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FIGO GUIDELINES

Prevention and treatment of postpartum hemorrhage in low-resource settings[☆]

FIGO Safe Motherhood and Newborn Health (SMNH) Committee

Introduction

This statement does not change the 2 previous statements on management of the third stage of labor (both available at <http://www.figo.org/projects/prevent/pph>): ICM/FIGO Joint Statement – Management of the Third Stage of Labour to Prevent Post-partum Haemorrhage [1]; and ICM/FIGO Joint Statement – Prevention and Treatment of Post-partum Haemorrhage: New Advances for Low Resource Settings [2].

The following guideline provides a comprehensive document regarding best practice for the prevention and treatment of postpartum hemorrhage (PPH) in low-resource settings.

FIGO is actively contributing to the global effort to reduce maternal death and disability around the world. Its mission statement reflects a commitment to the promotion of health, human rights, and wellbeing of all women—especially those at greatest risk for death and disability associated with childbearing. FIGO promotes evidence-based interventions that, when applied with informed consent, can reduce the incidence of maternal morbidity and mortality.

This statement reflects the best available evidence, drawn from scientific literature and expert opinion, on the prevention and treatment of PPH in low-resource settings.

Approximately 30% (in some countries, over 50%) of direct maternal deaths worldwide are due to hemorrhage, mostly in the postpartum period [3]. Most maternal deaths due to PPH occur in low-income countries in settings (both hospital and community) where there are no birth attendants or where birth attendants lack the necessary skills or equipment to prevent and manage PPH and shock. The Millennium Development Goal of reducing the maternal mortality ratio by 75% by 2015 will remain beyond our reach unless we prioritize the prevention and treatment of PPH in low-resource areas [4].

FIGO endorses international recommendations that emphasize the provision of skilled birth attendants and improved obstetric services as central to efforts to reduce maternal and neonatal mortality. Such policies reflect what should be a basic right for every woman. Addressing PPH will require a combination of approaches to expand access to skilled care and, at the same time, extend life-saving interventions

along a continuum of care from community to hospital [1,2]. The different settings where women deliver along this continuum require different approaches to PPH prevention and treatment.

Call to action

Despite Safe Motherhood activities since 1987, women are still dying in childbirth. Women living in low-resource settings are most vulnerable owing to concurrent disease, poverty, discrimination, and limited access to health care. FIGO has a central role to play in improving the capacity of national obstetric and midwifery associations to reduce maternal death and disability through safe, effective, feasible, and sustainable strategies to prevent and treat PPH. In turn, national obstetric and midwifery associations must lead the effort to implement the approaches described in this statement.

Professional associations can mobilize to:

- Lobby governments to ensure healthcare for all women.
- Advocate for every woman to have a midwife, doctor, or other skilled attendant at birth.
- Disseminate this statement to all members through all available means, including publication in national newsletters or professional journals.
- Educate their members, other healthcare providers, policy makers, and the public about the approaches described in this statement and about the need for skilled care during childbirth.
- Address legislative and regulatory barriers that impede access to life-saving care, especially policy barriers that currently prohibit midwives and other birth attendants from administering uterotonic drugs.
- Ensure that all birth attendants have the necessary training—appropriate to the settings where they work—to administer uterotonic drugs safely and implement other approaches described in this statement, and ensure that uterotonics are available in sufficient quantity to meet the need.
- Call upon national regulatory agencies and policy makers to approve misoprostol for PPH prevention and treatment and to ensure that current best-evidence regimens are adopted.
- Incorporate the recommendations from this statement into current guidelines, competencies, and curricula.

We also call upon funding agencies to help underwrite initiatives aimed at reducing PPH through the use of cost-effective, resource-appropriate interventions.

[☆] These guidelines were reviewed and approved in June 2011 by the FIGO Executive Board and SMNH Committee.

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Postpartum hemorrhage definition

Postpartum hemorrhage has been defined as blood loss in excess of 500 mL in a vaginal birth and in excess of 1 L in a cesarean delivery [5]. For clinical purposes, any blood loss that has the potential to produce hemodynamic instability should be considered a PPH. Clinical estimates of blood loss are often inaccurate.

Primary postpartum hemorrhage

Primary (immediate) PPH occurs within the first 24 hours after delivery. Approximately 70% of immediate PPH cases are due to uterine atony. Atony of the uterus is defined as the failure of the uterus to contract adequately after the child is born.

Secondary postpartum hemorrhage

Secondary (late) PPH occurs between 24 hours after delivery of the infant and 6 weeks post partum. Most late PPH is due to retained products of conception, infection, or both.

Etiology

It may be helpful to think of the causes of PPH in terms of the 4 “T”s:

- Tone: uterine atony, distended bladder.
- Trauma: uterine, cervical, or vaginal injury.
- Tissue: retained placenta or clots.
- Thrombin: pre-existing or acquired coagulopathy.

The most common and important cause of PPH is uterine atony. Myometrial blood vessels pass between the muscle cells of the uterus; the primary mechanism of immediate hemostasis following delivery is myometrial contraction causing occlusion of uterine blood vessels—the so-called “living ligatures” of the uterus (Fig. 1).

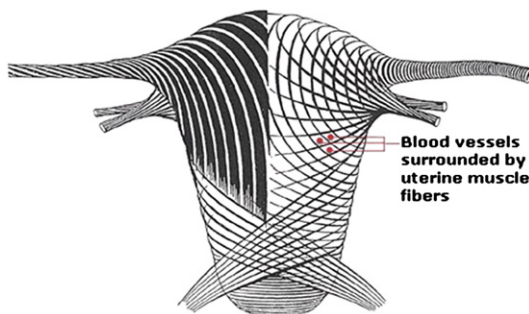


Fig. 1. Muscle fibers of the uterus. Image reproduced, with permission, from Ref. [6].

Prevention of postpartum hemorrhage

Pregnant women may face life-threatening blood loss at the time of birth. Anemic women are more vulnerable to even moderate amounts of blood loss. Most PPH can be prevented. Different approaches may be employed, depending on the setting and the availability of skilled birth attendants and supplies.

Active management of the third stage of labor

Data support the routine use of active management of the third stage of labor (AMTSL) by all skilled birth attendants, regardless of where they practice; AMTSL reduces the incidence of PPH, the quantity of blood loss, and the need for blood transfusion, and thus should be included in any program of intervention aimed at reducing death from PPH [7].

The usual components of AMTSL include:

- Administration of oxytocin (the preferred storage of oxytocin is refrigeration but it may be stored at temperatures up to 30 °C for up to 3 months without significant loss of potency) or another uterotonic drug within 1 minute after birth of the infant.
- Controlled cord traction.
- Uterine massage after delivery of the placenta.

The Bristol [8] and Hinchingbrooke [9] studies compared active versus expectant (physiologic) management of the third stage of labor. Both studies clearly demonstrated that, when active management was applied, the incidence of PPH was significantly lower (5.9% with AMTSL vs 17.9% with expectant management [8]; and 6.8% with AMTSL vs 16.5% without [9]) (Table 1).

Step 1: How to use uterotonic agents

- Within 1 minute of delivery of the infant, palpate the abdomen to rule out the presence of an additional infant(s) and give oxytocin 10 IU intramuscularly (IM). Oxytocin is preferred over other uterotonic drugs because it is effective 2–3 minutes after injection, has minimal adverse effects, and can be used in all women.
- If oxytocin is not available, other uterotonics can be used, such as: ergometrine or methylergometrine 0.2 mg IM; syntometrine (a combination of oxytocin 5 IU and ergometrine 0.5 mg per ampoule IM [10]); or misoprostol 600 µg orally. Uterotonics require proper storage:
 - Ergometrine or methylergometrine: 2–8 °C and protect from light and from freezing.
 - Misoprostol: in aluminum blister pack, room temperature, in a closed container.
 - Oxytocin: 15–30 °C, protect from freezing.
- Counseling on the adverse effects and contraindications of these drugs should be given.

Warning! Do not give ergometrine, methylergometrine, or syntometrine (because it contains ergot alkaloids) to women with heart disease, pre-eclampsia, eclampsia, or high blood pressure.

Table 1
Active versus physiologic management of PPH.

| | When active management of the third stage was applied | When expectant management of the third stage was applied | Odds ratio (95% confidence interval) |
|--------------------------|---|--|--------------------------------------|
| Bristol trial [8] | 50 PPH cases per 846 women (5.9%) | 152 PPH cases per 849 women (17.9%) | 3.13 (2.3–4.2) |
| Hinchingbrooke trial [9] | 51 PPH cases per 748 women (6.8%) | 126 PPH cases per 764 women (16.5%) | 2.42 (1.78–3.3) |

Abbreviation: PPH, postpartum hemorrhage.

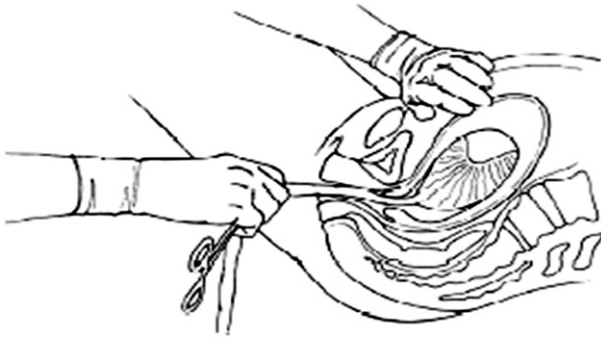


Fig. 2. Controlled cord traction.

Misoprostol and the prevention of postpartum hemorrhage

The 18th Expert Committee on the Selection and Use of Essential Medicines met in March 2011 and approved the addition of misoprostol for the prevention of PPH to the WHO Model List of Essential Medicines. It reported that misoprostol 600 µg administered orally can be used for the prevention of PPH where oxytocin is not available or cannot be safely used. Misoprostol should be administered by healthcare workers trained in its use during the third stage of labor, soon after birth of the infant, to reduce the occurrence of PPH [11,12]. The most common adverse effects are transient shivering and pyrexia. Education of women and birth attendants in the proper use of misoprostol is essential. Recent studies in Afghanistan and Nepal demonstrate that community-based distribution of misoprostol can be successfully implemented under government health services in a low-resource setting and, accompanied by education, can be a safe, acceptable, feasible, and effective way to prevent PPH [13,14].

The usual components of management of the third stage of labor with misoprostol include:

- A single dose of 600 µg administered orally (data from 2 trials comparing misoprostol with placebo show that misoprostol 600 µg given orally reduces PPH with or without controlled cord traction or use of uterine massage [8]).
- Controlled cord traction **only** when a skilled attendant is present at the birth.
- Uterine massage after delivery of the placenta, as appropriate.

Step 2: How to do controlled cord traction (Fig. 2)

- If the newborn is healthy, you can clamp the cord close to the perineum once cord pulsations stop or after approximately 2 minutes and hold the cord in one hand (immediate cord clamping may be necessary if the newborn requires resuscitation) [15,16].

- Place the other hand just above the woman's pubic bone and stabilize the uterus by applying counter-pressure during controlled cord traction.
- Keep slight tension on the cord and await a strong uterine contraction (2–3 minutes).
- With the strong uterine contraction, encourage the mother to push and very gently pull downward on the cord to deliver the placenta. Continue to apply counter-pressure to the uterus.
- If the placenta does not descend during 30–40 seconds of controlled cord traction, do not continue to pull on the cord:
 - Gently hold the cord and wait until the uterus is well contracted again.
 - With the next contraction, repeat controlled cord traction with counter-pressure.

Never apply cord traction (gentle pull) without applying counter-traction (push) above the pubic bone on a well-contracted uterus.

- As the placenta delivers, hold the placenta in 2 hands and gently turn it until the membranes are twisted. Slowly pull to complete the delivery.
- If the membranes tear, gently examine the upper vagina and cervix wearing sterile/disinfected gloves and use a sponge forceps to remove any pieces of membrane that are present.
- Look carefully at the placenta to be sure none of it is missing (Figs. 3 and 4). If a portion of the maternal surface is missing or there are torn membranes with vessels, suspect retained placenta fragments and take appropriate action [17].

Step 3: How to do uterine massage

- Immediately after expulsion of the placenta, massage the fundus of the uterus through the abdomen until the uterus is contracted.
- Palpate for a contracted uterus every 15 minutes and repeat uterine massage as needed during the first 2 hours.
- Ensure that the uterus does not become relaxed (soft) after you stop uterine massage.

In all of the above actions, explain the procedures and actions to the woman and her family. Continue to provide support and reassurance throughout.

Management of the third stage of labor in the absence of uterotonic drugs

FIGO promotes the routine use of AMTSL as the best, evidence-based approach for the prevention of PPH and emphasizes that every effort should be made to ensure that AMTSL is used at every vaginal birth where there is a skilled birth attendant. However, FIGO recognizes that there may be circumstances where the accessibility

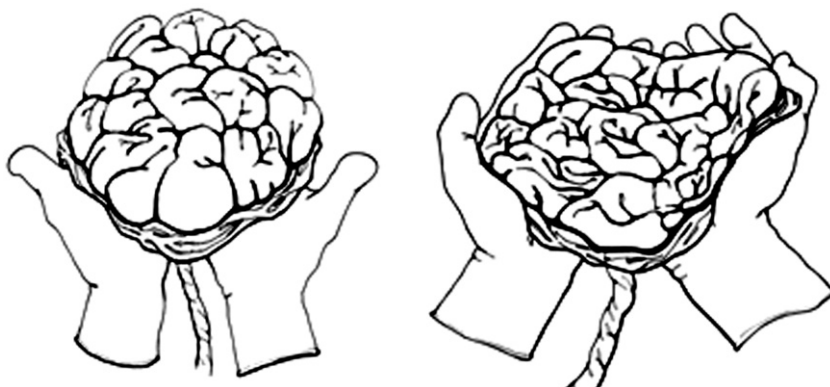


Fig. 3. Examining the maternal side of the placenta. Reproduced, with permission, from Ref. [18].



Fig. 4. Examining the fetal side of the placenta. Reproduced, with permission, from Ref. [19].

or the supply of uterotonics may be sporadic owing to interruptions in the supply chain, or it may be nonexistent in a country because it is not part of the approved list of essential medicines or included in the national guidelines/protocols. It is in this context that the birth attendant must know how to provide safe care (physiologic management) to prevent PPH in the absence of uterotonic drugs (Table 2).

The following guide reflects the best practice, drawn from scientific literature and expert opinion, in the management of the third stage when uterotonics are not available.

Physiology of the third stage

Excerpt from *Williams Obstetrics* [19]:

Near term, it is estimated that at least 600 mL/min of blood flows through the intervillous space. This flow is carried by spiral arteries and accompanying veins. With separation of the placenta, these vessels are avulsed. Hemostasis at the placenta site is achieved first by contraction of the myometrium that compresses the blood vessels followed by subsequent clotting and obliteration of their lumens. Thus, adhered pieces of placenta or large blood clots that prevent effective myometrium contraction can impair hemostasis at the implantation site.

Fatal post partum haemorrhage can result from uterine atony despite normal coagulation however conversely, if the myometrium within and adjacent to the denuded implantation site contracts vigorously, fatal hemorrhage from the placenta implantation site is unlikely, even in circumstances when coagulation may be severely impaired.

Table 2
Comparison of expectant (physiologic) versus AMTSL.^a

| | Physiologic (expectant) management | Active management |
|-------------------------------|---|--|
| Uterotonic | Uterotonic is not given before the placenta delivered | Uterotonic is given within one minute of the baby's birth (after ruling out the presence of a second baby) |
| Signs of placental separation | Wait for signs of separation: Gush of blood Lengthening of cord Uterus becomes rounder and smaller as the placenta descends | Do not wait for signs of placental separation. Instead: palpate the uterus for a contraction Wait for the uterus to contract |
| Delivery of the placenta | Placenta delivered by gravity assisted by maternal effort | Apply CCT with counter traction Placenta delivered by CCT while supporting and stabilizing the uterus by applying counter traction |
| Uterine massage | Massage the uterus after the placenta is delivered | Massage the uterus after the placenta is delivered |
| Advantages | Does not interfere with normal labor process Does not require special drugs/supplies May be appropriate when immediate care is needed for the baby (such as resuscitation) and no trained assistant is available May not require a birth attendant with injection skills | Decreases length of third stage Decrease likelihood of prolonged third stage Decreases average blood loss Decreases the number of PPH cases Decreases need for blood transfusion |
| Disadvantages | Length of third stage is longer compared to AMTSL | Requires uterotonic and items needed for injection safety |

Abbreviation: CCT, controlled cord traction.

^a Table reproduced, with permission, from Ref. [6].

Immediately following the birth and while awaiting delivery of the placenta

The birth attendant:

- Ensures the birth will be conducted in a semi-sitting position and/or position of comfort for the mother, and places the infant on the mother's thorax/chest to provide skin-to-skin contact for warmth and to encourage breast feeding as soon as possible.
- Monitors both the mother's and the infant's vital signs (see below).

In the case where the birth attendant needs to care for another woman in labor/delivery, she needs to find help to observe vital signs and/or bleeding. In this case, the person who takes over monitoring of vital signs needs to report back to the primary birth attendant.

Umbilical cord management

The cord is left alone until either it has stopped pulsating or the placenta has been delivered, at which point the cord is then clamped or tied and cut.

Physiologic signs of placental separation

The birth attendant visually observes for the following signs:

- A change in the size, shape, and position of the uterus; palpating the uterus should be avoided.
- A small gush of blood.
- The cord lengthens at the vaginal introitus.
- The woman may become uncomfortable, experience contractions, or feel that she wants to change position. She may also indicate heaviness in the vagina and a desire to bear down.

Most placentas will be delivered within 1 hour; if this does not occur, the attendant must seek further assistance. If there is presence of excessive bleeding at any time, further assistance and/or transfer needs to be effected and treatment of PPH initiated.

Facilitating delivery of the placenta

Upon observation of the signs of placental separation, the birth attendant:

- Encourages the woman into an upright position.

- Either waits for the placenta to be expelled spontaneously or encourages the woman to push or bear down with contractions to deliver the placenta (which should be encouraged only after signs of separation have been noted).
- Catches the placenta in cupped hands or a bowl. If the membranes are slow to deliver, the birth attendant can assist by holding the placenta in 2 hands and gently turning it until the membranes are twisted, then exerting gentle tension to complete the delivery. Alternatively, the attendant can grasp the membranes gently and ease them from the vagina with an up-and-down motion of the hand.

Controlled cord traction is not recommended in the absence of uterotonic drugs or prior to signs of separation of the placenta because this can cause partial placental separation, a ruptured cord, excessive bleeding, and/or uterine inversion.

Postpartum care regardless of third-stage management

Immediately following the birth of the placenta

The birth attendant:

- Monitors the mother's vital signs every 5–10 minutes during the first 30 minutes, then every 15 minutes for the next 30 minutes, and then every 30 minutes for the next 2 hours.
 - Blood pressure, pulse, level of the uterine fundus.
 - Massages the uterus, looks for bleeding, and makes sure the uterus is contracted (the uterus will be found in the area around the navel and should feel firm to the touch).
- Observes the infant's color, respirations, and heart rate every 15 minutes for the first 2 hours.
- Examines the placenta for completeness.

Treatment of postpartum hemorrhage

Even with major advances in prevention of PPH, some women will still require treatment for excessive bleeding. Timely interventions and appropriate access, or referral and transfer to basic or comprehensive emergency obstetric care (EmOC) facilities for treatment are essential to saving the lives of women.

All healthcare professionals should be trained to prevent PPH, to recognize the early signs of PPH, and to be able to treat PPH. Healthcare professionals should refresh their knowledge and skills in emergency obstetrics on a regular basis through workshops that include didactic practical exercises and evaluations. There exist several in-service emergency obstetric courses developed to provide skill in this area, which are offered globally, such as ALSO, MOET, ALARM, MORE^{OB}, and JHPIEGO. It is also recommended that obstetric units in hospitals introduce regular emergency drills for care of PPH. Once introduced, such emergency drills are invaluable for keeping all staff updated and alert to the emergency treatment of PPH, eclampsia, and other major obstetric emergencies.

Community-based emergency care: Home-based life-saving skills [12]

Anyone who attends a birth can be taught simple home-based life-saving skills (HBLSS). Community-based obstetric first aid with HBLSS is a family- and community-focused program that aims to increase access to basic life-saving measures and decrease delays in reaching referral facilities. Family and community members are taught techniques such as uterine fundal massage and emergency preparedness. Field tests suggest that HBLSS can be a useful adjunct in a comprehensive PPH prevention and treatment program [20].

Key to the effectiveness of treatment is early identification of hemorrhage and prompt initiation of treatment.

Clinical management of postpartum hemorrhage

Currently, the standard of care in basic EmOC facilities includes administration of intravenous (IV)/IM uterotonic drugs and manual removal of the placenta/retained products of conception; comprehensive EmOC facilities would also include blood transfusion and/or surgery [21]. FIGO recommends the following drug regimens for the prevention and treatment of PPH (Fig. 5).

Oxytocin

Oxytocin is the preferred uterotonic. It stimulates the smooth-muscle tissue of the upper segment of the uterus—causing it to contract rhythmically, constricting blood vessels, and decreasing blood flow through the uterus. It is a safe and effective first choice for treatment of PPH. For a sustained effect, IV infusion is preferred because it provides a steady flow of the drug. Uterine response subsides within 1 hour of cessation of IV administration [1,19].

Ergot alkaloids

Ergot alkaloids such as ergometrine, methylergometrine, and syn-tometrine cause the smooth muscle of both the upper and the lower uterus to contract tetanically. Although the ampoules can be found in different concentrations (either 0.2 mg/mL or 0.5 mg/mL), the recommended dose of ergometrine or methylergometrine is 0.2 mg IM, which can be repeated every 2–4 hours for a maximum of 5 doses (1 mg) in a 24-hour period. Ergot alkaloids are contraindicated in women with hypertension, cardiac disease, or pre-eclampsia because they can cause hypertension.

Misoprostol

Research has shown that a single dose of misoprostol 800 µg (4×200-µg tablets) administered sublingually is a safe and effective treatment for PPH due to uterine atony in women who have received oxytocin prophylaxis, as well as those who have received no oxytocin prophylaxis, during the third stage of labor [22,23]. In home births without a skilled attendant, misoprostol may be the only technology available to control PPH. Studies on treatment of PPH found that misoprostol significantly reduces the need for additional interventions [24]. Rarely, non-fatal hyperpyrexia has been reported after 800 µg of oral misoprostol [25]. There is no evidence about the safety and efficacy of the 800-µg dose for treatment of PPH when given to women who have already received 600 µg of prophylactic misoprostol orally. There is evidence that misoprostol provides no added benefit when given simultaneously with other injectable uterotonic drugs for the treatment of PPH, and therefore misoprostol as an adjunct treatment with oxytocin for PPH is not recommended [26].

Management of postpartum hemorrhage

Definition of postpartum hemorrhage:

- Blood loss is more than 500 mL or 2 cups after a vaginal delivery, or in excess of 1 L after a cesarean delivery.

Maternal signs and symptoms of hypovolemia:

- A rising pulse rate is an early indicator, followed later by a drop in blood pressure, pallor, sweating, poor capillary refill, and cold extremities.
- Symptoms may include faintness/dizziness, nausea, and thirst.

If excessive blood loss occurs:

- Call for help and set up an IV infusion using a large-bore cannula, and consider opening a second IV infusion.

**FIGO recommendations
Drug regimens for prevention and treatment of PPH**

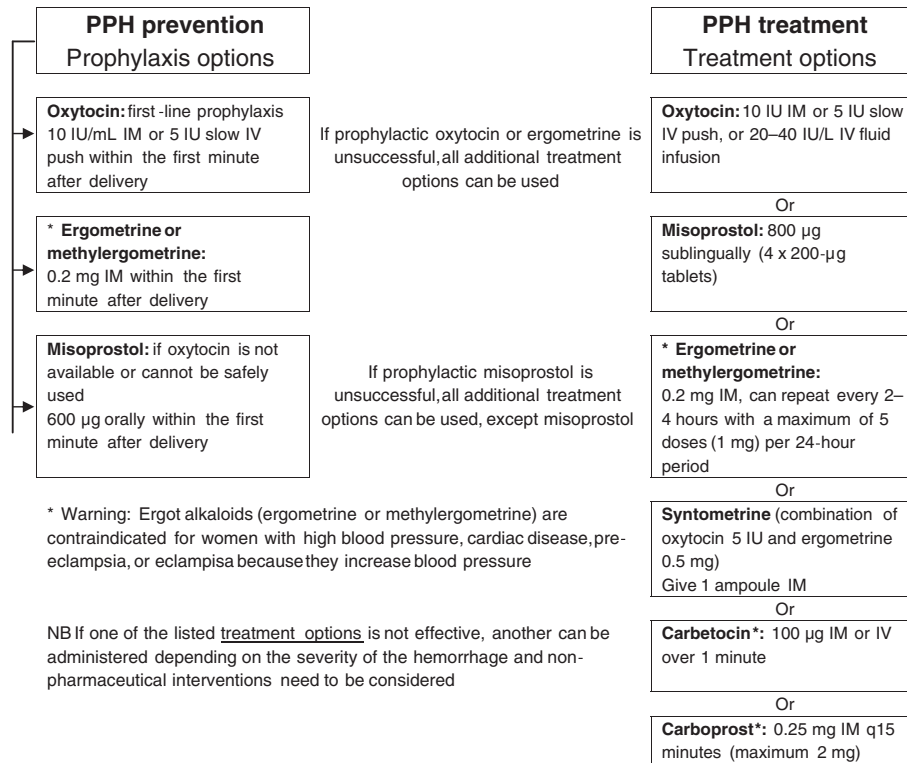


Fig. 5. FIGO recommendations for drug regimens for the prevention and treatment of postpartum hemorrhage (PPH). Abbreviations: IM, intramuscular; IV, intravenous.

- Place the woman on a flat surface, such as a delivery table or birthing bed, with her feet higher than her head.
- The birth attendant places a hand on the fundus of the uterus and gently massages until it is firm and contracted. This helps express out blood clots and allows the uterus to contract.
- Empty the bladder. The woman may be able to void on her own or she may need to be catheterized.
- Start oxygen, if available.
- Give uterotonic **as soon as possible**:
 - ♦ Oxytocin.
 - 10 IU IM.
 - Or
 - 20–40 IU in 1 L of normal saline at 60 drops per minute.
 - Continue oxytocin infusion (20 IU in 1 L of IV fluid at 40 drops per minute) until hemorrhage stops.
 - Or
 - ♦ Ergometrine or methylergometrine (used if oxytocin is not available or if bleeding continues despite having used oxytocin).
 - 0.2 mg (formulation may differ from country to country [ergometrine 0.2 or 0.5 mg]) IM or can be given slowly IV.
 - If bleeding persists, 0.2 mg IM can be repeated every 2–4 hours for a maximum of 5 doses (1 mg) in a 24-hour period.
 - Do not exceed 1 mg (or 5 0.2-mg doses) in a 24-hour period.
 - Hypertension is a relative contraindication because of the risk of stroke and/or hypertensive crisis.
 - Contraindicated with concomitant use of certain drugs used to treat HIV (HIV protease inhibitor, efavirenz, or delavirdine). If there is no alternate treatment available to control the hemorrhage, use the lowest dosage/shortest duration. Use it only if the benefits of ergometrine outweigh the risks.

- Or
- ♦ Syntometrine (combination of oxytocin 5 units and ergometrine 0.5 mg).
 - 1 ampoule IM (warning, IV could cause hypotension).
- Or
- ♦ Misoprostol (if oxytocin is not available or administration is not feasible).
 - Single dose of 800 µg sublingually (4 × 200-µg tablets).

For management of PPH, oxytocin should be preferred over ergometrine or methylergometrine alone, a fixed-dose combination of ergometrine and oxytocin, carbetocin, and/or prostaglandins such as misoprostol. If oxytocin is not available, or if the bleeding does not respond to oxytocin or ergometrine, an oxytocin–ergometrine fixed-

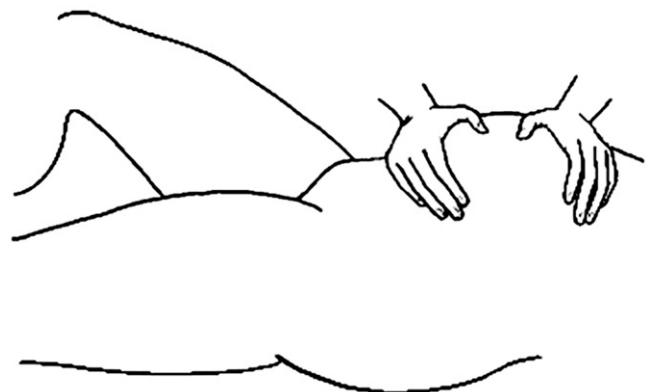


Fig. 6. External bimanual massage.

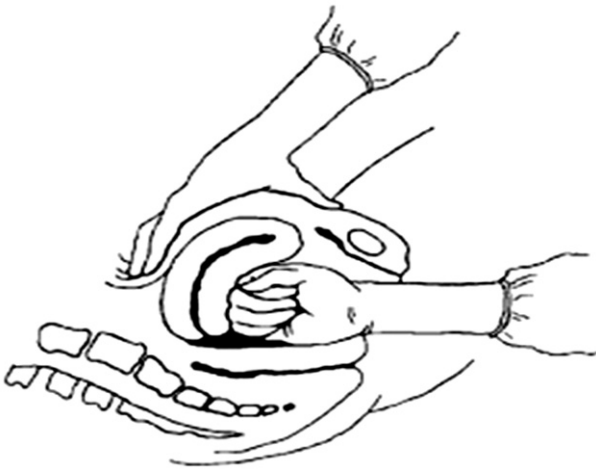


Fig. 7. Internal bimanual compression of the uterus. Reproduced, with permission, from Ref. [17].

dose combination, carbetocin, or misoprostol should be offered as second-line treatment. If these second-line treatments are not available or if the bleeding does not respond to the second-line treatment, a prostaglandin such as carboprost tromethamine (Hemabate; Pfizer, New York, NY, USA) should be offered as the third line of treatment, if available [27].

If bleeding persists after administration of uterotonics, consider these potentially life-saving procedures:

- Bimanual compression of the uterus (external or internal) (Figs. 6 and 7).
- Aortic compression.
- Hydrostatic intrauterine balloon tamponade.
- Use of an anti-shock garment for the treatment of shock or transfer to another level of care, or while waiting for a cesarean.
- Laparotomy to apply compression sutures using B-Lynch or Cho techniques.

Although uterine atony is the cause of PPH in the majority of cases, the birth attendant should also exclude retained products of conception (check the placenta again), vaginal or cervical tears, uterine rupture, uterine inversion, and coagulation disorders (bedside clotting test).

Internal bimanual compression to stop excessive blood loss [28].

- Explain to the woman and family the need to do bimanual compression and that it may be painful.
- Ensure clean hands and use sterile gloves, if possible.

- Place one hand in the vagina and clench hand into a fist.
- Place other hand on the fundus of the uterus.
- Bring the 2 hands together to squeeze the uterus between them, applying pressure to stop or slow the bleeding.
- Keep the uterus compressed until able to gain medical support.

Aortic compression

Aortic compression (Fig. 8) is a life-saving intervention when there is a heavy postpartum bleeding, whatever the cause. It may be considered at several different points during management of PPH. Aortic compression does not prevent or delay any of the other steps to be taken to clarify the cause of PPH and remedy it. Circulating blood volume is restricted to the upper part of the body and, thereby, to the vital organs. Blood pressure is kept higher, blood is prevented from reaching the bleeding area in the pelvis, and volume is conserved. Initially, the most qualified person at hand may have to carry out the compression to stop massive bleeding. As soon as possible, this technique is assigned to a helper so that the most qualified person is not tied up and interventions delayed. While preparing for a necessary intervention, blood is conserved by cutting off the blood supply to the pelvis via compression.

Step-by-step technique:

1. Explain the procedure to the woman, if she is conscious, and reassure her.
2. Stand on the right side of the woman.
3. Place left fist just above and to the left of the woman's umbilicus (the abdominal aorta passes slightly to the left of the midline [umbilicus]).
4. Lean over the woman so that your weight increases the pressure on the aorta. You should be able to feel the aorta against your knuckles. Do not use your arm muscles; this is very tiring.
5. Before exerting aortic compression, feel the femoral artery for a pulse using the index and third fingers of the right hand.
6. Once the aorta and femoral pulse have been identified, slowly lean over the woman and increase the pressure over the aorta to seal it off. To confirm proper sealing of the aorta, check the femoral pulse.
7. There must be no palpable pulse in the femoral artery if the compression is effective. Should the pulse become palpable, adjust the left fist and the pressure until the pulse is gone again.
8. The fingers should be kept on the femoral artery as long as the aorta is compressed to make sure that the compression is efficient at all times.

Note 1: Aortic compression may be used to stop bleeding at any stage. It is a simple life-saving skill to learn.

Note 2: Ideally, the birth attendant should accompany the woman during transfer.

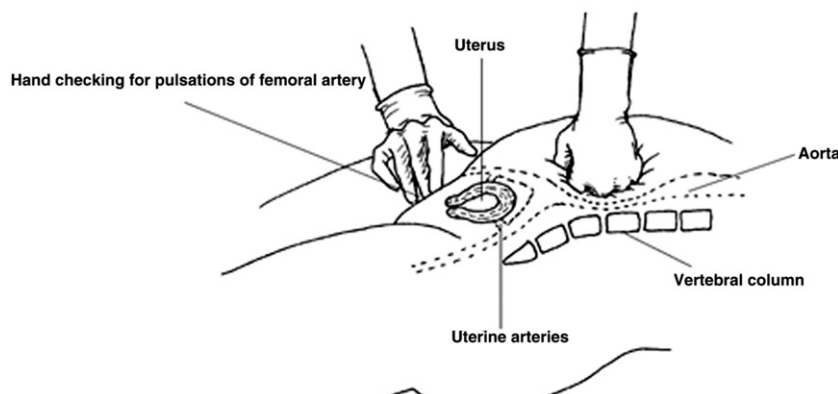


Fig. 8. Compression of abdominal aorta and palpation of femoral pulse. Adapted, with permission, from Ref. [29].

Hydrostatic intrauterine balloon tamponade

“This is a ‘balloon’ usually made of synthetic rubber balloon catheters such as Foley catheters, Rush catheters, SOS Bakri catheters, Sengstaken-Blakemore and even using sterile rubber glove, condom, or other devices that is attached to a rubber urinary catheter and is then inserted into the uterus under aseptic conditions. This device is attached to a syringe and filled with sufficient saline solution, usually 300 mL to 500 mL, to exert enough counter-pressure to stop bleeding. When the bleeding stops, the care provider folds and ties the outer end of the catheter to maintain pressure. An oxytocin infusion is continued for 24 hours. If bleeding persists, add more saline solution. If bleeding has stopped and the woman is in constant pain, remove 50 mL to 100 mL of the saline solution. The ‘balloon’ is left in place for up to 24 hours; it is gradually deflated over two hours, and then removed. If bleeding starts again during the deflating period, re-inflate the balloon tamponade and wait another 24 hours before trying to deflate a second time. A balloon tamponade may arrest or stop bleeding in 77.5% to 88.8% or more cases without any further need for surgical treatment” [30]. Other reviews state that the balloon tamponade (Fig. 9) is effective in 91.5% of cases and recommend that this relatively simple technology be part of existing protocols in the management of PPH [31]. Further, the balloon tamponade can test if the bleeding is uterine or from another source. If the bleeding does not stop with inflation, it is likely to be coming from a laceration or cause other than uterine atony.

Both aorta compression and balloon tamponade are illustrated by teaching videos available at www.glowm.com.

Non-pneumatic anti-shock garment

The non-pneumatic anti-shock garment (NASG) is a first-aid compression garment made of neoprene and hook-and-loop fastener comprising lower-extremity segments, a pelvic segment, and an abdominal segment, which includes a foam compression ball that goes over the uterus [32]. The NASG reverses shock by compressing the lower-body vessels, decreasing the container size of the body, so circulating blood is directed mainly to the core organs: heart; lungs; and brain. It also compresses the diameter of pelvic blood vessels, thus decreasing blood flow [33]. In preliminary pre-intervention/intervention trials in tertiary facilities in Egypt and Nigeria, the NASG was shown to significantly improve shock [34], decrease blood loss, reduce emergency hysterectomy for atony, and decrease



Fig. 10. Anti-shock garments work through the application of counter-pressure to the lower body, which may reverse shock by returning blood to the vital organs. The garment is applied first to the lowest possible extremity (the ankles), then upwards. Reproduced, with permission, from Ref. [37].

maternal mortality and severe maternal morbidities associated with obstetric hemorrhage [35,36]. A definitive trial of the NASG for use prior to transport from lower-level facilities to tertiary facilities is currently underway in Zambia and Zimbabwe. The NASG is applied to women experiencing hypovolemic shock secondary to obstetric hemorrhage, starting with the ankle segments and rapidly closing the other segments until the abdominal segment is closed (Fig. 10). The woman can then be transported to a higher-level facility or, if already in such a facility, survive delays in obtaining blood and surgery. The NASG is not a definitive treatment—the woman will still need to have the source of bleeding found and definitive therapy performed. The NASG can remain in place during any vaginal procedure; the abdominal segment can be opened for surgery. Removal of the NASG occurs only when the source of bleeding is treated, the woman has been hemodynamically stable for at least 2 hours, and blood loss is less than 50 mL/hour. Removal begins at the ankles and proceeds slowly, waiting 15 minutes between opening each segment, and taking vital signs (blood pressure and pulse) before opening the next segment [36].

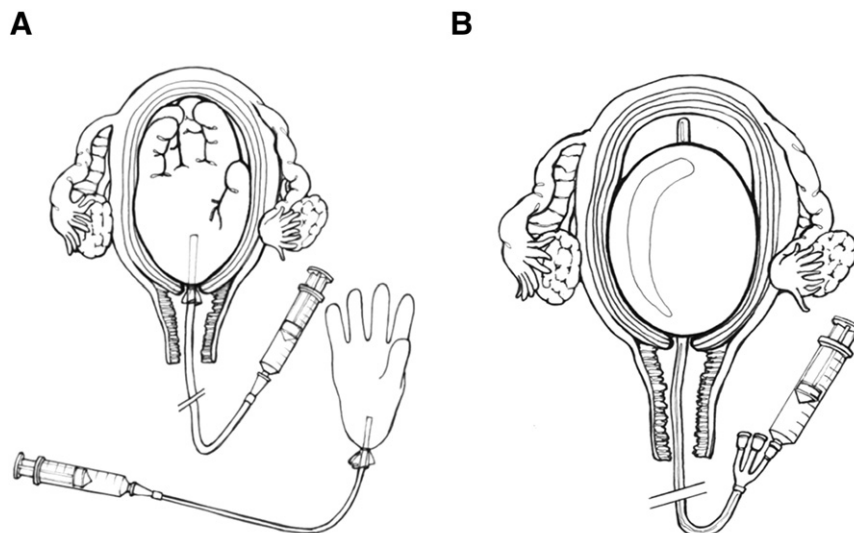


Fig. 9. Types of intrauterine tamponade device. A. Hydrostatic intrauterine balloon tamponade and glove [19]. B. Hydrostatic intrauterine balloon tamponade and Bakri SOS balloon [19].

Laparotomy to apply compression sutures using B-Lynch or Cho techniques

If bleeding does not stop despite treatment with uterotonics, other conservative interventions (e.g. uterine massage), and external or internal pressure on the uterus, surgical interventions should be initiated. The first priority is to stop the bleeding before the patient develops coagulation problems and organ damage from underperfusion. Conservative approaches should be tried first, rapidly moving if these do not work to more invasive procedures. Compression sutures and uterine, utero-ovarian, and hypogastric vessel ligation may be tried, but in cases of life-threatening bleeding subtotal (also called supracervical) or total hysterectomy should be performed without delay [38]. More information about these techniques is available in chapter 31 of *A Textbook of Postpartum Hemorrhage: a Comprehensive Guide to Evaluation, Management and Surgical Intervention*. The full text of this book can be downloaded for free at: <http://www.sapienspublishing.com/medical-publications.php?view=1>.

Other innovative techniques

Other promising techniques appropriate for low-resource settings for assessment and treatment of PPH include easy and accurate blood loss measurement [39,40], oxytocin in Uniject (Becton Dickinson and Company, Franklin Lakes, NJ, USA) [41], and the anti-shock garment [36]. These innovations are still under investigation for use in low-resource settings but may prove programmatically important, especially for women living far from skilled care.

Continued care of the woman

Once the bleeding has been controlled and the woman is stable, careful monitoring over the next 24–48 hours is required. Signs that the woman is stabilizing include a rising blood pressure (aim for a systolic blood pressure of at least 100 mm Hg) and a stabilizing heart rate (aim for a pulse under 90) [19].

Adequate monitoring includes:

- Checking that the uterus is firm and well contracted, and remains contracted.
- Estimating ongoing blood loss: to estimate bleeding accurately, put a sanitary napkin or other clean material under the woman's buttocks and ask her to extend her legs and cross them at the ankles for about 20–30 minutes. The blood will then collect in the area of the pubic triangle.
- Assessment of her vital signs:
 - Temperature.
 - Pulse.
 - Respiration.
 - Blood pressure.
 - General condition (e.g. color, level of consciousness).
- Ensuring adequate fluid intake:
 - After the woman has stabilized, IV fluids should be given at a rate of 1 L in 4–6 hours.
 - If IV access is not available or not possible, give oral rehydration salts (ORS) by mouth if able to drink, or by nasogastric tube. Quantity of ORS: 300–500 mL in 1 hour.
- Monitoring blood transfusion, including the volume of blood and other fluids that have been transfused. The transfused amount is recorded as part of the fluid intake.
- Monitoring urinary output.
- Keeping accurate records of the woman's conditions and any further interventions needed.
- Ensuring the continuous presence of a skilled attendant until bleeding is controlled and the woman's general condition is good.

Before the woman is discharged from the healthcare facility, consider these interventions:

- Check her hemoglobin.
- Give iron and folate supplementation as indicated by the woman's condition.

Research needs

Important strides have been made in identifying life-saving approaches and interventions appropriate for PPH prevention and treatment in low-resource settings. The field is rapidly evolving and the following issues have been identified as priorities for further research in low-resource settings:

- Assess the impact of better measurement of blood loss (e.g. with a calibrated drape or other means) on birth attendants' delivery practices.
- Further assess options for treatment of PPH in lower-level (basic EmOC) facilities—in particular, uterine tamponade and the anti-shock garment.
- Identify the most efficient and effective means of teaching and supporting the skills needed by birth attendants and for community empowerment to address PPH.
- Investigate how PPH can be managed effectively at the community level.

Key actions to reduce postpartum hemorrhage

1. Disseminate this clinical guideline to all national associations of midwives, nurses, medical offices, and obstetrician–gynecologists, and ask them to implement the guideline at the national, district, and community level.
2. Obtain support for this statement from agencies in the field of maternal and neonatal health care, such as UN agencies, donors, governments, and others.
3. Recommend that this guideline become a Global Initiative to be adopted by health policy makers and politicians.
4. Recommend that this Global Initiative on the prevention of PPH be integrated into the curricula of midwifery, medical, and nursing schools.

FIGO will work toward ensuring that:

1. Every mother giving birth anywhere in the world will be offered AMTSL for the prevention of PPH.
2. Every skilled attendant will have training in AMTSL and in techniques for the treatment of PPH.
3. Every health facility where births take place will have adequate supplies of uterotonic drugs, equipment, and protocols for both the prevention and the treatment of PPH.
4. Blood transfusion facilities are available in centers that provide comprehensive health care (secondary and tertiary levels of care).
5. Physicians are trained in simple conservative techniques such as uterine tamponade, compression sutures, and devascularization.
6. The study of promising new drugs and technologies to prevent and treat PPH is supported by donors and governments.
7. Member countries are surveyed to evaluate the uptake of recommendations.

Conclusion

1. Ensure pre- and in-service training to healthcare providers to practice AMTSL. Promote and reinforce the value and effectiveness of this intervention as a best practice standard.
2. All healthcare providers/professionals and/or birth attendants need to continue advocating for a secure continuous supply of oxytocics.

FIGO recommendations Prevention and treatment of PPH

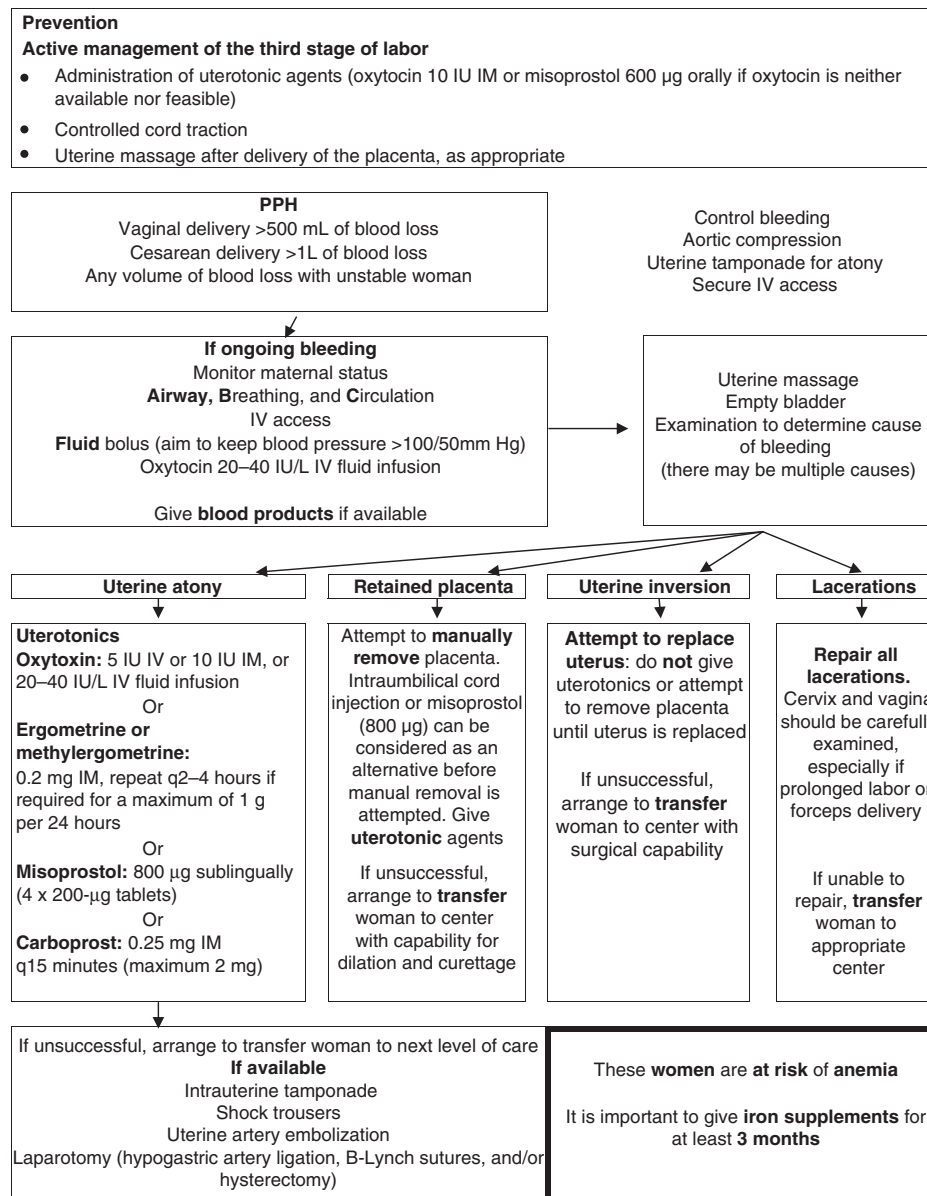


Fig. 11. FIGO recommendations for the prevention and treatment of postpartum hemorrhage (PPH). Abbreviations: IM, intramuscular; IV, intravenous.

3. Healthcare professionals need to be knowledgeable about physiologic management because they may practice in an environment where AMTSL may not be feasible. Training of all healthcare providers/professionals and/or birth attendants in the practice of physiologic management, AMTSL, diagnosis, and management of PPH.
4. Prepare and disseminate PPH prevention and treatment protocols (Fig. 11).
5. Monitor the incidence of PPH and ensure quality assurance at local, regional, and national levels.

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Conflict of interest

The authors have no conflicts of interest.

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