not respond to treatment using uterotonics, or if uterotonics are unavailable, the use of uterine balloon tamponade is recommended as an effective nonsurgical technique that can potentially improve survival in women with PPH due to uterine atony after ruling out retained products of conception or uterine rupture as a contributing factor.


Transvaginal placement
Procedural Steps and Animation
COOK

10. Use of the nonpneumatic antishock garment is recommended as a temporizing measure until appropriate care is available.

# Nonpneumatic antishock garment (NASG)

3
2
1

The NASG is a low-technology, affordable, first-aid compression device for the management and stabilization of women with hypovolemic shock due to PPH and management of refractory PPH.

This device serves as a temporizing measure to recover hemodynamic stability to allow definitive surgical interventions, blood transfusions, or transfer to more specialized healthcare facilities.

Direct abdominal and pelvic compression reduces the total vascular space in the lower body and decreases pelvic perfusion to pelvic compartment organs.

The pressure applied increases cardiac output and the central circulation, allowing an increased distribution of blood flow to vital upper body organs (heart, lung, brains) and contributing to a rapid recovery from shock.

It can be disinfected and washed over 100 times without losing it's compressive effects. It is also adjustable for many women of different girths and height

This device can be used safely for up to 48 hours as a temporizing measure until hemodynamic stability or adequate hemorrhage control is achieved.

There are reports of the NASG used for longer up to 72 hours

Monitoring and removal

Every time a segment is opened, a 15-min period is allowed to re-evaluate vital signs and check for active bleeding.

If vital signs remain stable and there are no signs of active bleeding, it is safe to open the next segment.

However, if systolic blood pressure drops ≥ 20 mm Hg or heart rate increases ≥ 20 bpm (rule of 20’s) or active bleeding is identified, all of the segments must be rapidly closed again

This device should be present in every healthcare facility, as it has proven to be effective and safe, granting significant reductions in PPH-related mortality

11. The use of uterine packing is not recommended for the treatment of PPH due to uterine atony after vaginal birth.

12. Uterine artery embolization can be another conservative management measure for PPH if technical conditions and skilled human resources are available for its use.

13. If bleeding does not stop despite treatment using uterotonics and other available conservative interventions (e.g. uterine massage, balloon tamponade), the use of surgical interventions is recommended

    Surgical interventions include the use of compression suture techniques, uterine and hypogastric artery ligation, and hysterectomy.

14. The priority is to stop the bleeding before the patient develops coagulation problems and organ damage from under-perfusion.
15. Conservative approaches should be tried first, rapidly moving to more invasive procedures if these do not work.

***An easy way to remember the most common etiologies is to remember the four T's:***

1. Tone: uterine atony (accounts for 70% of PPH cases).
2. Trauma: genital tract trauma (15-20%)
3. Tissue: retained products of conception.
4. Thrombin: coagulopathy

# *Summary of pharmacological treatment*

| Guideline/ year of publication | Pharmacological treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st line uterotonic** | **Oxytocin** | **Ergot alkaloids** | **Misoprostol** | **Injectable prostaglandin** | **TXA** | **Carbetocin** |
| FIGO 2012 | Oxytocin | 10 IU IM<br>or<br>20–40 IU in 1 L of normal saline at 60 drops per minute<br>Continue oxytocin infusion (20 IU in 1 L of IV fluid at 40 drops per minute) until hemorrhage stops | Ergometrine or methylergometrine (used if oxytocin is not available or if bleeding continues despite having used oxytocin): 0.2 mg IM or can be given slowly IV, repeated every 2–4 h (maximum of 5 doses) | If oxytocin is not available or administration is not feasible):<br>Single dose of 800 μg sublingually (4×200 μg tablets) | Carboprost (should be offered as the third line of treatment): 0.25 mg IM Q15 min (maximum 2 mg) | Not mentioned | Carbetocin recommended as a second-line treatment: 100 μg IM or IV over 1 min |

# *Carbetocin*

- Synthetic oxytocin analogue
- Binds to oxytocin receptors at the smooth muscles of the uterus
- Resulting in rhythmic contractions of the uterus
- Increased frequency  of existing contractions and increased uterine tone
- Its prolonged effect is due to the  longer half life (40 min)
- More heat stable
- Starts acting in 2 min causing firm uterine contractions
- Duration of  action one hour  after iv and 2 hours after im
- Its use reduces the need for other uterotonics and the need for uterine massage

| Guideline/ year of publication | Pharmacological treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st line uterotonic** | **Oxytocin** | **Ergot alkaloids** | **Misoprostol** | **Injectable prostaglandin** | **TXA** | **Carbetocin** |
| WHO 2012 | Oxytocin | Does not specify | Ergometrine or oxytocin-ergometrine if IV oxytocin fails or if it is not available. Dosages not specified | 800 µg sublingual if IV oxytocin fails or if it is not available | Does not specify | Use in all cases of PPH, regardless of the cause. Used as soon as possible. Dose: 1 g IV, over 10 min, within 3 h of birth, with a second dose of 1 g IV if bleeding continues after 30 min or restart within 24 h of completing the first dose | |

| Guideline/ year of publication | Pharmacological treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st line uterotonic** | **Oxytocin** | **Ergot alkaloids** | **Misoprostol** | **Injectable prostaglandin** | **TXA** | **Carbetocin** |
| RCOG 2016 | Oxytocin (preferred initially) | Oxytocin 5 IU, by slow IV injection (may hav to repeat dose); oxytocin infusion (40 IU in 500 ml isotonic crystalloids at 125 ml/h) unless fluid restriction is necessary | Ergometrine 0.5 mg, slow IV or IM (contraindicated in women with hypertension) | 800 μg sublingual | Carboprost 0.25 mg IM, repeated at intervals of not less than 15 min to a maximum of 8 doses (use with caution in women with asthma) | Consider TXA 1 g IV | |

| Guideline/ year of publication | Pharmacological treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st line uterotonic** | **Oxytocin** | **Ergot alkaloids** | **Misoprostol** | **Injectable prostaglandin** | **TXA** | **Carbetocin** |
| ACOG 2017 | Healthcare provider's discretion | 10–40 IU per 500–1000 ml as continuous infusion (IV) or 10 IU IM | Methylergonovine 0.2 mg IM, every 2–4 h. Contraindicated in hypertension | 600–1000 μg, oral, sublingual, or rectal | Carboprost 0.25 mg IM, every 15–90 min, 8 doses maximum (can be used as intramyometrial) Contraindicated in asthma | Should be considered when initial medical therapy fails. Earlier use is likely to be superior to delayed treatment | |

| Guideline/ year of publication | Pharmacological treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st line uterotonic** | **Oxytocin** | **Ergot alkaloids** | **Misoprostol** | **Injectable prostaglandin** | **TXA** | **Carbetocin** |
| SOGC 2018 | Does not clearly specify | 10 IU IM (consider ability of the medication to reach a uterus with poor tissue perfusion); 5 IU IV push; 20–40 IU in 250 ml of normal saline, infused IV at 500–1000 ml/h | Ergometrine 0.25 mg IM or IV, can be repeated every 2 h | 400–800 μg; onset of effects is faster with oral or sublingual than rectally 800–1000 μg; effects are longer lasting with rectal than with oral | Carboprost 0.25 mg IM or intramyometrially ; can be repeated every 15 min, to a maximum of 2 mg (8 doses) Asthma is a relative contraindication | Not mentioned | Carbetocin recommended 100 mg iv ,im |

***Damage control resuscitation (DCR)*** consists of a series of strategies to minimize hemorrhage, prevent the deadly triad (coagulopathy, acidosis, and hypothermia), and maximize tissue oxygenation.

Efforts are focused on *limited use of crystalloids* , *massive blood transfusion*, *surgery interventional* , *radiology intervention and ICU control*

# *Indications for damage control surgery secondary to postpartum hemorrhage*

| Indication |
| --- |
| Systolic blood pressure <70 mm Hg |
| Body temperature <34˚C |
| Maternal blood pH <7.1 |
| Venous bleeding not suitable for surgical control |
| Persistent bleeding despite several transfusions of blood products (>10 units of PRBC) |
| Massive transfusion: 6 units of Red Blood Cells (during the first 4 h) |
| Increasing and continuous need for fluids due to active nonarterial bleeding |
| Hemodynamic instability, requiring persistent vasopressor support or that results in the development of ventricular arrhythmias |
| coagulopathy resulting from a combination of hypothermia (temperature <35˚C), acidosis (pH <7.3), and loss of coagulation factors |
| Duration of surgery >90 min |

# *Hysterectomy*

Operative time is a crucial determinant in patient survival. Prolonged operative time has been linked to adverse outcomes as it can institute an irreversible physiologic insult; thus, the need to keep operative time under 90 min

Pelvic packing should be performed with at least 7-10 compresses, according to reported experience

Temporary abdominal closure is performed

Prophylactic broad-spectrum antibiotics every 6-8 h until the abdominal packing is removed

# Resuscitation - ICU

At this stage, the patient must be transferred to the ICU to address the physiologic derangements of the hemorrhagic patient: coagulation disorders and metabolic abnormalities. Interdisciplinary care specialist is key for these patients as complications could arise at any time.

# Definitive surgery

After restoring normal physiology, it is considered safe to review the abdominal cavity.

This should be performed 48-72 h after the initial surgical procedure.

Patients may require one or more surgical interventions, depending on the operative findings.

In cases where further interventions are warranted, it is recommended to continue with techniques of temporary closure of abdominal cavity.

# Definitive closure of abdominal wall and cavity

The final stage is the definitive closure of the abdominal wall, which is performed after all surgeries have been successfully completed and all additional damage has been repaired.

# Complications

The main complications include:

- Infection of the surgical wound in 28% of cases,
- Presence of intra-abdominal collections in 20%,
- Evisceration in 10% of patients

FIGO recommends that damage control resuscitation (DCR) should be implemented in the management algorithms for major obstetric hemorrhage.

All countries should establish one or more referral hospital(s) and develop expert teams that are familiar with this strategy, the technique, and indications to be able to offer DCR (Damage Control Resuscitation)

# *Resuscitation*

There are two strategies for fluid resuscitation in patients with hemorrhage: ***the aggressive approach*** and the ***hypotensive resuscitation approach***.

Aggressive resuscitation refers to the traditionally used strategy in which the key principle is restoring the effective circulating blood volume, and rapid normalizing of blood pressure with administration of large amounts of crystalloids.

**Hypotensive resuscitation, also called permissive hypotension,** consists of restrictive crystalloid resuscitation during the early stages of a hemorrhagic shock to maintain lower than normal systolic or mean blood pressure, sustaining organ perfusion until control of the bleeding occurs.

In contrast, **hemostatic reanimation** is based on early and aggressive blood product replacement, transfusing red blood cells (PRBC), fresh frozen plasma (FFP), and platelets (PLT) in the same proportion as found in circulating blood to correct coagulopathy.

Hypotensive resuscitation and hemostatic reanimation are the fundamentals for DCR.

**Intravenous fluids**

**Ringer better than normal saline**

**Targeted BP**

**MAP 55-60 mm Hg**

**Systolic B.P 80-90 mm Hg**

Scientific evidence recommends the use of balanced crystalloid solutions such as Ringer’s lactate owing to the risk hyperchloremic acidosis and the worsening of kidney function with chlorine-rich fluids (saline solution)

# Transfusion ratios

There is no consensus on the optimal ratio of blood product replacement

Recommendations for RBC:FFP ratios vary widely (eg, RBC:FFP: 1:1, 2:1, 3:2, 6:4)

A pragmatic approach is 1 unit FFP for every 2 to 3 units of RBCs or 4 units FFP for every 6 units of RBCs.

If massive transfusion is needed, the recommended initial transfusion ratio for RBCs:FFP:platelets is typically 1:1:1 to mimic replacement of whole blood

A unit of cryoprecipitate contains 2 g fibrinogen for each 100 ml; thus, a unit of cryoprecipitate will increase serum fibrinogen by 10 mg/dl.

The usual dose of cryoprecipitate is 10 units, which is estimated to raise serum fibrinogen by100 mg/dl.

In any massive transfusion situation where multiple units of blood are rapidly transfused, calcium and potassium should be monitored

For hypocalcemia and hperkalemia

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.

Emergency replacement may be accomplished by infusing 1 gram of calcium chloride over two to five minutes via a central line. Alternatively, 1 to 2 grams of calcium gluconate can be infused intravenously over two to three minutes empirically for every four units of pRBCs transfused

**Ionized calcium** – Ionized calcium should be measured at baseline and then every 15 to 30 minutes during a massive transfusion, and then hourly for the next few hours after transfusions have been stopped because of potential rebound hypercalcemia and hypokalemia.

**Potassium** – Hyperkalemia may result from the rapid transfusion of multiple units of pRBCs, especially if they are older units.

Hyperkalemia may be prevented by using washed units of blood and an in-line K+ filter; however, in a massive transfusion situation, this is usually impractical.

When urgent reduction of K+ is needed, one commonly used regimen for administering insulin and glucose as 10 to 20 units of regular insulin in 500 mL of 10% dextrose, given intravenously over 60 minutes.

## Laboratory monitoring

Blood loss should be estimated every 15 to 30 minutes and laboratory studies drawn every 30 to 60 minutes to guide blood product replacement.

CBC , DIC work, Ca , K, ABGs

**Transfusion targets** — We continue to transfuse RBCs, platelets, cryoprecipitate, and FFP in patients with ongoing bleeding to achieve the following targets:

- Hemoglobin greater than 7.5 g/dL
- Platelet count greater than 50,000/$mm^3$
- Fibrinogen greater than 300 mg/dL
- Prothrombin time less than 1.5 times the control value
- Activated partial thromboplastin time less than 1.5 times the control value

At a minimum, we attempt to achieve:

- Platelet count >50,000/$mm^3$
- Fibrinogen level >50 to 100 mg/dL
- pH ≥7.2
- Absence of hypothermia
- Absence of hypocalcemia

| Component (volume) | Contents |
| --- | --- |
| Whole blood<br>(1 unit = 500 mL)* | RBCs, platelets, plasma |

* 450 mL blood and 63 mL citrate-phosphate-dextrose (COD) anticoagulant-preservative solution.

| Component (volume) | Contents |
| --- | --- |
| RBCs in additive solution (1 unit = 350 mL) | RBCs |

| Component (volume) | Contents |
| --- | --- |
| Cryoprecipitate, also called "cryo" (1 unit = 10 to 20 mL) | Fibrinogen; Factors VIII and XIII; VWF |

| Component (volume) | Contents |
| --- | --- |
| FFP or other plasma product¶ (1 unit = 200 to 300 mL) | All soluble plasma proteins and clotting factors |

| Component (volume) | Contents |
| --- | --- |
| Platelets (derived from whole blood or apheresis) (1 unit of apheresis platelets or a 5 to 6 unit pool of platelets from whole blood = 200 to 300 mL) | Platelets |

# WHO CAREPATHWAY FOR PPH

**Make initial assessment and start basic treatment:**

- ✓ Call for help
- ✓ Assess airway, breathing, and circulation (ABC)
- ✓ Provide supplementary oxygen
- ✓ Obtain an intravenous line
- ✓ Start fluid replacement with intravenous crystalloid fluid
- ✓ Monitor blood pressure, pulse and respiration
- ✓ Catheterize bladder and monitor urinary output
- ✓ Assess need for blood transfusion
- ✓ Order laboratory tests:
  - •Complete blood count
  - •Coagulation screen
  - •Blood grouping and crossmatch

**Start intravenous oxytocin infusion and consider:**

- Uterine massage
- Bimanual uterine compression
- External aortic compression
- Balloon or condom tamponade

# Drugs and dosages

**Oxytocin – treatment of choice:**

- 20–40 IU in 1 liter of intravenous fluid at 60 drops per minute, and 10 IU intramuscularly
- **Continue** oxytocin infusion (20 IU in 1 liter of intravenous fluid at 40 drops per minute) until hemorrhage stops

# Drugs and dosages

**Ergometrine – if oxytocin is unavailable or bleeding continues despite oxytocin:**

- 0.2 mg intramuscularly or intravenously (slowly), or Syntometrine® 1 ml
- After 15 minutes, repeat ergometrine 0.2 mg intramuscularly
- If required, administer 0.2 mg intramuscularly or intravenously (slowly) every 4 hours
- **Do not exceed** 1 mg (or five 0.2 mg doses)

# Drugs and dosages

**Prostaglandins – if oxytocin or ergometrine are unavailable or bleeding continues despite oxytocin and ergometrine:**

**Misoprostol**:

- 200–800 µg sublingually
- **Do not exceed** 800 µg

**Prostaglandin F2α:**

- 0.25 mg intramuscularly
- Repeat as needed every 15 minutes 0.25 mg intramuscularly
- **Do not exceed** 2 mg (or eight 0.25 mg doses)

# Drugs and dosages

**Tranexamic acid:**

- 1 g intravenously (taking 1 minute to administer)
- **If bleeding continues**, repeat 1 g after 30 minutes

# Observe factors related to bleeding and determine cause

**Uterine atony:**
Uterus soft and relaxed

**Treat for uterine atony**

- Uterine massage
- Uterotonic drugs:
  - Oxytocin
  - Ergometrine
  - Prostaglandins
    - Misoprostol
    - Prostaglandin F2α

**If bleeding continues**

- Nonsurgical uterine compression:
  - Bimanual uterine compression
  - Balloon or condom tamponade
- Tranexamic acid

**If bleeding continues:**

- Compression sutures
- Artery ligation (uterine, hypogastric)
- Uterine artery embolization

**If bleeding continues:**

- Hysterectomy
- If intra-abdominal bleeding occurs after hysterectomy, consider abdominal packing

**Placenta not delivered**

**Treat for whole retained placenta**

- Oxytocin
- Controlled cord traction
- Intraumbilical vein injection

  (if no bleeding)

**If whole placenta still retained**

- Manual removal with prophylactic antibiotics

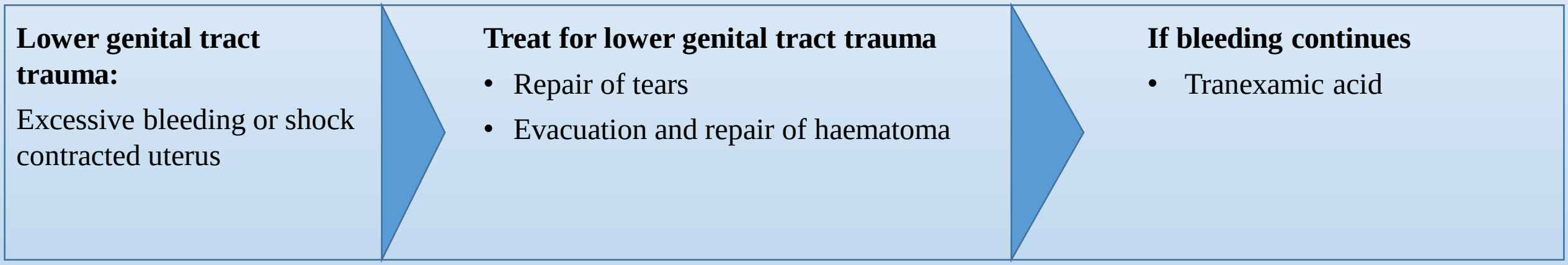
**Placenta delivered incomplete**

**Treat for retained placenta fragments**

- Oxytocin
- Manual exploration to remove fragments
- Gentle curettage or aspiration

**If bleeding continues**

- Manage as uterine atony


**Lower genital tract trauma:**
Excessive bleeding or shock contracted uterus
**Treat for lower genital tract trauma**
• Repair of tears
• Evacuation and repair of haematoma
**If bleeding continues**
• Tranexamic acid

**Uterine rupture or dehiscence:**

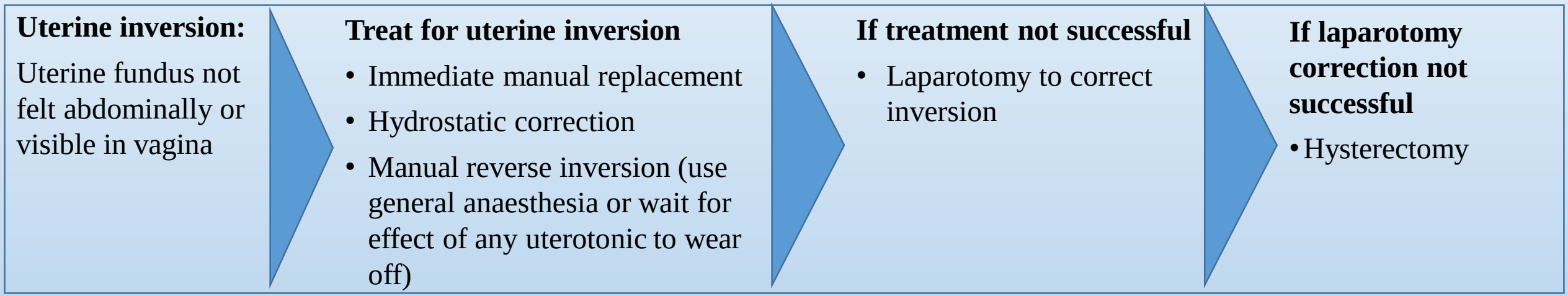
excessive bleeding or shock

**Treat for uterine rupture or dehiscence**

- Laparotomy for primary repair of uterus
- Hysterectomy if repair fails

**If bleeding continues**

- Tranexamic acid


Uterine inversion:
Uterine fundus not felt abdominally or visible in vagina
Treat for uterine inversion
• Immediate manual replacement
• Hydrostatic correction
• Manual reverse inversion (use general anaesthesia or wait for effect of any uterotonic to wear off)
If treatment not successful
• Laparotomy to correct inversion
If laparotomy correction not successful
• Hysterectomy

**Clotting disorder:**

bleeding in the absence of above conditions

**Treat for clotting disorder**

Treat as necessary with blood products

Dear Lord,
THANK YOU
for saving
my mother

TAX forms a reversible complex that displaces plasminogen from fibrin resulting in inhibition of fibrinolysis and inhibition of the proteolytic activity of plasmin.

**Misoprostol (PGE1)** is most useful for reducing blood loss in settings where injectable uterotonics are unavailable or contraindicated (eg, hypertension, asthma). A meta-analysis found no clear evidence that misoprostol is more effective than other uterotonics either for primary therapy of PPH or as an adjunctive treatment to oxytocin infusion. In addition, the side effect of hyperthermia is a significant disadvantage of this medication because it is uncomfortable, triggers a work up for sepsis, and may lead to unnecessary empiric antibiotic therapy.

**Misoprostol (PGE1)**

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

The most commonly used rectal doses are 800 to 1000 mcg.

Rectally administrated misoprostol has a longer duration of action than oral/sublingual routes (four hours versus two to three hours), which is advantageous in PPH and may be necessary in semi-conscious or unconscious patients.

# Symptoms related to blood loss with postpartum hemorrhage

| Blood loss, % (ML) | Systolic blood pressure, mmHg | Signs and symptoms |
|---|---|---|
| 10 to 15 (500 - 1000) | Normal and ≥ 90 | Palpitation, lightheadness, no or mild increase in heart rate |
| 15 to 25 (1000 - 1500) | 80 to 90 | Weakness, sweating, tachycardia (100-120 beats/min), tachypnea (respiratory rate of 20 to 24) |
| 25 to 35 (1500 - 2000) | 70 to 80 | Restlessness, confusion, pallor, oliguria, tachycardia (120-140 beats/min), cool and clammy skin |
| 35 to 45 (2000 – 3000) | 50 to 70 | Lethargy, air hunger, anuria, collapse, tachycardia (>140 beats/min) |