

# POSTPARTUM HEMORRHAGE

## Guidelines for Immediate Action



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### STEP 3

For more detailed information, see text on the reverse side of this leaflet →

## Drug Therapy for Management

### Syntocinon/oxytocin

Syntocinon/oxytocin **requires refrigeration** and must always be administered by injection. The usual dose is 20 IU in 500 ml of crystalloid solution. The intravenous route is used, with the dosage rate adjusted according to the response (typical rate 250 ml/h).

Intramuscular administration of 10 IU results in a slower onset of action (3–7 min) but with a longer-lasting effect (up to 60 min).

The preferred storage of oxytocin is refrigeration but it may be stored at temperatures of up to 30°C for up to 3 months without significant loss of potency.

### Syntometrine/ergometrine

Syntometrine **requires refrigeration**. It can be administered intramuscularly or intravenously, at a dose of 1 ampule (500 µg of ergometrine and 5 IU of syntocinon). Syntometrine is contraindicated in women with hypertension and cardiac disease.

### Carbetocin

Heat-Stable Carbetocin is a uterotonic medicine used for the prevention of postpartum hemorrhage. A single 100 micrograms intravenous or intramuscular injection of Carbetocin administered after the delivery of the infant is sufficient to maintain adequate uterine contraction that prevents uterine atony and excessive bleeding comparable with an oxytocin infusion. (NB After Caesarean section Carbetocin must be administered by intravenous injection only).

WHO guidelines recommend heat-stable Carbetocin for PPH prevention in settings where oxytocin is unavailable or its quality cannot be guaranteed, and where its cost is comparable to other effective uterotonics.

### Misoprostol PGE1

Misoprostol **does NOT require refrigeration**, is easy to administer, inexpensive, and widely available.

For the treatment of PPH, a single dose of misoprostol 800 µg administered sublingually, immediately following diagnosis, is indicated when IV oxytocin is not immediately available. If IV oxytocin is already being provided for treatment of PPH, evidence suggests that adjunct (simultaneous) use of misoprostol has no added benefit. Repeat doses of misoprostol for PPH treatment are not recommended.

The side effects of temperature changes and gastrointestinal effects are transient and can be simply treated using anti-pyretics and anti-emetics respectively.

### Prostaglandin F2α

Prostaglandin F2α **requires refrigeration**. It is administered intramuscularly, in a dose of 250 µg; the maximum number of doses is eight (15 minutes apart) (2 mg). It is contraindicated in women with asthma and cardiac disease.

### Tranexamic Acid

Tranexamic acid 1–2 g hourly will reduce fibrinolysis and will stabilize the clot in the uterine vessels. It is given via the intravenous route, and is best used when the bleeding continues despite oxytocin and when prostaglandin has become necessary.

### Recombinant Factor VIIa (rFVIIa)

rFVIIa is very expensive and **requires refrigeration**. It is used when uterine massage and uterotonic medications (oxytocin, ergometrine, prostaglandins) have all failed to control postpartum hemorrhage. The recommended dose is 40–60 µg/kg, administered intravenously.

In clinical practice this drug is used as a last resort

## BEFORE Prevention

Bleeding postdelivery is stopped by clotting in intrauterine vessels brought about by natural uterine contractions and is enhanced by oxytocin. All the medical and uterine conserving surgical steps attempt to facilitate the clotting and should be performed before coagulopathy sets in.

Prevention of postpartum hemorrhage (PPH) involves the practice of active management of the third stage of labor and the identification of those at high risk for postpartum hemorrhage, such as patients with prolonged labor, pre-eclampsia, previous postpartum hemorrhage and multiple pregnancy. Active management of the third stage of labor incorporates three main interventions:

- administration of oxytocin or misoprostol or another uterotonic drug within 1 minute after the birth of the baby;
- controlled cord traction (not essential with oxytocin); and
- uterine massage after delivery of the placenta.

Uterine massage every 5–10 mins is recommended to confirm that the uterus is contracted. Women should be taught to self massage and also advised to warn staff if the uterine fundus is soft, increasing in size or they have continued bleeding.

NB. If oxytocin is not available, administering a single dose of misoprostol 600 µg administered orally immediately after delivery of the newborn, is indicated. It is good practice to first do an abdominal palpation to confirm that there are no additional babies in utero.

### Training Programs and Simulation Training

It is recommended that simulations of postpartum therapy should be included in in-service training programs. It has also been demonstrated that good communication between healthcare providers and their patients (and families) can have a beneficial result.

### Want to know more about the management of postpartum hemorrhage?

If you would like to know detailed information about postpartum hemorrhage:

1. Read and/or download free of charge a 7-minute learning Module (principally designed for midwives and other professional birth assistants) at [www.glowm.com](http://www.glowm.com)
2. Read and/or download, free of charge, a 20-minute Masterclass Lecture (principally designed for doctors and doctors in training) at [www.glowm.com](http://www.glowm.com)
3. Read and/or download, free of charge, the 650 page *A Comprehensive Textbook of Postpartum Hemorrhage* at [www.glowm.com](http://www.glowm.com)

This Wall Chart has been written and developed by: Mahantesh Karoshi MD, MRCOG, DCRM, Barnet General Hospital, London, UK, Professor Sir Sabaratnam Arulkumaran MD, PhD, FRCS, FRCOG, St George's, University of London, UK and André B. Lalonde MD, FRCS, FRCOG, University of Ottawa and McGill University, Ottawa, Canada

### STEP 1

For more detailed information, see text on the reverse side of this leaflet →

## Immediate Action: Call for HELP

Have someone available at all times to help manage Postpartum Hemorrhage

### Vigilance

In order to identify potential problems promptly, it is critical that health workers remain vigilant during the minutes and first hours following birth.

In responding to early signs of postpartum hemorrhage the first step is to undertake a proper assessment of the woman and take immediate, non-specific, life-saving measures (such as resuscitation, monitoring vital signs and calling for additional HELP).

The next step is to provide specifically directed therapy once a diagnosis of postpartum hemorrhage has been confirmed. In practice, not all diagnostic assessments can be undertaken simultaneously, so the caregiver should try and assess the situation in the light of all the circumstances surrounding the birth. It should be emphasized that recent experience has demonstrated the special value of early hemorrhage control to avoid massive postpartum hemorrhage with coagulopathy.

### Resuscitation

Follow a simple ABC approach, as problems with Airway, Breathing, and finally Circulation are identified. The medical logic behind the 'ABC' approach is that an Airway problem will kill the patient more quickly than a Breathing problem, which in turn will kill a patient more quickly than a Circulatory (bleeding) problem. However, C-ABC with attention to arrest bleeding may be more appropriate for postpartum hemorrhage.

### Airway

In caring for the airway, the cervical spine must be protected. Place your hand on the patient's forehead and gently tilt the head back. At the same time, with your fingertips under the point of the patient's chin, lift the chin to open the airway. A jaw thrust may be required to facilitate this.

### Breathing

Assess breathing for 10 seconds by looking for chest movements, listening for breath sounds and feeling for the movement of air. If no breathing is detected, put out a cardiac arrest call and administer two rescue breaths.

### Circulation

If circulation is present but no breathing, continue rescue breathing at a rate of 10 breaths per minute. Recheck the circulation every 10 breaths, taking no more than 10 seconds each time. If the patient starts to breathe on her own but remains unconscious, turn her into the recovery position and administer oxygen at a rate of 15 liters/minute.



### STEP 2

For more detailed information, see text on the reverse side of this leaflet →

## Check for:

### Uterine Tone

In parallel with resuscitation, assessment of uterine tone should take place when managing primary postpartum hemorrhage because uterine atony is the dominant cause of postpartum hemorrhage. Uterine atony is suggested by the presence of a boggy soft uterus. If the uterus is atonic, immediately give 5 IU bolus dose of syntocinon intravenously or intramuscularly and manually rub the uterus over the abdomen – which should be continued until the bleeding stops.

Make sure that the bladder is empty, either by encouraging the woman to achieve this herself or by passing a catheter into the bladder.

### Trauma

Continued bleeding after uterotonic administration is most likely from unrecognized laceration of the genital tract, including uterine rupture. Hence, examination of the whole genital tract is essential under a good light source, with assistance and appropriate equipment to visualize all of the vagina and cervix. Any bleeding vessels should be tied and tears sutured.

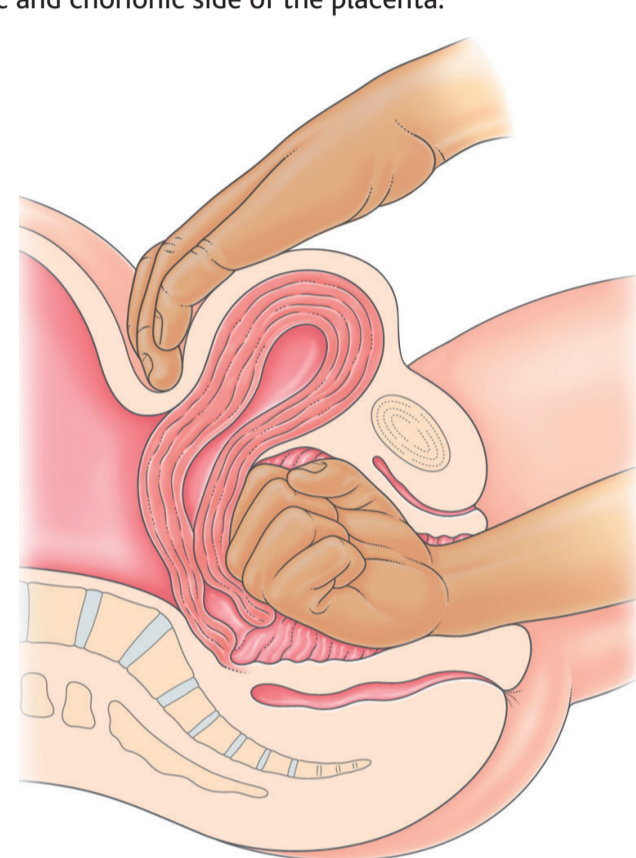
### Placenta

Inspection of the placenta after delivery must be routine to check for its completeness. Check for any missing cotyledon(s) by inspecting the amniotic and chorionic side of the placenta.

### Bimanual Compression

Insert one gloved hand into the vagina and push up against the body of the uterus. Place the other hand above the uterine fundus on the abdomen and compress the uterus against the hand in the vagina. To be effective bimanual uterine compression has to be maintained effectively for 8–10 mins till the blood clots in the uterine vessels. In a number of women this is all that is needed. In the others it is a temporary measure in the management of PPH caused by uterine atony after vaginal delivery.

**NB. This procedure is painful to the woman and is only undertaken in cases of PPH if drugs are not available or if drug therapy fails.**

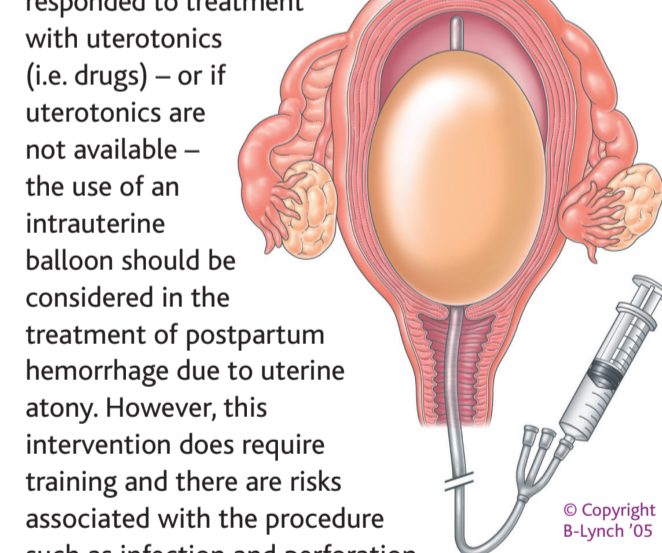


### STEP 4

For more detailed information, see text on the reverse side of this leaflet →

## Balloon Tamponade

In women who have not responded to treatment with uterotonics (i.e. drugs) – or if uterotonics are not available – the use of an intrauterine balloon should be considered in the treatment of postpartum hemorrhage due to uterine atony. However, this intervention does require training and there are risks associated with the procedure such as infection and perforation of the uterus. A Sengstaken tube, Rüşch balloon, Bakri balloon and even an inflated condom or glove have been used with success.



Use balloon tamponade following a vaginal delivery and atonic postpartum hemorrhage, that is unresponsive to uterotonics, prior to interventional radiological procedures or surgical interventions, such as the B-Lynch suture, uterine artery embolization or iliac artery ligation or hysterectomy being considered. It can be used during or after caesarean section and in a woman with vaginal birth after previous caesarean section with postpartum hemorrhage, after excluding rupture.

### How to use

Insert the balloon and instill warm sterile water/saline in increments of 50 ml while observing for bleeding from the cervix. When bleeding stops instill an extra 50 ml. If bleeding continues despite the balloon herniating via the cervix, the treatment is unlikely to be effective and the balloon will be expelled. The next step should be compression sutures.

The fundal height should be marked and the height monitored with vaginal bleeding, pulse, blood pressure and urinary output to identify signs of continued bleeding. Prophylactic antibiotics and slow IV oxytocin infusion is advised.

The balloon tamponade can be removed after 4–6 hours, although it is usually left overnight to stabilize the patient. Once the fluid in the balloon is withdrawn, check for bleeding. If there is no further bleeding for 30 minutes, remove the balloon.

### How to use a condom if no alternative is available

Open the condom, insert the end of a piece of tubing from an IV set into the condom, tie securely with sterile string, insert the condom into the uterus via the cervix, release fluid from the IV bottle down the tubing and into the condom (or glove) until it has expanded fully between the walls of the uterus.

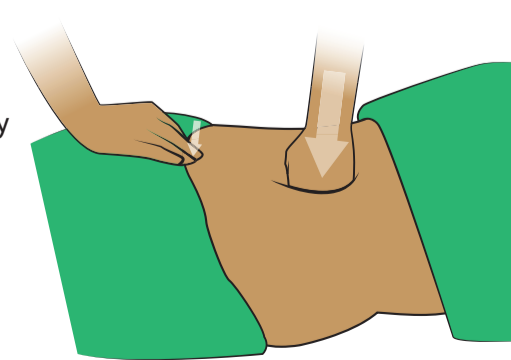
NB. To see a video demonstration of this procedure, go to [www.glowm.com](http://www.glowm.com)

### Aortic Compression

If bleeding is severe and if initial measures are not successful, then external aortic compression should be considered. Successful aortic compression, is achieved when the femoral pulse ceases and when blood pressure in the lower limit is unrecordable; it may be of benefit as a temporary measure in the management of postpartum hemorrhage whilst resuscitation and other management plans are made.

Internal aortic compression can also be used as a temporary measure to control severe postpartum hemorrhage due to placenta praecreta during caesarean section.

NB. To view a video demonstrating how to apply aortic compression visit [www.glowm.com](http://www.glowm.com)



### STEP 5

For more detailed information, see text on the reverse side of this leaflet →

## Seek Additional Help

If the patient continues to hemorrhage, it is important to seek additional help as a matter of priority and plan early referral. The normal chain of patient care involves the following transfers:

Home Delivery  
↓  
Nursing Station or Health Unit  
↓  
District or Regional Hospital

### Tertiary (University) Hospital

If necessary, transfer to Tertiary (University) Hospital in instances where full therapeutic measures such as blood bank facilities, surgical expertise, operating theater facilities, or embolization are not available or where there are delays in receiving these therapies or for intensive care monitoring in a patient who continues to bleed.

### Anti-shock garment

The best method of keeping a woman stable while transferring her is to use a non-inflatable anti-shock garment (NASG) if available. This in itself may stop bleeding in many cases.

### How it works

The NASG is a simple neoprene and Velcro device made of articulated segments that are wrapped tightly around the legs, pelvis and abdomen. It can be used to treat shock, resuscitate, stabilize and prevent further bleeding in women with obstetric hemorrhage.

The NASG is light, flexible and comfortable for the wearer. It has been designed to allow perineal access so that examinations and vaginal procedures can be performed without it being removed. Upon application a patient's vital signs are often quickly restored and consciousness regained.

### How to apply the non-inflatable anti-shock garment (NASG)

- Place the NASG under the women with the top edge at the level of her lowest rib (on her side).
- Close segment 1 (or 2, for short women) tightly around each ankle and make sure that when snapped, a sharp sound is heard.
- Close segment 2 tightly around calf. Check for snap sound. Leave the knee free so that the leg can be bent.
- Close segment 3 tightly around the thigh. Check for snap sound.
- Place segment 4 so it goes around the women with its lower edge at the level of her pubic bone.
- Place segment 5 with pressure ball directly over the umbilicus.
- Close the NASG using segment 6.
- Make sure the women can breathe normally with segment 6 in place.

NB. For a video demonstration of how to use a non-inflatable anti-shock garment visit [www.glowm.com](http://www.glowm.com)



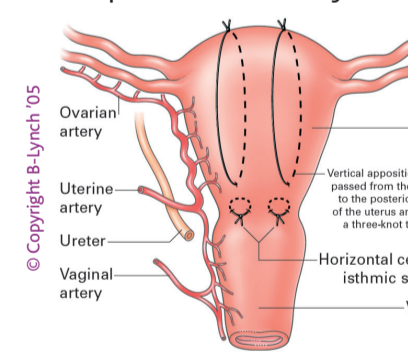
### STEP 6

For more detailed information, see text on the reverse side of this leaflet →

## Hospital-based procedures

### B-Lynch Suture

**Use Monocryl suture or Vicryl number 2**  
The B-Lynch suture aims to exert continuous vertical compression on the uterine vascular and muscular system. Laparotomy, uterine exteriorization and an opened uterine cavity are always necessary.



### Other Conservative Suture Procedures:

**Vertical Uterine Compression Sutures**  
These sutures are an alternative to the B-Lynch technique if no lower segment caesarean incision is present. They may be placed without opening the uterus.

**Cho Multiple Square Compression Sutures**  
Multiple square sutures are used to cover the whole body of the uterus and this may be useful in placenta previa.

### Uterine Artery Embolization

A patient must be sufficiently stable to transport to the angiography suite. Embolization should be considered early, because it may take time to mobilize services. When embolization is successful, the patient can rapidly recover without undergoing additional surgery. Embolization not only saves the life of the patient, but also the uterus and adnexal organs, thus preserving fertility.

### Stepwise Devascularization

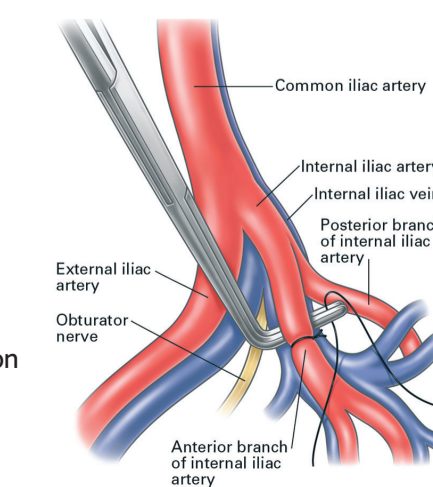
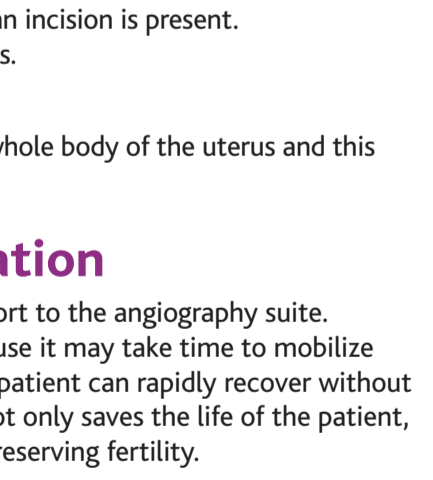
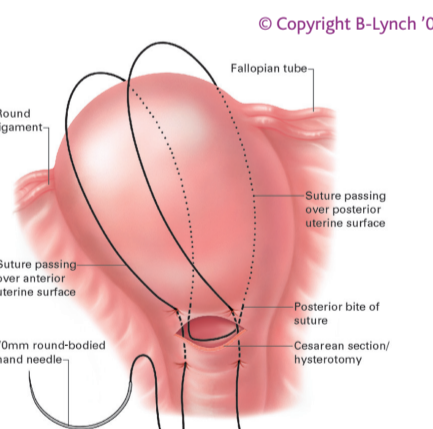
The essential requirements are not simple and may not be available in every unit. There is a need for a competent obstetric surgeon who is conversant and competent at pelvic gynecological procedures, and who has a working knowledge of the pelvic anatomy, including the vascular and neurological supply of the pelvic organs. Uterine artery and the infundibulopelvic vessels can be tied at the junction of the tube meeting the uterus without compromising ovarian blood supply.

### Internal Iliac Artery Ligation

This could be used as a prophylactic or therapeutic operation. There is a need for a competent obstetric surgeon who is conversant and competent at pelvic gynecological procedures.

### Subtotal or Total Hysterectomy

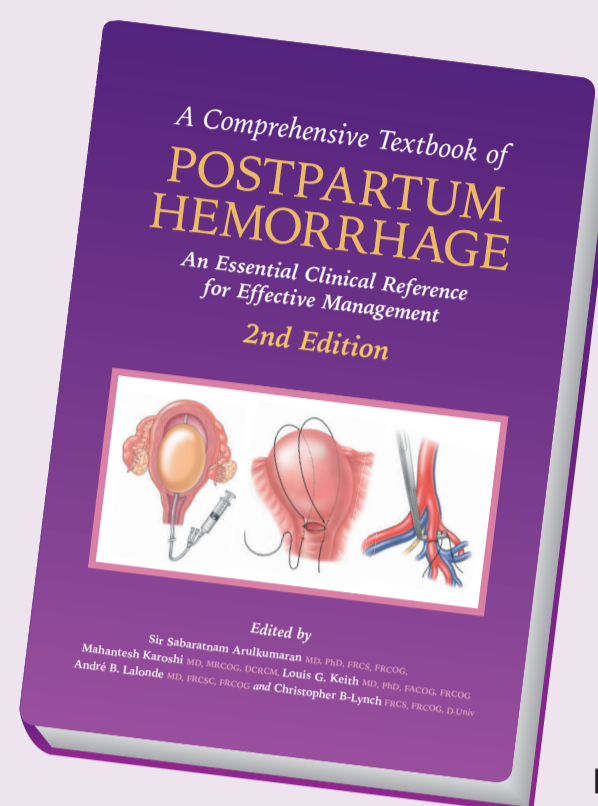
Hysterectomy is the best immediate option to save the hemorrhaging woman's life when uterine atony is unresponsive to uterotonics and where facilities for embolization are not available and/or the obstetrician is not well versed with the technical aspects of conservative surgical procedures or iliac artery ligation. Subtotal hysterectomy is easy to perform, quick and is applicable in most cases of atonic uterine bleeding. Total hysterectomy may be needed in cases of placenta previa, accreta and cases of uterine rupture involving the lower segment.





# This Leaflet and Wall Chart

This leaflet and wall chart has been written and developed by Dr Mahantesh Karoshi, Professor Sir Sabaratnam Arulkumar and Dr André Lalonde, and is based on *A Comprehensive Textbook of Postpartum Hemorrhage* (Second Edition), edited by Sir Sabaratnam Arulkumar MD, PhD, FRCS, FRCOG, Mahantesh Karoshi MD, MRCOG, DCRCM, Louis G. Keith MD, PhD, FACOG, FRCOG, André B. Lalonde MD, FRCS, FRCOG and Christopher B-Lynch FRCS, FRCOG



This practical *Guidelines for Immediate Action* is based on material published in *A Comprehensive Textbook of Postpartum Hemorrhage* (Second Edition). The book, which is available through the normal commercial channels in the Western World, is being provided free to selected physicians in less-resourced countries.

The whole 650 page book is also available entirely free of charge on the internet from the Global Library of Women's Medicine, where it may be read or downloaded at will by anyone. To do so, please visit [www.glowm.com](http://www.glowm.com)

For further information, please contact the Publishers – who are publishing these materials on a not-for-profit basis and making them available free, on a selective basis, in loving memory of their daughter Abigail Bloomer.



Abigail Bloomer 1970–2001



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## BEFORE Prevention

### Incidence and Risk Factors

Postpartum hemorrhage occurs in approximately 4% of vaginal deliveries, and it is estimated that it causes significant morbidity and 25% of all maternal childbirth-related deaths.

Active management of labor incorporates three main interventions: administration of a uterotonic medication after delivery of the baby; cord clamping and cutting; and controlled traction on the umbilical cord while awaiting placental separation and delivery.

Good evidence shows that active management of the third stage of labor provides a better balance of benefits versus harms and should be practiced routinely to decrease the risk of postpartum hemorrhage. Active management involves facilitation for the separation and delivery of the placenta and enhances the effectiveness of the uterine contractions to shorten the duration of the third stage of labor and reduce the risk of postpartum hemorrhage.

Oxytocin is the uterotonic agent of choice; it can be administered as 10 units intramuscularly or as 5 units intravenously, and can safely and effectively be given to the mother after delivery of the placenta. Alternatively, 1 ampule of syntometrine can be given

intravenously. In settings where oxytocics are not feasible, 600µg of misoprostol can be administered orally for the prevention of PPH

Risk factor	Odds ratio
Prolonged third stage of labor	7.6
Pre-eclampsia	5.0
Mediolateral episiotomy	4.7
Previous postpartum hemorrhage	3.5
Twin pregnancy	3.3
Arrest of descent	2.9
Soft-tissue lacerations	2.0
Asian ethnicity	1.7
Augmented labor	1.7
Forceps or vacuum delivery	1.7
Hispanic ethnicity	1.7
Midline episiotomy	1.6

Adapted with permission from Combs CA, Murphy EL, Laros RK Jr. Factors associated with postpartum hemorrhage with vaginal birth. *Obstet Gynecol* 1991;77:73

### Want to know more about the management of postpartum hemorrhage?

If you would like to know detailed information about postpartum hemorrhage:

1. Read and/or download free of charge a 7-minute learning Module (principally designed for midwives and other professional birth assistants) at [www.glowm.com](http://www.glowm.com)
2. Read and/or download, free of charge, a 20-minute Masterclass Lecture (principally designed for doctors and doctors in training) at [www.glowm.com](http://www.glowm.com)
3. Read and/or download, free of charge, the 650 page *A Comprehensive Textbook of Postpartum Hemorrhage* at [www.glowm.com](http://www.glowm.com)

For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Section 7 and Chapters 14, 15 and 66

## STEP 1

# Immediate Action: Call for HELP

Have someone available at all times to help manage Postpartum Hemorrhage

### Resuscitation

The care-giver must ensure a safe environment; shake the patient and shout. If there is no response, call for assistance and then return to the patient.

Speak to the patient at the very beginning of the resuscitation process. Her verbal response gives several pieces of clinical information. To be able to speak, a patient must have circulating oxygenated blood, a reasonable patent airway, a reasonable tidal volume, and a reasonable cerebral perfusion for her to comprehend and answer.

If the patient does not respond and appears lifeless, open the airway, assess for breathing by watching the chest, listening and feeling and, if necessary, give two rescue breaths and assess for signs of circulation (breathing movements and carotid pulse).

If there is no circulation, start chest compression as in the cardiopulmonary resuscitation drill.

### Airway

Place your hand on the patient's forehead and gently tilt the head back. At the same time, with your fingertips under the point of the patient's chin, lift the chin to open the airway. A jaw thrust may be required to facilitate this.

### Breathing

Assess breathing for 10 seconds by looking for chest movements, listening for breath sounds and feeling for the movement of air. If no breathing is detected, put out a cardiac arrest call and administer two rescue breaths.

### Circulation

If circulation is present but no breathing, continue rescue breathing at a rate of 10 breaths per minute. Recheck the circulation every 10 breaths, taking no more than 10 seconds each time. If the patient starts to breathe on her own but remains unconscious, turn her into the recovery position and administer oxygen at a rate of 15 liters/minute.

### Communication & Teamwork

Wherever possible, have senior input from the obstetric, anesthetic and midwifery professions. Ensure that the family is looked after and kept informed. Document timings and interventions accurately.

### Logistics

Recruit as many staff as possible. You will need an individual responsible for each of the following: recording events, management, communication and runner/porter/transport.

### General principles of management

Bleeding from the placental bed is arrested by the clotting of the vessels supplying the placental bed and facilitated by uterine contractions –'natural ligatures'. This is further enhanced by oxytocics which keep the uterus contracted for a longer time, or by bimanual compression (maintained for an adequate time) or by balloon or by compression sutures. Vessel ligation or embolization reduces the pressure and volume of flow. Medical and simple uterine conservation techniques need to be undertaken before coagulopathy sets in. Medications to promote clotting or to stabilize the clots can be useful but should be used appropriately. Delay in intervening with the onset of coagulopathy gives rise to the need for the use of blood and clotting factors as well as adequate fluid replacement.

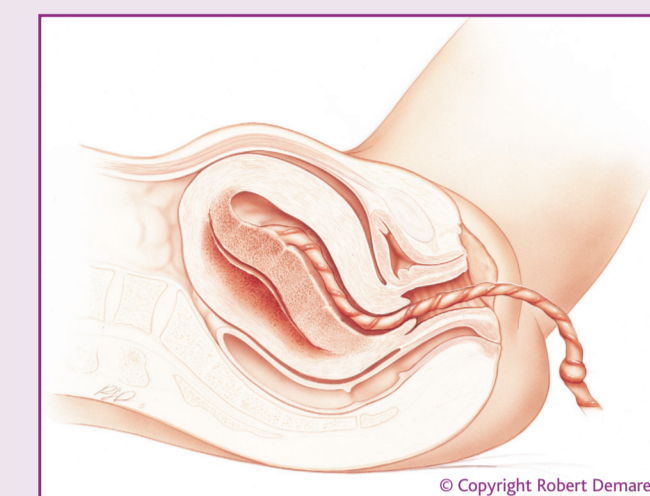
For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Section 11

## STEP 2

# Check for:

### Uterine Tone

After resuscitation, assessment of uterine tone is always the next step in the management of primary postpartum hemorrhage for which uterine atony is overwhelmingly the dominant cause. Uterine atony is suggested by the presence of a boggy soft uterus. If the uterus is atonic, immediate attention must be given to mechanical massage by rubbing up for a contraction and by using pharmacological approaches to contract the uterus.



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### Trauma

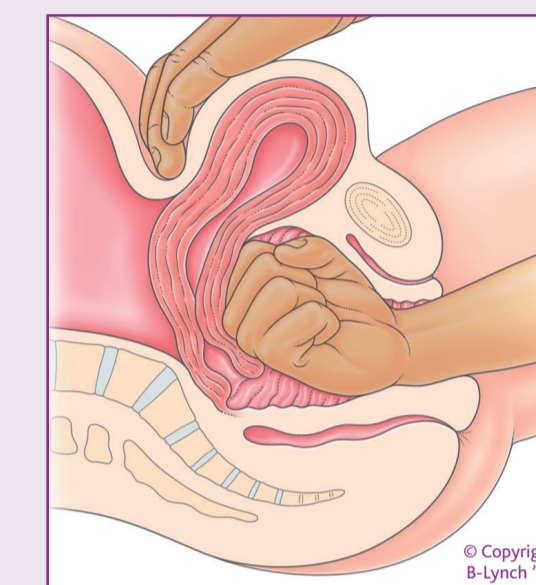
At any time that bleeding persists in the presence of a firmly contracted intact uterus, and after failure of initial measures to control postpartum bleeding, hemorrhage from lacerations of the cervix, vagina or uterus should be suspected. Adequate exposure of the vagina and cervix under good light and then repair form the keystone of the management of trauma. If uterine rupture is suspected, then laparotomy and repair or hysterectomy become life-saving procedures.

### Placenta

Inspection of the placenta after delivery must be routine. If a portion of the placenta is missing, the uterus should be explored and the fragment removed, particularly if postpartum hemorrhage continues.

### Bimanual Uterine Compression

Bimanual compression causes mechanical constriction of myometrial vessels and stimulates uterine contractions. The steps of uterine massage are, first, insert a gloved hand into the vagina, and push up against the body of the uterus, and, second, place the other hand above the uterine fundus on the abdomen and compress the posterior uterine wall against the hand in the vagina. Bimanual compression also helps to reduce bleeding, thus aiding rapid resuscitation. To be effective the compression should continue for 10 minutes that would allow the blood to clot in the uterine vessels.



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For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Chapter 51 and Appendix

## STEP 3

# Drug Therapy for Management

### Syntocinon/ oxytocin

With timely and appropriate use of uterotonic therapy, the majority of women with uterine atony can avoid surgical intervention.

Stimulation of uterine contraction is usually achieved, in the first instance, by external uterine massage. Syntocinon acts rapidly, with a latency period of < 1 minute after intravenous injection and 3–7 minutes after intramuscular injection. When syntocinon is administered by a continuous intravenous infusion, the uterine response begins gradually and reaches a steady state within 20–40 minutes. The mode of action of oxytocin involves stimulation of the upper uterine segment to contract in a rhythmic fashion. Owing to its short half-life (3 minutes), a continuous intravenous infusion is required in order to maintain the uterus in a contracted state. Rapid intravenous bolus administration of undiluted oxytocin results in relaxation of vascular smooth muscle, which can cause severe hypotension. Therefore, it is best given by intravenous infusion or the intramuscular route. Syntocinon is stable at temperatures up to 25°C, but refrigeration prolongs its shelf-life.

The preferred storage of oxytocin is refrigeration but it may be stored in temperatures up to 30°C for up to 3 months without significant loss of potency (WHO 1995).

### Syntometrine/ ergometrine

Syntometrine causes sustained tonic uterine contraction. It stimulates contraction of both the upper and lower uterine segments in a tetanic manner. Intramuscular injection of a 500 µg dose results in an onset of action after 2–5 minutes. The clinical effect of syntometrine persists for approximately 3 hours. The co-administration of ergometrine and syntocinon results in a complementary effect, with syntocinon achieving an immediate response and ergometrine a more sustained action. Contraindications include cardiac disease, hypertension and pre-eclampsia. First-line treatment of uterine atony, therefore, involves administration of oxytocin or

ergometrine as an intramuscular or diluted intravenous bolus, followed by repeat dosage if no effect is observed after 5 minutes, and complemented by continuous intravenous syntocinon infusion. Atony that is refractory to these first-line oxytocics will warrant prostaglandin therapy.

### Carbetocin

Heat-Stable Carbetocin is a uterotonic medication used for the prevention of postpartum hemorrhage. A single 100 micrograms intravenous or intramuscular injection of Carbetocin administered after the delivery of the infant is sufficient to maintain adequate uterine contraction that prevents uterine atony and excessive bleeding comparable with an oxytocin infusion. (NB After Caesarean section Carbetocin must be administered by intravenous injection only). WHO guidelines recommend heat-stable Carbetocin for PPH prevention in settings where oxytocin is unavailable or its quality cannot be guaranteed, and where its cost is comparable to other effective uterotonics.

### Misoprostol

Misoprostol is a synthetic analogue of prostaglandin E1 which does not require refrigeration, is easy to administer, inexpensive, and widely available. It provides a safe and effective option for the prevention and treatment of PPH where oxytocin is not available and/or feasible.

For the treatment of PPH, a single dose of 800 µg of misoprostol administered sublingually is indicated.

The side effects of temperature changes and gastro-intestinal effects are transient and can be simply treated using anti-pyretics and anti-emetics respectively.

The use of misoprostol in low resource settings where birth attendants are able to manage PPH based on visual estimates and clinical symptoms may result in a significant reduction in the number of women who need to be referred to hospital for further treatment.

### Prostaglandin F2α

The third-line agent for use in the management of uterine atony unresponsive to syntocinon, ergometrine or misoprostol is prostaglandin F2α, which has been shown to control hemorrhage in up to 86% of cases where other means have failed. It is given intramuscularly in a dose of 250 µg every 15 minutes, up to a maximum of eight doses (2 mg). Intramuscular injection yields peak plasma concentrations at 15 minutes. It should be used with caution in patients with asthma, hypertension, cardiac and pulmonary disease. Side-effects include nausea, vomiting, diarrhea, pyrexia and bronchospasm. It is light- and heat-sensitive and must be kept refrigerated at 4°C.

### Tranexamic Acid

Tranexamic acid is an antifibrinolytic agent and is widely used in general surgery to reduce blood loss. A systematic review of randomized controlled trials of antifibrinolytic agents in elective surgery showed that tranexamic acid reduced the risk of blood transfusion by 39%. Tranexamic acid can be offered as a treatment for PPH either (i) when two successive uterotonics have failed to stop the bleeding or (ii) if it is thought that the bleeding may be partly due to trauma. A Cochrane Review reported that a dose of 0.5–1 g intravenously was effective in reducing postpartum hemorrhage after vaginal birth and caesarean section with minimal side-effects.

### Recombinant Factor VIIa (rFVIIa)

Patients who develop massive, life threatening postpartum hemorrhage often exhibit a combination of 'coagulopathic' diffuse bleeding in addition to 'surgical bleeding'. Whereas bleeding from larger vessels may be controlled by surgeons using a variety of operations, the ability to control diffuse bleeding is limited and, in many cases, not feasible. Thus, administration of hemostatic drugs that can control the coagulopathic component of blood loss may reduce mortality and morbidity in such patients.

- rFVIIa has a special role in patients with HELLP syndrome and in patients with disseminated intravascular coagulopathy who are experiencing postpartum hemorrhage.
- The recommended dose is 40–60 µg/kg administered intravenously.

For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Sections 6 and 8, and Chapters 14, 15 and 40

## STEP 4

# Balloon Tamponade

### The Balloon Tamponade

The balloon tamponade two-way catheter provides control of postpartum uterine bleeding in nearly 85% of cases and in the others reduces the bleeding till the next step is undertaken. The balloon tamponade is especially feasible in a scenario of atonic postpartum hemorrhage following a vaginal delivery, unresponsive to medical management and before interventional radiological procedures or surgical interventions, such as the B-Lynch suture, or iliac artery ligation or hysterectomy are considered.

The insertion technique is simple and consists of placing the balloon portion of the Sengstaken, Rüşch or Bakri catheter (others have used a glove or condom tied to a catheter) directly into the uterus, making sure that the entire balloon is inserted past the cervical canal and internal os. A 60 ml syringe or a giving set of a saline infusion can be used for inflating the balloon. The balloon is filled gradually and when the bleeding stops emerging via the cervix, the method is successful and another 50 ml is introduced to make sure it is effective. It is unusual for more than 500 ml to be required and if that is the case, exploration by laparotomy may be needed and a compression suture as the next step. If there is continued bleeding with this volume or if the balloon herniates, compression suture should be considered. Gentle traction on the balloon shaft ensures proper contact between the balloon and the tissue surface and enhances the

tamponade effect. Success is judged by no loss of blood from the cervix or seen through the drainage port.

All patients should be managed by close monitoring of vital signs, fluid input/output, fundal height and vaginal blood loss. Continued oxytocin infusion may be necessary to keep the uterus contracted over 12–24 hours. A prophylactic broad-spectrum antibiotic should be administered. The mean time for leaving the tamponade balloon ranges from 8 to 48 hours. A gradual deflation of the balloon is advised to reduce the potential risk of further bleeding. Tamponade procedures are simple, cheap, easy to use and effective measures that should be considered for intractable postpartum hemorrhage, especially when other options are not available.

### Alternative

An alternative innovative approach from Bangladesh uses a sterile rubber catheter fitted with a condom as a tamponade balloon device. The sterile catheter is inserted within the condom and tied near the mouth of the condom with a silk thread; the other end of the catheter is connected to a saline set. After placement in the uterus, the condom is inflated with 250–500 ml normal saline according to need, and the other end of the catheter is folded and tied with thread after bleeding has stopped. To keep the balloon *in situ*, the vaginal cavity is packed with roller gauze. This method represents a cheap, simple and quick intervention, which is invaluable in resource-poor countries.

### Pelvic Packing – Achieving hemostasis in difficult cases when standard surgical methods are not working (a "second line of defence")

In cases where hemodynamic stability is not achieved either during caesarean section or after caesarean hysterectomy – or in cases involving complicated instrumental delivery – pelvic packing may be useful.

Before proceeding a careful check should be made for any obvious arterial bleeding which could be readily accessed and controlled by clamping, by ligature, or by tying the artery. The effectiveness of the tamponade should be re-checked and all identifiable bleeding controlled by direct surgical means where possible.

Pelvic packing can then be applied. The pouch of Douglas and the anterior vesical space should be packed using standard surgical (medium or large) gauzes and the fascia should then be closed. Afterwards the patient should be transferred to an intensive care unit for further stabilization.

If the bleeding still continues, an angiography, combined with embolization, can be performed. If active bleeding persists and the need for blood transfusion becomes apparent, the patient's body temperature should be

normalized as soon as possible in order to stabilize the intrinsic hemostatic system. When a normal body temperature has been achieved a second attempt at hemorrhage control by changing the packing should be considered.

Once the hemodynamics are stabilized, the packing should normally be left in place for 24–48 hours. During a "second look" operation it is usual to observe a significant improvement or complete cessation of the bleeding. If there is any remaining bleeding, it may be controlled by local surgical hemostasis.

For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Chapters 45–49 and 54

## STEP 5

# Seek Additional Help

If the tamponade test fails, the next step would be compression suture alone or a combination of compression suture with a balloon (sandwich technique). The compression suture devised by Christopher B-Lynch is well known and is described as the next step.

## Home Delivery



## Nursing Station or Health Unit



## District or Regional Hospital



If necessary, transfer to

## Tertiary (University) Hospital

in instances where full therapeutic measures such as blood bank facilities, surgical expertise, operating theater facilities, or embolization are not available or where there are delays in receiving these therapies or for intensive care monitoring in a patient who continues to bleed.

For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Chapters 38 and 39

## STEP 6

# Hospital-based procedures

### B-Lynch Suture

The B-Lynch suture aims to exert continuous vertical compression on the uterine vascular system. Laparotomy, uterine exteriorization and an opened uterine cavity are necessary. Test for the potential efficacy of the B-Lynch suture by performing open bimanual compression to see whether the bleeding stops, before proceeding to place the suture into the uterus. If the bleeding stops on applying such compression, there is a good chance that application of the B-Lynch suture will stop the bleeding.

### Procedure

The assistant performs compression and maintains it with two hands during the placement of the suture by the surgeon. To perform the procedure, the operating surgeon should be well accustomed with the steps, which can be achieved by regular practice during skills and drills courses on dummies.

### Other Procedures

#### Quadruple Compression Sutures

Multiple square sutures are used to cover the whole body of the uterus and may be useful in cases of placenta previa (ensure a drainage portal is left). Check that the compression sutures have worked by observing blood loss vaginally before closing the abdomen. Suture through and through with a straight 10-cm needle.

### Uterine Compression Sutures – Vertical

These are an alternative to the B-Lynch technique if no lower segment cesarean incision is present. They may be placed without opening the uterus, using a straight 10-cm needle. Ensure downward bladder retraction and place two to four vertical sutures. Check that the compression sutures have worked by observing blood loss per vaginam before closing the abdomen.

### Uterine Artery Embolization

Embolization is a highly feasible, safe and beneficial procedure, possibly precluding further laparotomy and hysterectomy. If successful, it not only saves the patient's life, but also the uterus and adnexal organs.

For detailed reading, consult *A Comprehensive Textbook of Postpartum Hemorrhage*, Chapters 2, 51–53 and 55

Where available, it should be the procedure of choice for postpartum hemorrhage prior to surgical intervention, when other therapies have not achieved hemostasis. Embolization requires an obstetric department that is well aware of its implications in postpartum uterine hemorrhage and a proactive protocol providing easy access for the obstetricians to emergency care from the interventional radiology team.

### Stepwise Devascularization

Essential requirements are an obstetrician competent in pelvic gynecological procedures and an obstetric anesthetist, and provisions for close supervision postoperatively. The surgical approach starts with ligation of the uterine artery and its distribution to the uterus, either unilaterally or bilaterally, preferably as it emerges from crossing over the ureter or as it approaches the uterine wall to penetrate and establish its divisions and the infundibulopelvic vessels before they enter the uterus.

### Internal Iliac Artery Ligation

Conditions indicating ligation are postpartum hemorrhage due to atonic uterus refractory to other measures, abruptio placentae with uterine atony, abdominal pregnancy with pelvic implantation of the placenta and placenta accreta. Therapeutic indications include: before or after hysterectomy for postpartum hemorrhage; continuous bleeding from the broad ligament base; profuse bleeding from the pelvic side-wall or the angle of the vagina; diffuse bleeding without a clearly identifiable vascular bed; ruptured uterus in which the uterine artery may be torn at its origin from the internal iliac artery; and where extensive lacerations of the cervix have occurred following difficult instrumental delivery.

### Hysterectomy

Emergency peripartum hysterectomy is the best option when uterine atony is unresponsive to oxytocics and prostaglandins and where facilities for embolization are not available and/or the obstetrician is not versed with conservative surgical procedures. Uterine rupture secondary to obstructed labor and previous caesarean section may be indications. If the rupture is extensive and hemorrhage cannot be contained by suture of the ruptured area, then hysterectomy may be necessary.