

Management of Obstetric Haemorrhage

Initial management

3

- **CALL FOR HELP**
- Assess and treat Airway, Breathing, Circulation
- High flow **OXYGEN** via facemask
- Head down tilt (left lateral if APH)
- **IV ACCESS** - Two 14G (orange) cannulae
- Take blood - FBC, coagulation, +match 6 units
- Request cell salvage
- **GIVE WARMED FLUIDS** (level 1 infuser)
 - crystalloid up to 2000ml
 - colloid up to 1500ml
- **CONTACT HAEMATOLOGY**
- 0-ve blood if bleeding uncontrolled
- **Type specific blood** if the time permits (20 minutes)

Definitions

1

MINOR	500 - 1000ml
MODERATE	1000 - 2000ml
SEVERE	>2000ml

Blood loss is frequently underestimated

Diagnosis

2

- APH** Placenta praevia or placental abruption
If severe consider immediate delivery
- PPH** **Tone** (atonic uterus - 70%) **Trauma** (20%)
Tissue (retained products - 10%)
Thrombin (coagulopathy)

4 Management of PPH

PHARMACOLOGICAL:

- Syntocinon 2-5IU slowly IV (repeat once)
- Ergometrine 500mcg slowly IV (caution in hypertension)
- Syntocinon IV infusion 30IU in 500mls at 125ml.hr⁻¹
- Carboprost 0.25mg IM every 15min - 8 doses max (caution in asthmatics)
- Misoprostol 1mg PR

SURGICAL

- Examination under anaesthetic
- Uterine massage if atony
- Bimanual uterine compression
- Balloon tamponade (e.g. Rusch balloon)
- B-Lynch suture
- Ligation of uterine/internal iliac arteries
- Hysterectomy

RADIOLOGICAL:

- Contact radiology consultant
- Embolisation / arterial balloon occlusion

5 Blood loss and coagulation

- Team member to coordinate sample delivery and blood product collection
- Contact senior haematologist for advice
- Give packed blood cells (RBC)
- After 4U RBC give 1 unit FFP for each further unit of blood
- If INR >1.5 give **FFP**
- Give **platelets** if <50x10⁹/l
- **Cyroprecipitate** 1 unit per 5kg, if fibrinogen 1.5g/l⁻¹
- If DIC suspected, transfuse platelets and cyroprecipitate early
- Repeat coagulation studies and regular Hemocue[®]
- Consider **recombinant factor VIIa** 90mcg.kg⁻¹ and/or Octaplex if available (D/W haematologist)
- Consider 10ml 10% calcium gluconate
- Consider **gluconate tranexamic acid** 15mg.kg⁻¹ IV

6 Anaesthetic considerations

- Call consultant anaesthetist
- Liaise early with ICU
- Avoid hypothermia: early use of warm air blower and warmed fluids
- Weigh swabs to aid accurate estimation of blood loss
- Monitor urine output and temperature
- Consider arterial line early
- Take regular blood samples for FBC, coagulation, ABG and Hemocue[®]
- Avoid regional anaesthesia if cardiovascular instability: **GA and RSI is usually indicated**
- Consider oesophageal Doppler and/or CVP monitoring
- A vasopressor may be required despite fluid resuscitation. Use phenylephrine in first instance; norepinephrine infusion (4mg in 40ml 5% glucose) may be necessary

Management of obstetric haemorrhage

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INTRODUCTION

Obstetric haemorrhage remains one of the leading causes of preventable maternal morbidity and mortality worldwide. Life-threatening haemorrhage occurs in around 1 in every 1000 deliveries. Prompt recognition and management of obstetric haemorrhage is essential.

The majority of maternal deaths due to haemorrhage in the 2003-2005 UK Confidential Enquiry into Maternal and Child Health report were deemed to have received 'major substandard care' (10 out of 17 fatalities). The implications of suboptimal management of severe obstetric haemorrhage are numerous, threatening not only the well being of the mother, but also that of her neonate and family.

The guideline shown in Figure 1 is an adapted version of the local guideline in use in our centre – it has been adapted with reference to the Royal College of Obstetricians and Gynaecologists (RCOG) Green-top Guideline No.52, that deals specifically with postpartum haemorrhage and is for use by both anaesthetists and obstetric staff.

For the purpose of this review, the points made in the boxes of the guideline in Figure 1 are expanded and discussed in sequential order. However, in a case of major obstetric haemorrhage resuscitation, monitoring, investigation and management should occur simultaneously. Note that the core guideline gives recommendations for management of postpartum haemorrhage, whilst additional points appropriate to antepartum cases are also highlighted.

Some of the facilities and equipment detailed in the guideline will not be available in many healthcare settings. They are included for completeness, in the knowledge that practitioners will be able to use those parts of the guideline which are applicable to the system within which they work.

COMMENTARY ON ALGORITHM

Box 1 – Definitions

Antepartum haemorrhage (APH)

APH is defined as vaginal bleeding after gestation of 22 weeks. Blood loss may be concealed and lead to underestimation of haemorrhage.

Causes include:

- Placenta praevia
- Placental abruption
- Infection
- Trauma

Postpartum haemorrhage (PPH)

Post partum haemorrhage may be primary or secondary.

Primary PPH can be defined as the loss of more than 500ml of blood within 24 hours of delivery. It can be further subdivided into minor (500ml-1000ml) or major (more than 1000ml). Exact numerical definitions of blood loss are unimportant. It is essential to remember that blood loss is frequently underestimated and physiological variables, especially that of systolic blood pressure, may change little until 30 to 40% circulating blood volume has been lost. The clinician must therefore maintain a high index of suspicion for major obstetric haemorrhage.

An estimated blood loss of 1000ml (or less with concurrent clinical signs of haemorrhagic shock such as tachycardia, tachypnoea, prolonged capillary refill, oliguria and, in extremis, hypotension and altered cognitive function) should initiate the protocol for the management of major obstetric haemorrhage. Education of staff in the use of more accurate measurement of blood loss, near patient testing of haemoglobin (Hemacue™) and an obstetric Early Warning Score may facilitate earlier diagnosis and treatment of obstetric haemorrhage (see appendices).

Box 2 - Diagnosis

Causes of primary PPH can be divided into the "Four Ts": (See Table 1. *Risk factors for PPH*)

- **Tone:** Atonic uterus (The most common, accounting for 70% of PPH)
- **Tissue:** Retained products (10%)
- **Trauma:** Genital tract trauma (20%)
- **Thrombin:** Coagulopathy, e.g. DIC (1%)

Secondary PPH is defined as abnormal or excessive bleeding from the birth canal between 24 hours and 12 weeks postnatally. Causes include retained products of conception and sepsis.

Summary

Obstetric haemorrhage is frequently underestimated.

Ensure your Obstetric Unit has a protocol for the management of haemorrhage – and practice it.

Call for senior help.

Successful management requires multidisciplinary input.

Remember to replace both blood and blood components.

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Table 1: Risk factors for PPH

Classification	Risk factor
Tone	Multiple pregnancy Previous PPH Obesity (BMI>35) Large baby (>4kg) Prolonged Labour (>12hrs) / prolonged 2nd stage Advanced maternal age (>40 years, primiparous) Retained placenta Asian ethnicity Placenta Praevia
Tissue	Retained placenta Placenta accreta, increta and percreta (high mortality: associated with previous caesarean section)
Trauma	Delivery by caesarean section (emergency>elective) Operative vaginal delivery Mediolateral episiotomy Large baby (>4kg)
Thrombin	APH (placental abruption) Pre-eclampsia Sepsis
Other	Pre-existing coagulation problems, thrombocytopaenia, women taking anti-coagulants

Women with pre-existing coagulation problems, thrombocytopaenia or those on anticoagulants are at increased risk of obstetric haemorrhage. The specific management is not described within this article.

Box 3 - Initial management of obstetric haemorrhage, monitoring and effective fluid and transfusion strategies

Call for help

This is essential. An obstetric emergency requires multidisciplinary input. Several pairs of hands are needed to aid resuscitation, to fetch equipment, prepare the operating theatre and transport blood samples and blood products to and from the laboratory. In the author's hospital, switchboard can be asked to put out a Major Obstetric Haemorrhage Call, which summons the appropriate staff including the obstetrician, anaesthetist, haematologist, operating department assistant, midwives, theatre staff and porter.

A, B, C and oxygen

Assess Airway, Breathing and Circulation in accordance with the ALS guidelines. It is important to perform concurrent evaluation and resuscitation. Ensure monitoring is attached (BP, ECG, SaO₂).

Resuscitation should include:

- High flow oxygen via a face mask with a reservoir bag.
- Head down tilt to increase venous return to the heart and help preserve cardiac output.
- Intravenous access with two large bore (14G) short cannulae remembering to take blood for FBC, coagulation, and cross-match (minimum of 6 units).
- Consider invasive arterial blood pressure (IABP) monitoring early, once resuscitation is underway. IABP monitoring provides accurate, continuous blood pressure measurement as well as access to arterial blood for blood gas analysis and blood samples for evaluation of coagulation.

Fluid resuscitation

Commence intravenous fluid resuscitation. Aim to aggressively restore circulating volume using pressure bags and a fluid warmer (or Level 1 infuser if available). It is essential to infuse warmed fluids as large volumes of cold fluids place the patient at risk of hypothermia. Hypothermia may induce shivering and subsequently increase O₂ consumption in a patient with decreased O₂ carrying capacity and decreased O₂ reserves. Hypothermia may also impair coagulation, affect renal and liver function and delay wound healing.

Once 3500ml of warmed crystalloid (2000ml) and/or colloid (1000ml) have been infused, further resuscitation should continue with blood. Give O Rhesus negative blood (immediate) or group specific blood (20 minutes) until crossmatched red blood cells are available (40-60 minutes). This ensures improvement in the O₂ carrying capacity. If the haemorrhage continues, inform the haematology laboratory of the likely need for additional blood and blood products.

Note that use of major haemorrhage packs is now established for management of traumatic blood loss in conflict zones. These packs contain four units of blood with a unit of fresh frozen plasma (and, in some instances, platelets or cryoprecipitate) and are aimed at pre-emptive control of the coagulopathy that complicates major haemorrhage. The most recently constructed algorithms for management of major haemorrhage in trauma recommend this approach, although currently available guidance for the obstetric setting recommends conventional use of packed cells and other blood products guide by laboratory investigations. Guidance from the Association of Anaesthetists of Great Britain and Ireland is anticipated in October 2010 and will be reproduced in a future edition of *Update*.

Specific points for management of APH

Many of the initial resuscitative measures remain identical to those in PPH. In addition, consideration must be given to assessment and optimisation of foetal well being. The patient should be placed in a head down position with left lateral tilt or uterine displacement in order to avoid aorto-caval compression. Foetal monitoring should be applied and an assessment of the foetal gestation and viability made. Severe APH usually mandates urgent surgery and delivery of the baby.

Box 4 - Management of PPH

Measures aimed at minimising blood loss can be divided into pharmacological, surgical, radiological and haematological. Treatment must be tailored to the underlying cause of PPH, for example use drugs to stimulate uterine contraction in cases of uterine atony, or undertake evacuation of the uterus for retained products or surgical repair of genital tract trauma.

Box 4A – Pharmacological management of PPH

The most common cause of PPH is uterine atony. In addition to uterine massage, the following drugs stimulate uterine contraction:

Syntocinon

- Syntocinon is a synthetic analogue of oxytocin and 5IU is given by slow intravenous injection.
- Rapid injection may result in vasodilatation and subsequent hypotension and tachycardia.
- The dose may be repeated once (maximum of 10IU).
- Thereafter, an infusion of 30 to 40IU in 500mls 0.9% Saline may be commenced at a rate of 125ml.hr⁻¹.

Ergometrine

- The dose is 500mcg by slow intravenous or intramuscular injection.
- Adverse effects include nausea, vomiting and vasoconstriction leading to a marked rise in BP. It is therefore best avoided in patients with cardiovascular disease and pre-eclampsia.

Carboprost

- Carboprost is a prostaglandin F2 receptor agonist which stimulates uterine contraction
- 250mcg is given by intramuscular injection. This may be repeated at 15 minute intervals to a maximum of eight doses.
- Adverse effects include bronchospasm, hypoxia, flushing, nausea and vomiting. It should be avoided in patients with asthma.

Misoprostol

- Misoprostol is a prostaglandin E1 analogue which also stimulates uterine contraction. It rarely causes any serious side effects.
- The dose is 1mg rectally.

Box 4B - Surgical treatments for PPH

If pharmacological measures fail to adequately control the haemorrhage, attempt mechanical measures. In the case of uterine atony, uterine massage or bimanual uterine compression may stimulate uterine contractions and aid control of PPH. However, if the preceding measures fail, the following invasive surgical measures should be considered:

- Balloon tamponade
- B-Lynch suture
- Bilateral ligation of uterine or internal iliac arteries
- Hysterectomy

Balloon tamponade has largely superseded uterine packing in the control of PPH secondary to uterine atony. A variety of hydrostatic balloon catheters (including the Foley catheter, Bakri balloon, Rusch balloon and Senstaken Blakemore tube) are suitable for intrauterine placement and subsequent balloon inflation. If PPH is arrested, the catheter should be left in situ for at least 6 hours. Failure to achieve haemorrhagic control after balloon inflation indicates the need for laparotomy.

B-Lynch sutures are a form of haemostatic brace suturing which require hysterotomy for insertion. They are most useful in the control of PPH following caesarean section (as the uterus has already been opened). Modified techniques which do not require hysterotomy have been described. Haemostatic sutures may reduce the need for hysterectomy but should only be used by a skilled surgeon familiar with the technique.

The choice of surgical procedure will depend on the expertise of the staff and availability of equipment. Temporising measures may be undertaken pending the arrival of an experienced clinician skilled in both judging the need for, and in performing, peripartum hysterectomy which is often challenging. Unnecessary delay must be avoided however and the difficult decision to perform a peripartum hysterectomy should be made before the woman is in extremis.

Box 4C - Radiological strategies in PPH

Where facilities for interventional radiology are available, arterial embolisation or balloon occlusion of iliac vessels may obviate the need for hysterectomy. However, few centres have this service immediately available and many patients will be too unstable to tolerate potentially long X-ray procedures which may also require transfer to a radiology department. Transfer for an interventional radiological procedure may be particularly useful in the stable patient who is still bleeding despite the surgical interventions described above.

Box 5 - Blood loss and coagulation management

At term, the blood supply to the uterus may exceed 800ml.min⁻¹. Haemodynamic compromise may occur rapidly or more insidiously (e.g. retained products). The latter may be associated with a delay in recognition of the severity of haemorrhage due to the patient's ability to compensate until life threatening haemorrhage has already occurred.

It is important to remember that haemorrhage results in the loss of not only red blood cells but also blood components and platelets. Once four units of packed red blood cells (RBCs) have been transfused, consideration should be given to the replacement of other blood components. There is recent evidence from military medicine that aggressive replacement of coagulation products may improve outcome. Following transfusion of 4 units RBCs, a 1:1 ratio of FFP to RBC is recommended in major haemorrhage. Transfusion of RBCs alone increases the oxygen carrying capacity of blood but will not correct an underlying coagulopathy.

The endpoint of the coagulation cascade is the conversion of fibrinogen to fibrin. Even with adequate factor levels, fibrinogen is essential for coagulation. During pregnancy, fibrinogen levels increase and women should be considered severely hypofibrinogaemic and transfused

fibrinogen in the form of cryoprecipitate if their fibrinogen level falls below 1.5g.l⁻¹.

A named team member should coordinate the delivery of blood samples and collection of blood products to and from the haematology laboratory. Delivery of multiple blood samples and collection of blood products may be required.

Alert the oncall haematologist. They are best able to guide transfusion requirements based on regular full blood count and coagulation studies, however in a major haemorrhage, waiting for coagulation results from the laboratory must not delay transfusion of coagulation factors. The following may serve as a guide to the main haematological goals in the management of massive blood loss:

Suspicion of disseminated intravascular coagulation should prompt earlier administration of platelets and cryoprecipitate.

Table 2. Guide to use of blood products

	Target	Action
Hb	> 8g.dl ⁻¹	If less, transfuse RBCs
INR	< 1.5	If prolonged, transfuse Fresh Frozen Plasma (FFP)
Platelets	> 50 x 10 ⁹ .l ⁻¹	If less, transfuse platelets
Fibrinogen	> 1.5g.l ⁻¹	If less, transfuse cryoprecipitate 1unit/5kg

Pharmacological manipulation of coagulation

Recombinant factor VIIa - 90mcg.kg⁻¹

Recombinant activated Factor VII was originally developed for the treatment of haemophilia but has been used in the management of major trauma and obstetric haemorrhage. Evidence of its efficacy is limited. However, as the activation of factor VII by tissue factor is one of the initial steps in the coagulation cascade, it may prove to be useful in the management of life threatening PPH. Ensure adequate levels of fibrinogen and platelets prior to administration.

Human pro-thrombin complex (e.g. Octaplex)

Octaplex is a human pro-thrombin complex which may have a role in the management of persistent non surgical haemorrhage.

Tranexamic acid - 15mg.kg⁻¹ IV

Tranexamic acid is an antifibrinolytic agent which inhibits the conversion of plasminogen to plasmin. It may have a role in uncontrolled haemorrhage although there is little supporting evidence for its efficacy.

Near patient testing of coagulation and fibrinolysis by thromboelastography or thromboelastometry if available, may be very useful in guiding the management of coagulation as a result of massive obstetric haemorrhage.

Box 6 - Anaesthetic considerations

Call a senior anaesthetist

This is essential. Obstetric patients with severe haemorrhage may decompensate rapidly. An experienced pair of hands is vital to aid

in resuscitation and decision making. Seek early Intensive Care involvement.

Continue resuscitation with warmed fluids and apply early active patient warming (e.g. forced warm air device) to avoid hypothermia. Consider upgrading monitoring (arterial +/- CVP) if situation allows but **DO NOT DELAY URGENT SURGERY** to facilitate insertion. Haemostasis takes precedence.

If surgery is required, remember to ensure that routine safety precautions are taken including anaesthetic history, airway assessment, antacid prophylaxis and pre-oxygenation. Regional anaesthesia is usually best avoided in the case of major obstetric haemorrhage as it may prevent sympathetic compensation in a patient who is intravascularly deplete, leading to marked hypotension and inadequate perfusion of vital organs. General anaesthesia following a rapid sequence induction with cricoid pressure is therefore usually the technique of choice.

Drug dosages for induction and maintenance of general anaesthesia may need to be modified according to the circulatory status of the patient. Some induction agents (e.g. thiopentone, propofol) may result in significant hypotension in the presence of hypovolaemia. In major haemorrhage, ketamine (1.5mg.kg⁻¹ IV) may better preserve cardiovascular stability. Remember that the volatile agents cause uterine relaxation and excessive concentrations should be avoided, especially in the case of uterine atony.

The focus of resuscitation should be preservation of the woman's life rather than preservation of her uterus.

Resuscitation must be guided by taking regular blood samples for FBC (Hemacue™ if available), coagulation and arterial blood gases. Cell salvage may reduce requirements for homologous blood and is increasingly used in obstetric haemorrhage. Other means of assessing cardiovascular status include the use of an oesophageal Doppler and/or a central line. Although the latter may be used to monitor trends in central venous pressure it has perhaps greater benefit in facilitating inotrope administration if required.

Postoperative care

The patient should be managed where she can be watched closely, given oxygen and her vital signs monitored at regular intervals. Ideally this should be in a high dependency area.

SUMMARY

This guideline and accompanying article describe the emergency management of an obstetric patient with major haemorrhage. Haemorrhage in this setting can be sudden, profuse and unexpected. Management is therefore likely to be more efficient and effective if guided by a protocol, which combines the common objectives of anaesthesia, midwifery and obstetric staff. It is important to call for senior anaesthetic and obstetric assistance at an early stage. As blood is transfused it is important to remember to administer blood products - it is likely that future guidelines will advocate use of 'massive transfusion packs' (with blood, fresh frozen plasma and platelets) from the onset of resuscitation.

FURTHER READING

1. Royal College of Obstetricians and Gynaecologists. Prevention and Management of Postpartum Haemorrhage. Green-top Guideline No.52. London RCOG; 2009. Available at: www.rcog.org.uk/womens-health/clinical-guidance/prevention-and-management-postpartum-haemorrhage-green-top-52
2. Royal College of Obstetricians and Gynaecologists. Blood Transfusion in Obstetrics. Green-top Guideline No.47. London RCOG; 2008. Available at: www.rcog.org.uk/files/rcog-corp/uploaded-files/GT47BloodTransfusions1207amended.pdf
3. Confidential Enquiry into Maternal and Child Health. Saving Mothers Lives 2003-2005. Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. London: CEMACH; 2006. Available at: www.cmace.org.uk/getattachment/927cf18a-735a-47a0-9200-cdea103781c7/Saving-Mothers--Lives-2003-2005_full.aspx
4. Bose P, Regan F, Paterson-Brown S. Improving the accuracy of estimated blood loss at obstetric haemorrhage using clinical reconstructions. *BJOG* 2006; **113**: 919–24.
5. P. Moor, D. Rew, M.J. Midwinter, H. Doughty. Transfusion for trauma: civilian lessons from the battlefield? *Anaesthesia* 2009, **64**, 469-72.

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



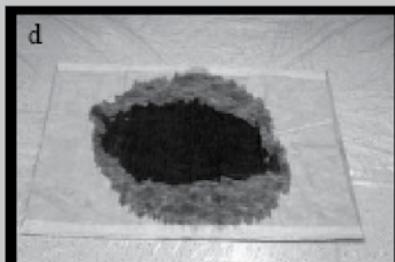
Soiled Sanitary Towel
30ml



Soaked Sanitary Towel
100ml



Small Soaked Swab 10x10cm
60ml



Incontinence Pad
250ml



Large Soaked Swab 45x45cm
350ml*



ABL 50cm diameter (500ml), 75cm diameter (1000ml) and 100cm diameter (1500ml)

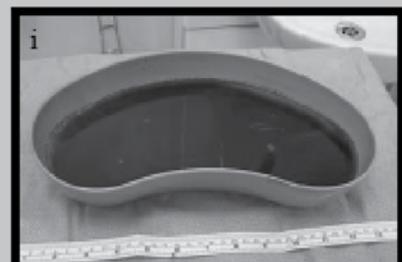
100cm Diameter Floor Spill
1500ml*



PPH on Bed only
1000ml



PPH Spilling to Floor
2000ml



Full Kidney Dish
500ml

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

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