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Postpartum and Major Obstetric Haemorrhage Guideline

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Author/Further information:	Millicent Nwandison, Consultant Obstetrician, Joanna Allam, Consultant Anaesthetist, Natasha Singh, Consultant Obstetrician, Philip Barclay, Consultant Anaesthetist		
Joint guideline changes	Removal of antepartum haemorrhage management (WMUH) New threshold for MOH now 1000mls Terminology for MOH call out uniform across both sites New scribe sheets for EBL 1000ml or more (site specific) Escalation for EBL 3000ml or more (WMUH) Introduction of shock packs Introduction of ROTEM Management of secondary PPH Process for transfer for selective arterial embolisation (WMUH)		
Stakeholders involved:	Midwives, Obstetricians, Haematology, Blood Transfusion, Anaesthetics, Allied Staff		
Applicable to:	Intrapartum, Postnatal care		
Directorate responsible	Women"s and Children's Division		
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Version History	**Date**	**Responsibility**	**Comments**
V13	May 2020	Jennifer Ryan, Guideline Specialist Midwife	If Ergometrine is unavailable, Syntometrine® to be used as a substitute. Pg 22, point 8.3.18
V12	April 2020	Jennifer Ryan, Guideline Specialist Midwife	Amendment made to administration of Oxytocin following administration of Carbetocin - See page 9, point 4.1. and page 24 point 8.3.18
V11	Nov 19	Millicent Nwandison, Consultant Obstetrician	Update to appendix 3
V10 WMUH guideline	Jul 15	Christina Cotzias, Consultant Obstetrician Louise Page, Consultant Obstetrician	Updated from London Strategic Clinical Networks best practice toolkit Use of tranexamic acid to arrest bleeding **May 2016**: antibiotic prophylaxis for balloon tamponade added; oxytocin replaces Syntocinon

Postpartum and Major Obstetric Haemorrhage

1.0 PURPOSE OF GUIDELINE

Obstetric haemorrhage remains one of the major causes of maternal death in both developed and developing countries. The 2011–13 Confidential Enquiries into Maternal Deaths and Morbidity report identified 13 direct deaths due to obstetric haemorrhage with obstetric haemorrhage as the second leading cause of direct maternal deaths. The recommendations focus on basic clinical skills, with prompt recognition of severity of haemorrhage and emphasise the importance of communication and teamwork in the management of these cases.
Every maternity unit should have a multidisciplinary protocol for the management of post-partum haemorrhage (PPH), (Mavrides et al, 2016). This guideline describes a multi-disciplinary team approach for recognition and management of maternal haemorrhage with fast, safe and effective intervention to achieve the best outcome, through:

- Early recognition of and response to, postpartum haemorrhage
- Activation of the major obstetric haemorrhage protocol
- Early involvement of senior clinicians

2.0 POSTPARTUM AND MAJOR OBSTETRIC HAEMORRHAGE: DEFINITIONS & EMERGENCY CALLS

2.1 Definitions

Primary postpartum haemorrhage: loss of 500 ml or more of blood from the genital tract, within 24 hours of delivery.

Secondary postpartum haemorrhage: abnormal or excessive bleeding from the birth canal, between 24 hours and 12 weeks after delivery.

Minor Obstetric haemorrhage: 500-999 ml blood loss, without clinical shock.

When blood loss **is ≥ 500ml and ongoing** after any vaginal delivery outside of theatre, use the emergency button to obtain immediate help from **first line** members of staff who comprise the LW co-ordinator, Obstetric SpR & SHO and Anaesthetic SpR , or equivalent Staff Grades (Mavrides et al, 2016: AAGBI, 2016)

Major Obstetric haemorrhage (MOH): defined as blood loss ≥1000 ml, or where blood loss is ongoing, or where there is maternal clinical shock, regardless of the volume of blood loss.

After any vaginal or operative delivery, when blood loss is **≥1000ml and ongoing**, use the emergency button to obtain immediate help from first line staff (if not already

present) and dial 2222 to obtain further help and to alert **second line** members of staff as detailed below in section 2.2. This call also activates the major obstetric haemorrhage protocol (see below)

- The LW Co-ordinator should contact the Consultant Obstetrician to attend **when blood loss is ≥ 1500 ml and ongoing**

Major Obstetric Haemorrhage protocol: this is automatically activated when the 2222 call „major obstetric haemorrhage" is made to switchboard. It alerts the blood transfusion laboratory that blood and blood products may be required immediately. The duty biomedical scientist will contact the location of the MOH to obtain the woman"s full name, date of birth and hospital number. The validity of G&S samples can then be confirmed and advice given on how quickly blood can be obtained for that particular woman. If and when blood and blood products are required, this must be communicated to the laboratory and the use of either generic shock packs 1-3 or specific products may be requested depending on the clinical situation (see section 10.0)

2.2 Emergency calls

There are TWO emergency „2222" obstetric haemorrhage calls that may be made.

1. When Blood loss is ≥1000 ml

This is the first emergency call made to switchboard by dialling 2222, when blood loss is 1000 ml or there is clinical shock. The caller may be any member of staff that is requested or delegated to do so.

• Dial 2222: State „**Major Obstetric Haemorrhage**" and precise location

This 2222 MOH call alerts the following on-duty staff to attend orstand-by;

- **First line staff:** LW co-ordinator, Obstetric SpR & SHO, Anaesthetic SpR (or Staff Grade equivalents) to attend
- **Second line staff:** Senior Obstetric and Senior Anaesthetic SpR (or Staff Grade equivalents), ODP and porter to attend
- Please note, Consultant Obstetricians and Consultant Anaesthetists at WMH and CWH sites are **not** routinely alerted by phone by switchboard for this call at any time. However, if on-site and carrying emergency bleeps, they will be included in this group alert and should liaise with the team and attend if requested to do so.

Haematology biomedical scientist (BMS) / blood transfusion to contact team at location of MOH in anticipation of providing blood and blood products Porter to be deployed to MOH location for the duration of the emergency, for delivery of specimens / blood and blood products until requested to „stand down" by LW co- ordinator.

Please note that the Haematology SpR on call is **no** longer routinely alerted following a 2222 MOH call. If you require further haematology advice, please contact the Haematology SpR separately (Blp 121 &172 WMH; Blp 0902 or mobile CWH) or the on call Consultant Haematologist through the hospital switchboard.

At WMUH site only, the following health care professionals are also alerted:
- Site manager to provide possible administrative assistance to the LW co-ordinator
- Main Theatre sister to be available for the loan of equipment / personnel
- A&E to be aware of competing demands for resources

2. When Blood loss is ≥ 1500 ml

This is the second emergency call made to switchboard by dialling 2222, when blood loss is 1500 ml, with or without clinical shock. The caller may be any member of staff that is requested or delegated to do so.

• Dial 2222: State either „**Controlled Major Obstetric Haemorrhage**" or „**Ongoing Major Obstetric Haemorrhage'** (see definitions below) and precise location

This 2222 MOH call again alerts the on-duty staff to attend and also alerts off-site/duty Consultant staff as below;

- First line and Second line staff (as above)
- Both duty Consultant Obstetricians and Consultant Anaesthetists are contacted by phone by switchboard at all times

Controlled MOH: When bleeding is controlled (is slow or reducing) or has stopped and the situation is stable. A „**controlled'** 2222 call should only be authorised by a Consultant Obstetrician, Consultant Anaesthetist or Obstetric ST 6-7 level. If there is any doubt, then the default type of call should **always** be ONGOING. The Consultant Obstetrician and Consultant Anaesthetist should liaise with the LW coordinator or their respective teams, and attend if requested to do so. The Consultant Obstetrician should attend when blood loss is ≥ 1500 ml and ongoing (Mavrides et al, 2016).

Ongoing MOH: When bleeding is not controlled, remains ongoing and / or there is clinical shock. The Consultant Obstetrician and Consultant Anaesthetist should liaise with the LW coordinator or their respective teams, and attend if requested to do so. The Consultant Obstetrician should attend when blood loss is ≥ 1500 ml and ongoing.

3.0 PREDICTING PPH & MOH

There are well-recognised risk factors for PPH. These are summarised in Table 1 below and identify women at **increased** risk of PPH and/ or MOH. These risk factors should be recognised antenatally and individualised plans for labour and delivery should be discussed, agreed with the women and documented. However, two thirds of PPH occurs without predisposing factors, so prophylactic uterotonics are recommended in routine management of the third stage of labour for **all** women and in all birth settings, as they reduce the risk of PPH by 60%.

Table 1. Risk factors for PPH or MOH

MATERNAL	FETAL	INTRAPARTUM
Age > 40 yrs	Multiple pregnancy	PROM
Obesity (BMI > 35)	Fetal demise	Induction & augmentation
Asian ethnicity	Polyhydramnios	Prolonged 2nd /3rd stage (>12hrs)
Previous PPH	Macrosomia (> 4Kg)	Precipitous labour
Grand multiparity		Placental abruption
Abnormal placentation		Operative delivery
Uterine fibroids/surgery/ anomaly		Episiotomy
Maternal sepsis/pyrexia		Uterine/lower genital tract trauma
Anaemia (Hb < 90g/l)		Retained placenta or products
Pre-eclampsia		General Anaesthesia
Acquired / Hereditary Coagulopathy		

3.1 Antenatal management

- Clinicians should recognise women with increased (one or more) risk factors for PPH as they arise either antenatally or intra-partum
- Women should be counselled antenatally about care plans and place of delivery, with documentation of recommended measures to reduce blood loss atdelivery
- Women with risk factors should be advised to deliver in an obstetric led unit with blood bank on site (Knight et al, 2015).
- Antenatal anaemia should be investigated and treated promptly as this may reduce the morbidity associated with PPH. Haemoglobin (Hb) levels of 110 g/l at first contact and 105 g/l at 28 weeks should be investigated and iron supplementation considered if indicated. See *Anaemia guideline* (WMHonly).
- For women identified with a suspected morbidly adherent placenta, please see *Placenta praevia, placenta accrete and vasa praevia* cross-site guideline.
- All clinicians should be aware of Trust guidance for management of women who refuse blood transfusion /blood products in pregnancy; *Refusal of blood transfusion and blood products in pregnancy* (CWH only) and/or *Haemorrhage in women who refuse blood transfusion* (WMH only). Both Consultant Obstetrician and Anaesthetist should see women antenatally for counselling, with management plans clearly documented.

4.0 PREVENTING PPH & MOH

Anticipating PPH in any woman, particularly those at increased risk (Table.1) and implementing routine precautionary pharmacological and mechanical measures

(Section 5.0) may reduce blood loss, reduce incidence of MOH and improve maternal outcomes. **'Put the plug in'** is the combined approach of anticipation, early recognition and prompt management of blood loss ≥ 500 ml, which may prevent progression to MOH and includes:

1. *Risk assessment of all women antenatally / intrapartum, with escalation if required*
2. *Controlled delivery of the baby's head and guarding of the perineum*
3. *Administration of syntocinon / syntometrine with delivery of the anterior shoulder*
4. *Immediate recognition of blood loss ≥ 500mls: call for help, give tranexamic acid*
5. *Early bimanual compression*
6. *Prompt suturing of perineal trauma and removal of placenta; move to theatre early*

4.1 Active Intrapartum management

Recommendations for intrapartum management of patients recognised to be at increased risk of bleeding should be followed as below;

- Establish early intravenous (IV) access in labour
- Early sampling for full blood count (FBC), group and save (G&S) and in cases with potential coagulopathy (e.g. placental abruption, pre-eclampsia, sepsis) include a coagulation screen with fibrinogen
- Review antenatal blood results on admission for any atypical antibodies. If present, confirm with blood transfusion the anticipated time or delay to supply blood and blood products. Liaise with Obstetric and Anaesthetic teams to discuss the need for pre-delivery cross matching.
- **Pharmacological methods:** Routine use of prophylactic uterotonic drugs as part of active management of the third stage in **ALL** women (whether at increased risk or not). This reduces the risk of PPH by 60%. Please see section 8.3, DRUGS, for further information on side-effects, cautions and contra-indications of the below agents.

  Syntometrine: 5units oxytocin / 500mcg ergometrine, 1 ampoule IM, administered after delivery of the anterior shoulder (vaginal delivery)

  Oxytocin (Syntocinon): 10 units IM, to be used instead of syntometrine in pre-eclampsia or hypertension

  Oxytocin (Syntocinon): 5 units, by slow IV injection, following caesarean section (CWH)

  Carbetocin: 100 mcg, by slow IV injection, used instead of oxytocin for all elective and emergency caesarean sections **at WMH only**

  Oxytocin (Syntocinon) infusion: Oxytocin (Syntocinon) infusion: 40 units oxytocin / 500mls 0.9% sodium chloride at 10 units per hour over 4 hours i.e. 125mls /hr. May be considered additionally on an individual patient basis, after syntometrine, oxytocin or carbetocin administration. Due to the

half-life of carbetocin there may be little benefit in using an oxytocin infusion if carbetocin has been given recently.

Tranexamic Acid: 1g, by slow IV injection (over 10 mins) for; blood loss ≥ 500 ml after vaginal delivery (AAGBI 2016, WOMAN 2016, JPAC); women at increased risk of PPH at caesarean section (Mavrides et al, 2016); blood loss ≥1000 ml at caesarean section (AAGBI, 2016)

- **Mechanical methods:** Uterine massage is of no benefit in prevention of PPH, but should be implemented if there is brisk loss at delivery and PPH is anticipated. Early bimanual compression should also be performed where appropriate. Early cord clamping, although of benefit in reducing PPH, risks fetal well-being and should **not** be performed earlier than 1 minute from delivery (NICE Intrapartum care guideline, 2014).

- For women at increased risk of PPH, a combination of the abovepreventative measures may be superior to oxytocin alone in preventing PPH

5.0 CAUSES OF MOH & PPH

The common causes of PPH and MOH may be described as the „4 Ts". Treatment is with simultaneous mechanical (as below) and pharmacological interventions, escalating to surgical intervention when required (see Section 9.0).

TONE: loss of uterine tone or atony

- Represents majority (70%) of cases
- Rub up a contraction, expel any clots
- Ensure urinary bladder is empty (leave Foley catheter in situ)
- Bimanual uterine compression: Insert one hand in the vagina and push up against the body of uterus in the anterior aspect, place the other hand on the abdomen above the fundus of the uterus and compress it against the vaginal hand and maintain pressure
- Administer uterotonics (see Section 8.3)

TISSUE: Retained or adherent products of conception

- Remove any clots from the cervix
- Inspect the placenta and membranes for completeness
- Retained placenta is described as undelivered after 30mins after active management or 60mins after physiological third stage. If the placenta is retained despite controlled cord traction and bleeding is ongoing, proceed to theatre for manual removal. See guideline *Manual removal of placenta* (cross-site)

TRAUMA: uterine or lower genital tract injuries

- Visual inspection of the vaginal canal and cervix must be performed and documented
- Look for and suture any bleeding cervical or vaginal lacerations, have a low

threshold for moving to theatre for improved lighting, assistance and equipment
- When bleeding is brisk, perineal trauma should be sutured expeditiously bya registrar see *Perineal repair* (CWH) and *Repair of perineal trauma* guideline (WMH)
- Suture, pack or apply pressure as required
- Maintain a high index of suspicion for cervical, uterine and broad ligament tears or lacerations when MOH occurs that responds poorly to treatment for uterine atony (see Section 9.0)

THROMBIN: Acquired (e.g. placental abruption, sepsis) or hereditary coagulopathies

- Represents minority (only 10%) of cases
- Consumptive coagulopathy is the commonest coagulation defect in the context of PPH and most commonly occurs with very large blood loss (circa 3-4 litres) or rarely when associated with specific conditions such as amniotic fluid embolism or large placental abruption. In severe cases, there will be absent clot formation
- and oozing from venepuncture sites and the mucous membranes
- Check history of maternal anticoagulant therapy, pre-existing bleeding disorder e.g. Von Willebrand"s or other cause for coagulopathy e.g. sepsis, and treat where possible
- May require management as for other causes or „T"s" of bleeding
- Additional treatment with blood products (FFP, cryoprecipitate) is likelyrequired and can be guided by serial point of care coagulation (ROTEM) and / or laboratory testing (see sections 10.3, 10.4, 11.0)
- Ensure tranexamic acid 1g IV is given when vaginal blood loss is ≥ 500 ml or blood loss at caesarean is ≥1000ml.

6.0 RECOGNISING PPH & MOH

Midwives and obstetricians must remain vigilant of blood loss and anticipate PPH after every delivery. Visual estimation of estimated blood loss (EBL) alone is inaccurate in assessing severity of haemorrhage and so use of blood collection drapes for vaginal deliveries and weighing of swabs improves accuracy. If in the birthing pool, one litre blood loss will obscure view of the legs.

In term pregnancy, the circulating volume is increased by 40% (100 ml/kg) and so **blood loss up to 1500 ml may occur without any signs or symptoms of hypovolaemia** and is falsely reassuring. Early recognition of EBL ≥ 500 ml is more important and informative than maternal observations. In particular, drop in BP (hypotension) is a very **late** sign and may only occur after 40% blood loss! Maternal body weight (Kg) should be noted, with smaller women more susceptible to shock at lower volume blood loss. Symptoms and signs of haemorrhage may also be masked in very fit women or those taking beta-blockers.

Increasing proportion of blood loss manifests as;

- **15% (750 -1000ml): possible anxiety, other observations within normal range**
- **30% (1500-2000ml):** RR > 20, HR > 100, narrowed pulse pressure, UO < 30ml/hr
- **40% (2000-2800ml):** RR > 30, HR 120, hypotension, pallor, confusion, UO < 15ml/hr

Narrow pulse pressure

Using this example BP= 102/88 mmHg, the pulse pressure is calculated as 14 mmHg (the difference between systolic and diastolic BP). If the difference is less than 25% of the systolic BP, the pulse pressure is considered to be narrow. A narrow pulse pressure in a hypovolaemic patient indicates a decreasing cardiac output and an increasing peripheral vascular resistance. Thus, a BP recording of 102/88 mmHg is not "normal" and requires further assessment of heart rate, respiratory rate and other signs of perfusion, such as skin colour, temperature and mental status.

PPH may be recognized by any combination of the below;

- Weighing and measuring blood loss. This should be performed in the room after vaginal or instrumental delivery, especially if blood loss is brisk and considered to be more than normal (> 500 ml). Blood loss in the obstetric theatre should be routinely calculated.
- Assessing clinical signs and symptoms
- Recording regular observations on the MEWS chart for all post-natal women
- Visual inspection of all sanitary pads / soiled sheets etc

Use of the Shock Index

The shock index (SI), as calculated from the heart rate / systolic blood (SI = HR/ Systolic BP) has been employed as an early marker of haemodynamic compromise. The normal Obstetric Shock Index (OSI) should range between 0.7-0.9. An OSI of >1 is a useful adjunct in estimating severity of blood loss in massive haemorrhage and may be used as a marker for prompt and aggressive resuscitation. If major blood loss is not recognised or corrected, then clinical shock will develop.

Clinical signs of shock

- Tachycardia (occasionally paradoxical bradycardia)
- Tachypnoea
- Poor peripheral perfusion (cold, clammy, pale, cyanosis with delayed capillary refill)
- Confusion, agitation or decreased level of consciousness
- Requiring >2 units of colloid to maintain BP
- Oliguria or anuria
- Hypotension (late sign)
- Unexplained metabolic acidosis on Venous or Arterial blood gas (Lactate > 2mmol/l)

7.0 THE TEAM APPROACH TO MOH

A senior or most appropriate member of the multi-disciplinary team should take a lead role in co-ordinating MOH management. The team leader may be identified by wearing a coloured bib. Assessment, monitoring, treatment and documentation should all be carried out simultaneously when adequate help is available. However, careful consideration of the priorities and an A, B, C, D, E approach should be adopted, when in doubt or when only limited help is available (see Fig 1). Team members should reassess clinical condition frequently.

7.1 Roles of MOH Team members

Team Leader

- Aims to delegate tasks appropriately without direct involvement wherever possible, based on the structured A, B, C, D, E approach (see Section 8.3)
- Management as guided by the cross-site PPH and MOH flowchart (Appendix 3)
- Re–assess maternal condition frequently and update the team
- Offer change of team leadership at any time they feel it is appropriate to do so

Labour Ward Coordinator

- Responsible for contacting the first and second line members of staff
- Forms the initial point of contact between the blood transfusion (BT) laboratory and team, but this may later be adopted by the resuscitating anaesthetic team
- Allocation of one experienced midwife to act as scribe

HAEMORRHAGE

- Arrange collection of emergency 2 units group O, rhesus D (RhD)-negative, K-negative packed red cells (PRC) from the Labour Ward blood fridge if required
- To confirm „STAND DOWN" of BT laboratory and porter when bleeding has stopped

Scribe

- Records vital signs, blood results, fluid balance, blood products and drugs administered as per MOH scribe sheet (Appendix 1, WMUH) or MOH proforma (Appendix 2, CWH)
- Refers to cross-site PPH and MOH Management Flowchart (Appendix 3) to prompt the team leader and team of necessary actions
- Prompts the team for blood loss and temperature measurements every 15 mins

Obstetric Team

- To advise if MOH is controlled or ongoing (Consultant or ST 6-7)
- To advise and perform surgical intervention, in addition to pharmacological and mechanical treatments
- To escalate to senior team members as required

- To involve a second consultant obstetrician if hysterectomy is being considered

Anaesthetic team

- Control of Airway and Breathing
- Ensure adequate venous access and invasive monitoring as required
- Maternal resuscitation with fluid and blood /blood products as guided by serial VBG/ laboratory /ROTEM results as per MOH algorithm (Appendix 4)
- Liaise with BT laboratory for blood/ blood products (Blp 0360 CWH or Blp 238 WMH)
- Update team on the clinical status of the patient in terms of cardiovascular stability, level of consciousness and coagulation status
- Provide appropriate method of analgesia / anaesthesia
- To escalate to senior/Consultant team members as required

The Blood Transfusion laboratory

- Responsible for contacting the team at precise MOH location, either via extension number or LW co-ordinator bleep (see below), to obtain relevant patient details
- To ascertain whether a valid G & S sample is available and advise when blood and blood products will be available
- Responsible for providing blood and blood products in the agreed timeframe
- Continuing communication with either the LW co-ordinator (Blp 6778 CWH or Blp 522 WMH) or Anaesthetic SpR (Blp 0316 CWH or Blp 182 WMH)
- To await „STAND DOWN" instruction from LW co-ordinator

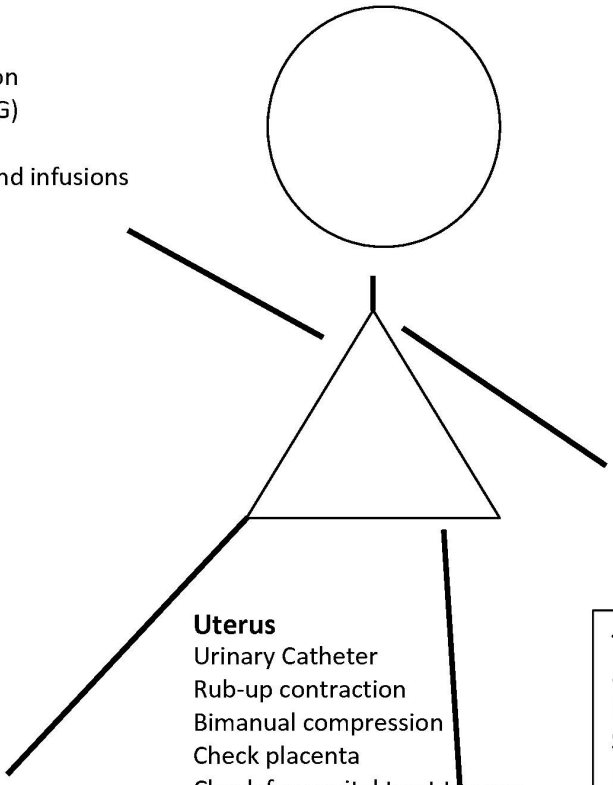
Porter

- Alerted via the Major Obstetric Haemorrhage call and should attend the MOH location immediately
- To collect blood from, and deliver specimens to, the laboratory as directed by MOH team
- To remain at MOH location until requested to „STAND DOWN" by the Labour Ward Co-Coordinator

Figure 1. Team Approach to management of MOH

Head
Lie mother flat; Reassure
Assess Airway, give Oxygen 15 l/min
Assess Breathing, apply pulse oximetry

Right arm
Assess Circulation
IV access (14-16G)
Push IV Fluid
Drugs- boluses and infusions



Left arm
Assess Circulation, continuous ECG, BP + HR
IV access (14G-16G) + 20 ml venous blood
Push IV Fluid
Serial VBGs / ABGs, every 15-30 mins
Aim for Hb > 90 g/l + correct coagulopathy as per MOH algorithm

Uterus
Urinary Catheter
Rub-up contraction
Bimanual compression
Check placenta
Check for genital tract trauma

Team leader: delegates tasks based on ABCDE approach; follows management as guided by PPH/ MOH flow chart; regularly reviews patient status
Scribe: completes MOH scribe sheet/proforma; prompts actions; records EBL + temp every 15mins
Runner: measures blood loss every 15 mins; sources drugs and equipment
Reassure mother & family regularly
MOVE TO THEATRE if required

8.0 MANAGEMENT OF PPH & MOH

After delivery of the baby and placenta, monitor for and anticipate PPH in every woman. **Act immediately following maternal blood loss ≥ 500ml, regardless of maternal observations.** For women delivering at home, dial 999 and ask for a paramedic ambulance for transfer to hospital. All women in the birthing centre should also be transferred to the Labour Ward if deemed stable enough for transfer. The co-ordinating midwife should be informed. The team approach to MOH should be adopted. The cross-site PPH and MOH Management Flowchart (Appendix 3) should be utilised in the acute clinical situation to help guide management.

8.1 Overview: PPH / minor obstetric haemorrhage (500-999 ml), without clinical shock

- If blood loss **is ≥ 500 ml and ongoing** after vaginal delivery in room, use the emergency button to summon help from first line staff (Section 2.2). Please note, this is not required for cases already in theatre, where first line staff are already present
- Do not leave the woman unattended and consider putting baby to the breast, but only if not detracting from care of the woman
- Ensure / insert one large bore IV cannula (14 or 16G)
- **If not performed on admission/prior to delivery,** urgent venepuncture to obtain G&S and FBC samples, plus coagulation screen, if coagulopathy suspected
- Give 1 g Tranexamic Acid, IV (over 10 mins) if EBL ≥ 500 ml after vaginal delivery
- Assess maternal condition using the A, B, C, D, E approach (Section 8.3)
- Measure BP, HR and RR every 15 mins
- PUSH 1 litre warmed crystalloid infusion (CSL) e.g. Compound Sodium Lactate (Hartmann"s)
- Ensure bladder is empty / insert indwelling catheter
- Assess cause of bleeding (4 „T"s) and treat with mechanical e.g. bimanual compression and pharmacological intervention as required (sections 5.0, 8.3)
- Maintain communication with woman and partner or family member
- Re-assess whether the situation remains as **minor** obstetric haemorrhage or has proceeded to **major** obstetric haemorrhage (≥1000mls)

8.2.1 Overview: Major Obstetric haemorrhage (≥ 1000mls), with or without clinical shock

- If blood loss is ≥1000 ml and continuing, after any vaginal or operative delivery, use the emergency button to obtain immediate help from first line members of staff (if not already present) AND dial 2222 to obtain further help from second line members of staff
- Dial 2222 and state **'Major Obstetric haemorrhage'** plus location
- Do not leave the woman unattended
- Fetch the MOH trolley/ box
- Position the patient / bed flat
- Apply 15 l/min oxygen via a non-re-breathing mask
- Establish team leader and maintain communication with the team
- Scribe to commence MOH scribe sheet (WMUH, Appendix 1) or MOH proforma (CWH, Appendix 2)
- Assess maternal condition using ABCDE approach
- Commence **continuous** monitoring of HR, RR, BP and oxygen saturation using pulse oximeter, electrocardiogram and automated BP recordings
- Give 1g Tranexamic Acid, IV (over 10 mins), if not already given for PPH ≥ 500ml and give a repeat (second) dose if bleeding is ongoing, 30 minutes after initial dose
- Commence /continue to **PUSH** through **first** litre of warmed crystalloid. Ensure this runs well / apply pressure (manually or with pressure bag)
- **Obtain / ensure IV access with TWO large bore cannulae** (14-16 G). Try to site all IV lines in the hand or forearm where possible
- Take **TWENTY (20) ml of venous blood for**;

→ **G&S** plus request 4 UNITS PACKED RED CELLS (Shock pack 1)

→ **FBC**

→ **TWO coagulation tube samples** (screen to include fibrinogen), for both laboratory + ROTEM analysis (paired samples), ensure each tube is filled with 4.5ml blood.
Please note that the ROTEM sample should not be routinely processed immediately if blood loss is less than 1500 ml, unless there is clinical shock or

suspected coagulopathy. ROTEM samples should be processed when blood loss continues to ≥1500 ml with ongoing bleeding and thereafter always paired with coagulation screen samples for the laboratory (refer to cross-site MOH Algorithm, Appendix 4).

→ **Venous blood gas** (VBG) for Hb, Lactate, pH and BE

→ **Renal (U&E) / Liver (LFTs) baseline function**

- Commence and **PUSH** through **second** litre of warmed crystalloid via second cannula as soon as possible. Ensure fluid infusion runs well / apply pressure, monitor closely for obstruction or cannula displacement
- Blood transfusion and blood product replacement should be based on both clinical and haematological (VBG, FBC, ROTEM and coagulation screen) assessment as outlined in Appendix 4
- Perform **serial** VBG every 15-30 min, depending on rate of blood loss
- Aim for Hb > 90 g/l
- Insert Foley catheter to monitor urine output hourly
- Re-evaluate the 4 T"s, with pharmacological and /or mechanical intervention
- Measure maternal temperature every 15 minutes
- Keep the woman warm using warmed fluids and blankets
- Scribe to prompt measuring of blood loss, every 15 mins
- When blood loss is ≥1500 ml and continuing, a **second** 2222 emergency call should be made to alert the duty Consultant Obstetrician /Anaesthetist. Dial 2222 and state either **'Controlled'** or **'Ongoing' Major Obstetric haemorrhage** plus location
- Consider need for surgical interventions, method of anaesthesia and move to theatre
- Consider arterial line/ invasive monitoring if ongoing MOH and skilled staff. If established, serial arterial blood gases (ABGs) are preferable to VBGs
- Maintain effective communication / regularly update woman, partner or family member

8.3 LW Co-ordinator to „STAND DOWN" BT laboratory and porter when bleeding stopped

Following recognition of MOH, maternal assessment, resuscitation and treatment with fluids, mechanical and pharmacological methods, should follow the structured A-E approach, and be performed simultaneously by the responding team as promptly as possible. An evaluation of severity, rate and cause of bleeding as well as degree of shock should be made by the team with appropriate response.

Specific management of blood and blood products as per MOH Algorithm (Appendix 4) and surgical methods to arrest bleeding (Section 9.0), are addressed separately.

A and B – Assess airway and breathing with resuscitation

8.3.1 If the mother is talking, her airway is patent. If she is not verbalising, assess for any noisy breathing e.g. gurgling or snoring and apply head tilt /chin lift and or jaw thrust. If no breath sounds are heard or there is no chest wall movement, escalate this to the team leader immediately – the airway needs urgent attention and skilled assistance is required.

8.3.2 Oxygen 15 l/min via a non-rebreathing facemask should be administered

8.3.3 Apply pulse oximeter and continuously monitor oxygen saturation and RR.

C – Assess circulation with resuscitation

8.3.4 Continuously monitor HR (use ECG) and BP (automated recordings preferable)

8.3.5 Assess pulse volume, peripheral temperature, capillary refill and cyanosis

8.3.6 **Infuse up to a total maximum volume of 3.5 L of warmed fluids- initially 2L of crystalloid followed by up to 1.5L of colloid** (gelofusin, not hydroxyethyl starch), depending on rate of blood loss, clinical condition, Hb level and availability of blood and blood products.

8.3.7 Maintain a strict intake and output monitoring chart, which must account for the fluid given during the acute episode.

8.3.8 Serial VBG sampling (every 15-30 mins) will provide reliable information on maternal haemoglobin and acid base balance, and should be used to guide volume replacement.

8.3.9 Aim for Hb > 90 g/l and platelets > 75 x 10^9/l on serial VBG / FBC, to allow a margin of safety for ongoing bleeding
Until blood is available, special blood filters should not be used, as they slow infusions
Transfuse blood as soon as possible if clinically required. If immediate transfusion is indicated for clinical shock, give emergency group O, rhesus D (RhD)-negative, K-negative red cell units (readily available in Labour Ward fridge). **IT SHOULD NOT BE USED** for patients" known to have any atypical blood group antibodies other than anti-C, D or E. You must inform the transfusion laboratory immediately if you have used the uncross-matched blood, as it will need to be replaced as soon as possible.

8.3.10 Group specific blood may be more readily available than fully cross-matched blood in some patients. Close communication with blood

8.3.11 transfusion laboratory is required for individual cases. See section 10.1.

8.3.12 Point of care coagulation testing using the ROTEM sigma, should be used when trained personnel are available (see section 11.0), as it provides information on coagulation status within 10 mins. This will inform blood product management (FFP and cryoprecipitate), as outlined in the MOH Algorithm (Appendix 4). Any samples taken for ROTEM analysis should be paired with a laboratory coagulation screen sample.

8.3.13 Where ROTEM analysis is not possible, coagulation screen including fibrinogen, should be sent to the laboratory (results available in 45-60 mins). Where coagulation screen results are **not** available in the face of ongoing bleeding, use of generic „shock packs" should be used until coagulation status is known or haemostasis is achieved (see section 10.2).

8.3.14 **For the escalation process at WMUH when MOH occurs with EBL ≥ 3000mls –** please see Appendix 5

D – Deficit (and Drugs)

- Assess response to stimuli on the AVPU scale and inform scribe or team leader:
  - A – Alert
  - V – Responds to verbal stimuli
  - P – Responds to painful stimuli
  - U – Unresponsive

D – Drugs

Use of drugs / pharmacological agents should occur in parallel to maternal resuscitation with fluids and blood/ blood product replacement and in conjunction with mechanical interventions such as bimanual compression. The drugs below are predominantly used in the management of uterine atony, but may also be used to aid management in bleeding from any cause. Please note that the list of side effects and contra-indications listed below is NOT exhaustive:

8.3.15 **Syntometrine:** (5 units oxytocin /500 micrograms ergometrine), 1 ampoule IM, administered after delivery of the anterior shoulder, as it reduces the risk of minor PPH compared to oxytocin. Its use should be avoided in women with hypertension, pre-eclampsia or eclampsia, severe cardiac, liver or kidney disease and sepsis. If further uterotonics are required after administration of syntometrine, consider oxytocin bolus or infusion, carboprost or misoprostol in preference to a further dose of ergometrine 500 micrograms (IM or IV). **N.B. Repeat dose of ergometrine should be used with caution and administration delayed for 2-4 hours, wherever possible, as there is risk of hypertension and cerebrovascular accident.** In women with elevated BP or other contraindications to ergometrine, give oxytocin 5 units IV slowly or 10 units IM instead.

8.3.16 **Oxytocin (Syntocinon):** 5 units by slow IV injection should be routinely administered following caesarean delivery at CWH. It may lead to nausea and vomiting, hypotension and tachycardia. It should be used very cautiously in patients with cardiovascular instability and is usually avoided in patients with

cardiac disease. This dose may be repeated at the request of the surgeon if there is poor uterine tone and mother is cardiovascularly stable. This may be given in conjunction with an oxytocin infusion.

8.3.17 **Carbetocin:** 100 micrograms IV, is used instead of syntometrine/oxytocin at WMUH for all elective and emergency caesarean sections, for prevention of PPH. It may cause nausea/vomiting, chest pain, dizziness, tachycardia, abdominal pain and itching. It should be avoided in patients with hypertension or cardiovascular disease. The carbetocin dose should **NOT** be repeated; instead further treatment with other uterotonic drugs should be used, including oxytocin. Carbetocin should be used cautiously in the presence of epilepsy, migraine, asthma, eclampsia and pre-eclampsia.

8.3.18 **Ergometrine:** 500 micrograms by slow IV or IM injection (contraindicated in women with hypertension and pre-eclampsia). Please note, if syntometrine has already been administered at vaginal delivery, other uterotonics should be considered in preference to a repeat dose of ergometrine. Consider repeat dose of ergometrine with caution and delay administration by 2-4 hours, wherever possible. Maximum total dose is 1mg (see also syntometrine)

Please note-If Ergometrine is unavailable, Syntometrine® should be used as a substitute.

8.3.19 **Oxytocin (Syntocinon) infusion:** 40 units of oxytocin in 500ml of 0.9% sodium chloride at 125 ml/hour (10 units /hour). May be considered additionally on an individual patient basis, after syntometrine, oxytocin or carbetocin administration. Due to the half-life of carbetocin there may be little benefit in using an oxytocin infusion if carbetocin has been given recently. In women at risk of fluid retention, consider oxytocin 40 units in 40ml 0.9% sodium chloride at a rate of 10 units /hr via syringe pump.

8.3.20 **Misoprostol:** May be administered first line rectally, at a dose of 1000 mcg. Possible side effects of pyrexia, diarrhoea, nausea /vomiting and shivering are usually short lived. Misoprostol may also be administered via the sublingual route at a reduced dose of 800 mcg (recent recommendation, Mavrides et al, 2016), however, there **is risk of malignant hyperthermia and severe maternal morbidity via the sublingual route** and it should only be used with caution by clinicians specifically familiar with this route of administration.

8.3.21 **Carboprost (Hemabate®):** 250mcg by IM injection repeated at intervals of not less than 15 minutes, to a maximum of 8 doses. It is contraindicated in women with asthma. After the second dose of carboprost, if there is uncontrolled bleeding, proceed to transfer patient to theatre for Examination under Anaesthetic (EUA) and operative interventions. Side effects include nausea/vomiting, diarrhoea, flushing and headache.

8.3.22 **Tranexamic acid:** 1g by slow IV injection (over 10 mins), and a second dose can be repeated after 30 minutes if bleeding is ongoing. Contra-indications to use include acquired defective colour vision, hypersensitivity/allergy, active intravascular clotting, subarachnoid haemorrhage, cerebral oedema or infarction,

active / history of thromboembolic disease and renal failure. It is not recommended with some clotting factor concentrates. Convulsions have been reported and dose adjustment is recommended in patients with impaired renal Function.

E - Exposure

Look for ongoing signs of bleeding (between the legs, sheets, drapes etc) but maintain patient temperature with warmed fluids and blankets as fully as possible, to encourage blood clotting and to minimise maternal acidosis.

9.0 SURGICAL INTERVENTION

Simple mechanical and pharmacological measures should be implemented in every case of MOH as appropriate, depending on the cause of bleeding (4 T's), until PPH or MOH is controlled. However, when there is further ongoing bleeding, proceed to the obstetric theatre for Examination under Anaesthesia (EUA) and surgical (operative) interventions.

9.1 Examination under Anaesthesia: '4 Ts'

- Assess and examine for cause of bleeding (4 Ts)
- Cervical or uterine tears should be suspected when bleeding does not seem to respond to treatments for uterine atony
- Digital examination of the uterine cavity must be performed during examination under anaesthesia to exclude retained products and possible uterine lacerations
- Extension of the uterine incision at caesarean section must be recognised and efforts made to secure the extended angle prior to uterine closure. Any vessels within the extension should be visualised, clamped and secured with sutures.

9.2 Use of vaginal packs

Indication: for friable vaginal walls; extensive perineal tears; atonic PPH when an intrauterine balloon or uterine packing is in-situ
Procedure The pack should be lightly lubricated with chlorhexidine obstetric cream [Hibitane] prior to its insertion. A urinary catheter must be sited. Intravenous antibiotics should be used whilst a pack is in situ and should rarely remain in place for longer than 24 hours.
Documentation It is *essential* that the insertion of a vaginal pack is clearly documented and communicated to all members of the team. **A green wristband must be attached to the woman's wrist to identify any vaginal pack that is intentionally retained in-situ.**
Two healthcare professionals at the end of every procedure must confirm and sign for correct swabs, needles and vaginal pack.
Clear plans must be included in the operation notes for the timing of pack removal and clearly recorded once removed. If more than one vaginal pack is required to achieve appropriate haemostatic pressure, they must be tied together securely, and the number of vaginal packs used clearly documented. When removing the vaginal packs, care must be taken to ensure the correct number is removed

9.3 Uterine Balloon Tamponade (Uterine balloon / no latex)

Indication: Temporary management of lower uterine segment bleeding; uterine atony.

Contraindications: Cases indicating hysterectomy; cervical cancer; purulent infection of the vagina, uterus or cervix; untreated uterine anomaly
Application: The balloon should be inserted into the uterine cavity in theatre, ideally under ultrasound guidance. Good practice is to insert the balloon manually, without instrumenting the uterus. If an instrument is used to insert the balloon, ultrasound guidance must be used. This is to minimise the risk of uterine perforation.
Transvaginal placement of balloon: Determine uterus is clear of any retained placental tissue or clots. Insert the balloon portion of the catheter in the uterus; making certain that the entire balloon is inserted past the cervical canal and internal os.
Transabdominal placement of balloon (at time of Caesarean Section): Pass the balloon through the Caesarean incision, inflation port first. Have an assistant pull the shaft of the balloon through the vaginal canal. Close the uterine incision as per normal procedure, taking care to avoid puncturing the balloon while suturing. Ensure maintenance of correct placement and maximize tamponade effect manually through the vagina.
The abdominal cavity should remain open, during inflation, to confirm arrest of haemorrhage.
Inflation: The balloon should be filled with warmed sterile water or sodium chloride 0.9%, using the enclosed 60ml syringe through the stopcock.
The balloon should be filled at 60ml increments until bleeding is arrested and only to a maximum capacity 500 ml. Do not over-inflate the balloon. Once inflated, connect the drainage port to a fluid collection bag to monitor haemostasis.
To maximize the tamponade effect, counter pressure can be applied by packing the vaginal canal with iodine- or antibiotic-soaked vaginal gauze.
Post-Inflation
An IV infusion of 40units oxytocin in sodium chloride 0.9% 500ml running at a rate of 125mls/hr via a pump should continue for a minimum of four hours.
Patients should be prescribed intravenous antibiotics. Withhold low molecular weight heparin for thromboprophylaxis until after removal of the balloon.
Balloon removal
The balloon should remain in-situ for a minimum of 12hrs and no more than 24hrs.
It should not be removed unless full facilities for either embolisation or laparotomy with a view to hysterectomy are available. Therefore deflation is advised in daytime hours only.
Patient should be nil by mouth for 4 hours prior to tamponade release and the balloon deflated slowly and observe for bleeding for 30 minutes. If there is no bleeding then continue to deflate the balloon slowly until empty and removed.
Lochia should be carefully observed and increased lochia should be reported to the senior Midwife.
Patient can be transferred to the postnatal ward 2 hours after removal of the balloon.

9.4 Haemostatic bracing suturing (such as B-Lynch or modified compression sutures)

The B-Lynch suture technique is the most common technique. It is easy to perform

Caesarean Sections and can be adopted in vaginal deliveries, to avoid a uterine incision. Other alternatives such as the Hayman suture can be used avoiding hysterectomy.

9.5 Systemic pelvic de-vascularisation

1. Unilateral then bilateral ligation of uterine arteries
2. Unilateral then bilateral ligation of ovarian arteries
3. Unilateral then bilateral ligation of internal iliac arteries (NB: A senior gynaecologist or vascular surgeon should be informed and involved since this technique requires a high degree of surgical skill and training, and may be associated with ureteric injury).

9.6 Hysterectomy

Proceed to hysterectomy sooner rather than later, especially in cases of placenta accreta and uterine rupture. A second Obstetric /Gynaecology Consultant must be involved in the decision-making and attend. Subtotal hysterectomy is the operation of choice in many instances of PPH requiring hysterectomy, unless there is trauma to the cervix or a morbidly adherent placenta in the lower segment.

9.7 Pelvic tamponade

In the event hysterectomy does not control bleeding, pack the abdomen with Raytec abdominal swabs and close the abdominal wall, leaving drains in situ. Aim to remove the abdominal swabs 24-48 hours later at return laparotomy.

9.8 Selective pelvic arterial embolisation (SPAE) by interventional radiology

SPAE has a low rate of complications. Success rates for SPAE in the control of obstetric haemorrhage are reported as between 85-95%, with the added advantage of preserving fertility. Complications include pelvic infections, perforation or occlusion of external iliac artery, the need for repeated embolisation, uterine necrosis, transient ovarian failure, muscle pain, neurological damage, bladder wall necrosis and vaginal fistula.

SPAE: CWH Interventional radiology is available within the Trust. Contact the Consultant Radiologist on call, via switchboard, who will be able to inform you if the interventional services are staffed and available. A Midwife and senior obstetric staff member and senior Anaesthetist should accompany the woman to the Radiology department.

SPAE: WMUH WMH do not have interventional radiology service on site. Use of SPAE is a decision made by the West Middlesex Obs/Gynae Consultants in consultation with the Consultant Anaesthetist, the Consultant Haematologist and after discussion with the Consultant Obstetrician and Interventional Radiologist at the tertiary centre. The

Consultant Anaesthetist at West Middlesex should liaise with the Consultant Anaesthetist at the receiving hospital if the patient requires Level 2 or Level 3 care, in accordance with Intensive Care Society transfer standards.
Women may be transferred to QCCH (Imperial College Healthcare trust). Liaise with the on call Obstetric Consultant first to accept the patient, then the interventional radiologist via switchboard - **020 3313 1111**.

It is imperative the Consultant Obs/Gynae or Senior Obstetric trainee leads this process to ensure the patient is transferred to the correct location at the tertiary centre when they leave WHUH – this could be AE, Labour Ward, directly to Radiology suite.

Selection of Cases
Use of SPAE is a decision made by the Obstetrician/Gynaecologist in consultation with an Anaesthetist, Haematologist and Interventional Radiologist. Patient should be haemodynamically stable at time of transfer.
Interventional radiology can be considered in the management of postpartum haemorrhage secondary to:

- Atonic uterus where medical and surgical interventions have failed – including systemic devascularisation or when deemed unsuitable
- Surgical complications or uterine tears at the time of caesarean section
- Bleeding following hysterectomy
- Bleeding which is difficult to access surgically (e.g. broad ligament haematomas)
- Ongoing haemorrhage post Caesarean section, after closure of the abdomen, when the woman is unresponsive to standard PPH management (uterotonics, evacuation of uterine clot), unresponsive or unsuitable for B Lynch suture and a non-pelvic surgical cause of blood loss has been excluded
- Ongoing haemorrhage in a patient with significant comorbidity

Transfer for SPAE
Patients should be haemodynamically stable at time of transfer. This should be a clinical decision made by the Consultant Obs/Gynae in conjunction with the Consultant Anaesthetist. The time frame for transferring the patient should not exceed 2-4 hours once the patient has been deemed haemodynamically stable. A senior member of the obstetric team, a senior member of the anaesthetic team and a midwife should accompany all women who are transferred out. A separate Datix should be completed for all women transferred out.
Any unstable woman should only be transferred for interventional radiological procedures, if, in the opinion of the Consultant Obstetrician/Gynaecologist, the risk of surgical intervention outweighs the risks inherent in:

- Moving an unstable woman
- Managing an unstable woman in a less-than-ideal environment during transfer
- Delays caused by transfer and time to achieve embolisation

If any unstable woman absolutely requires SPAE but is deemed unfit for transfer, then the interventional radiologist and team may be able to perform the procedure in main / LW theatres with mobile radiography.SUPPLY AND AVAILABILITY OF BLOOD AND BLOOD PRODUCTS (CWH and WMH)

10.0 Packed Red Cells (PRCs)

Both hospitals store 2 units of O Rh-negative, CMV- negative and K-negative PRCs in the fridge on Labour Ward, available for immediate use in life threatening MOH. Fully cross-matched or group specific blood should be used in preference wherever possible to minimise risk of transfusion reaction.

- Supply and availability depends on the validity of the G&S sample and antibody status
- All women should have their antibody status identified when presenting in labour
- Where antibodies exist, provision of appropriate PRCs will be delayed. The extent of delay will depend on the nature and number of antibodies, and a discussion with the laboratory is required on an individual patient basis to best inform management and whether pre-prepared blood is required.
- Both sites require a minimum of TWO (one may be historical) G&S samples before supplying Packed red cells (PRCs). One **valid** G&S sample needs to be supplied **within 72hrs** of request for PRCs.
- Currently, both WMUH and CWH BT laboratories can supply blood as outlined below. However, they operate independently and samples are not valid cross-site.

Valid sample held in the Transfusion

- If negative antibody screen, full cross match can be issued in 10 mins (by electronic issue at CWH and „immediate spin" at WMUH)
- If antibodies present, blood availability depends on nature of antibody and BT laboratory to advise on individual patient basis

No valid sample held in Transfusion

- If no valid G&S sample held in the Blood Transfusion Laboratory: Emergency Group O negative blood issued in 5 minutes (i.e. immediate)
- On receipt of a valid G&S sample by the Blood Transfusion Laboratory:
  - Group Specific blood issued in 10 minutes
  - If no antibodies: Full Cross Match in 55 minutes
  - If antibodies present: availability of fully crossed matched blood depends on nature of antibody

10.1 Shock packs

The blood transfusion laboratories at both hospital sites will provide blood and blood products for MOH grouped into SHOCK packs, which will be made available on request by the attending Obstetric Anaesthetist or senior Obstetric SpR or Consultant. The

composition of the shock packs provides generic management of maternal bleeding, which typically only results in **late** coagulopathy after large amount of blood loss i.e. FFP is usually only required after 4 PRC units are administered. There are however, a few specific maternal conditions associated with **early** coagulopathy where clotting products are required immediately.

The use of shock packs is indicated when;

- bleeding is extremely fast and ongoing
- there is no point of care (ROTEM) coagulation testing available to guide haemostatic management
- laboratory coagulation tests are not yet available in the face of deteriorating clinical condition

The number of shock packs (1-3) required will depend on the clinical situation, and not all components in each pack may need to be administered. Transfusion of blood and blood products should be based on Hb level (aim for Hb > 90 g/l in the acute situation), coagulation status and platelet count as per MOH Algorithm (Appendix 4).

SHOCK PACK 1: This contains 4 units of PRCs and is often the only shock pack required in managing the majority of cases of MOH. Shock pack 1 should be prepared by the BT laboratory at time of 2222 MOH call when the patient details are known and a G&S sample has been provided. The number of PRC units administered should be based on maintaining Hb level at >90 g/l in the acute bleeding situation and not all 4 units may be indicated.

SHOCK PACK 2: This contains 4 units of PRCs and 4 units of FFP

SHOCK PACK 3: This contains 2 pools of cryoprecipitate, 1 pool of platelets and further PRC: FFP provided as required in 6:4 ratio.

10.2 Fresh frozen plasma (FFP)

Once requested, FFP takes 30minutes to thaw, before it can be supplied. It can be stored for 24 hours.

- If coagulation or haemostatic results are **not** available, and bleeding is ongoing, FFP should initially be given after transfusion of 4 units of PRCs, as provided in shock pack 2 (equivalent to 12–15 ml/kg), until haemostatic test results are known
- Where coagulation or haemostatic results are available, FFP should be administered as per MOH algorithm (Appendix 4)
- Earlier administration of FFP should be considered in certain conditions associated with early coagulopathy (AFE, abruption, HELLP) or where late /delayed detection of MOH has occurredCryoprecipitate

Once requested, cryoprecipitate takes 30minutes to thaw, before it can be supplied.

- BCSH, 2015 recommends „meticulous attention" and **early** & **frequent** (30-60 min) coagulation tests to guide therapy, especially fibrinogen in obstetrics
- If haemostatic results are **not** available, it is recommended that 2 pools are administered after 8 PRC, as supplied in Shock Pack 3
- Where haemostatic test results are available, cryoprecipitate should be used for fibrinogen replacement to maintain maternal fibrinogen >2 g/l during MOH (Mavrides et al, 2016, BCSH 2015, AAGBI 2016) as indicated in the MOH algorithm (Appendix 4)

10.3 Platelets

Both hospitals aim to have compatible platelet pools on site for MOH, however there may be interruptions in supply and platelets may need to be sourced externally on an individual patient basis. Platelets may be administered as part of Shock Pack 3 management or requested earlier in specific cases of MOH.

- Anti – D prophylaxis must be administered to Rhesus negative women if transfused
- Platelets should be transfused at a trigger of 75×10^9/l (Mavrides et al, 2016) to maintain a level greater than 50×10^9/l during ongoing PPH.

10.4 Fibrinogen concentrate

- Fibrinogen concentrate is an alternative to giving FFP or cryoprecipitate and may be used to maintain fibrinogen levels > 2g/l in MOH, even if APTT and PT are normal
- This is only currently licensed for congenital hypofibrinogenaemia in the UK, however, it is licensed and being used in MOH in certain parts of the UK and more widely in Europe
- This product may be made available at both WMH and CWH and may be supplied only on a named patient basis after discussion and agreement by a Consultant Haematologist i.e. it is not for routine first line use in replacing fibrinogen, but may be specifically indicated in certain rare cases of suspected early or profound coagulopathy e.g. AFE. Recommended dose is 4-6g.

10.5 Recombinant Activated Factor VIIa (NovoSeven®)

Recombinant activated factor VII (rFVIIa) is a prohaemostatic agent that can be used for patients with previously normal coagulation who experience serious bleeding, after major surgery, trauma or childbirth. **The routine use of rFVIIa is not recommended in the management of MOH unless as part of a clinical trial.** Its use is rarely indicated in MOH and should only be administered after consultation with expert haematological advice as serious adverse events have been reported.

11.0 POINT OF CARE TESTING

11.1 ROTEM sigma (coagulation testing)

Methods to assess haemostatic impairment during MOH include clinical observation, laboratory-based tests (PT, APTT, fibrinogen and platelet count) and point of care testing (POCT). Use of laboratory or POCT leads to appropriate use of blood components (Solomon et al, 2012) and both may be used simultaneously. POCT using rotational thromboelastometry (ROTEM®, Werfen), combined with an agreed treatment algorithm, is associated with decreased blood loss and blood product use (*Collins et al, 2015; Mallaiah S, Barclay P et al,* 2015). The main advantage is that results are known sooner than for laboratory tests. Point of care testing is recommended by the AAGBI.

The BCSH (BCSH, 2015) also recommends „meticulous attention" and **early** & **frequent** (30-60 min) coagulation tests to guide therapy, especially fibrinogen in obstetrics. Coagulopathies may evolve rapidly and repeated testing during ongoing bleeding is more useful than single measurements. Frequency of testing should be as advised in the MOH Algorithm (Appendix 4).

The ROTEM sigma device is available for use on labour ward at both CWH and WMH sites. It provides information on clotting within 10 mins vs 60 mins for traditional laboratory testing. In 90% of MOH, maternal clotting is adequate and unnecessary use of FFP and cryoprecipitate can be avoided. Similarly, in a minority of cases where coagulopathy develops unexpectedly early, this may be ascertained more readily.

IMPORTANT Although venepuncture for blood sampling (inclusive of two tubes for coagulation) is advised at EBL ≥ 1000 ml, ROTEM samples **should not** be routinely processed if EBL remains ≤ 1500 ml (due to cost implications) unless there is clinical shock or high risk of coagulopathy. The sample should however, be routinely processed if EBL continues on to ≥ 1500 ml and blood loss remains ongoing. Any and all samples taken for ROTEM analysis should be paired (a duplicate coagulation screen tube should be taken for laboratory analysis at the same time) for quality control purposes. The time at which blood is drawn from patients should be documented and tubes labelled to identify matched or paired samples.

11.2 Venous Blood Gas

The use of serial venous blood gas sampling to guide blood and volume management is supported in MOH as haemoglobin levels correlate well with laboratory measurements and results are quickly available. Single estimations of Haemoglobin or haematocrit may be misleading, so **serial** or repeated measurements are advised to guide treatment with blood. Additionally, repeated measurements of serum lactate and base deficit can be used to assess tissue perfusion and oxygenation and guide volume replacement (Kozek-Langenecker SA et al, 2013).

12.0 INTRA-OPERATIVE CELL SALVAGE

Intraoperative cell salvage is the process whereby blood shed is collected, filtered and washed to produce autologous red blood cells [RBCs] for autotransfusion. Cell salvage does not appear to impact adversely on clinical outcomes and NICE, CMACE Enquiries (CMACE) and the AAGBI have endorsed cell salvage in obstetric practice.

Cell salvage should be considered for emergency use in PPH associated with both caesarean section and vaginal delivery, where adequate and skilled personnel are available and it does not detract from care of the woman. This is currently not an assured 24 hour service.

See guideline *Cell salvage in the Obstetric Theatre* (cross-site) for further information.

13.0 SECONDARY PPH

Is defined as abnormal or excessive bleeding from the genital tract between 24 hours and 12 weeks post-delivery.

Causes: It is often associated with endometritis, retained products of conception and subinvolution of the placental bed site. Rarer causes include pseudoaneurysms and arteriovenous malformations.

Assessment: Part of the clinical assessment should include a high vaginal swab and endocervical swab, then appropriate antibiotics initiated.
The clinical findings, including the degree of bleeding and whether the cervical os is open, should be taken into account before the decision to undertake surgery is made. However, if there is excessive or continuing bleeding, surgical measures should be undertaken irrespective of ultrasound finding or waiting for an ultrasound.

Intervention:

- In case of endometritis (tender uterus) or overt sepsis, the addition of gentamicin is recommended.
- Surgical evacuation of the uterus for RPOC is not without morbidity and can result in uterine perforation (1.5%) and Asherman's syndrome. It is, therefore, recommended that surgical evacuation of retained placental tissue should be undertaken or supervised by an experienced clinician. An appropriatelytrained clinician may consider performing uterine evacuation under direct ultrasound guidance.

- Uterotonics should be used as clinically indicated. Misoprostol and ergometrine have been recommended in the management of secondary PPH, although evidence to support their use is limited. Transcatheter arterial embolisation and balloon tamponade have been employed in cases of secondary PPH with ongoing bleeding.

Role of ultrasound scanning

Ultrasound scans are commonly performed on women presenting with secondary PPH to identify any RPOC. There is a wide range of sensitivities and specificities of ultrasound in the detection of RPOC.

In a prospective observational study of 79 women with secondary PPH, Mulic-Lutvica et al, 2006 concluded that an echogenic mass in the uterine cavity and an anteroposterior diameter of the cavity above the 90th centile (approximately 25 mm on days 1–7 postpartum) was associated with RPOC. It has been proposed that colour flow Doppler imaging should be included in the evaluation of the postpartum uterus, although, there is no strong evidence to support its use; its use may facilitate the diagnosis of pseudoaneurysms and arteriovenous malformations, which are rare but recognised causes of secondary PPH.

14.0 RECOVERY AND ONGOING MANAGEMENT

- Following control of MOH and haemostasis, stable patients should be transferred with continuous monitoring of HR, BP and ECG to an appropriate post-procedure Level 1 - 3 area, depending on their clinical condition, for surveillance and monitoring

- If Level 3 care is required, this will be undertaken by the Intensive Care Unit at CWH and WMH. Level 2 care may be undertaken on the Simpson Unit (Maternity HDU, please see *Guideline for the Simpson Unit*) at CWH or on the Obstetric Acute Observation Area at WMUH (see WMUH High Dependency Unit guideline)

- Ongoing observations should be recorded on the Maternity Early Warning Scoring system (MEWSS) and particular attention paid to fluid balance

- Alongside regular monitoring of observations, individual management plans should be made with regards to repeat blood sampling, administration of LMWH and further investigations

- **Repeat FBC and coagulation screen is advised 1-2 hrs after admission to the recovery area**

- When blood transfusion is indicated in stable patients in the recovery phase, this should be prescribed **on a single unit basis** as per AAGBI 2016 guidance, with re-assessment of Haemoglobin level before further blood transfusion

- **ALL patients should have repeat FBC performed and checked either 24 hours after MOH ≥ 1000 ml or prior to discharge home**

- Ensure a full debrief discussion with documentation, involving the woman and partner / family members, which should be led by the Obstetric team but supported by the anaesthetic and midwifery teams as required

- Following MOH there is increased risk of delayed lactation and breastfeeding problems - initiate skin contact and breastfeeding as soon as possible, and encourage early and frequent hand expressing if baby does not breastfeed effectively. If mother is unable to hold the baby, encourage partner to have skin contact until she is ready to.

15.0 MULTIDISCIPLINARY TEAM TRAINING

All staff should participate annually in multidisciplinary skills and drills sessions. Focus is on specific management but also the importance of working as a MDT in emergency situations. Training compliance will be monitored and reported. Learning points from MOH cases should be shared at multidisciplinary mortality and morbidity meetings.

16.0 MONITORING AND AUDITABLE STANDARDS

- An incident / Datix report should be completed for all MOH ≥1500mlsCases are reviewed weekly at the labour ward risk meeting and learning disseminated (CWH)
- Monthly presentation of data at Maternity Forum (WMUH
- Where care or service delivery problems are deemed to have contributed to any MOH or ITU admission, a serious incident investigation/ root cause analysis will be undertaken (CWH)
- Cases are monitored via the maternity dashboard and a thematic review performed where indicated

London maternity dashboard data

- Overall number of cases of MOH (according to London wide definition)and blood transfusion requirements for each individual case
- Number of cases requiring unplanned interventional radiology services
- All cases of peri-partum hysterectomy
- Number of cases admitted to Level 3 ITU care, with MOH as the reason for admission
- Number of cases referred to tertiary centre for the management of acute MOH

17.0 REFERENCES

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Appendix 1:OBSTETRIC HAEMORRHAGE SCRIBE SHEET FOR ALL EBL ≥ 1000ml (WMUH only)

Patient Name: Date and time:

Hospital number:

IMMEDIATE MEASURES

Action	Yes / No	Time
Emergency buzzer activated		
Woman laid flat		
Airway checked		
Breathing: Facial O_2 at 15 L/min		
Circulation: 1 or 2 large bore cannulae inserted		1st: 2nd:
Blood sent for FBC / clotting / U&E / cross match		
IV Fluid		
Administer 1g Tranexamic acid intravenously (1st dose)		
Bimanual compression		
Placenta checked		Complete / incomplete (circle)
Perineum checked		
Catheter inserted with urometer		

Time MOH (1000 ml or more EBL) recognised	
Time MOH call (2222) put out	
Type of call put out	Controlled or Ongoing (circle)
Has the woman been on the sepsis protocol previously?	Yes or No (circle)
Drug used for 3rd stage of labour	Syntometrine im / oxytocin 10units im / carbetocin 100mcg iv [circle]

DRUGS USED - Name	Dose	Time given	Repeat dose (time)
Syntometrine [if not used for 3rd stage]	1 amp IM		Only 1 dose of Syntometrine and not within 2 hours of Ergometrine Only if BP normal
Ergometrine	500mcg IM or IV		Only 1 dose of Ergometrine and not within 2 hours of Syntometrine Only if BP normal
Oxytocin 5 units IV or 10 units IM [if Syntometrine contraindicated]			
Oxytocin infusion 40 units in 500ml of N saline over 4 hours			
Tranexamic acid 1g IV	1st: 2nd:		Dose can be repeated after 30 mins if bleeding on-going. Max. 2 doses.
Carboprost 250mcg every 15 minutes to max 8 doses.	1st: 2nd: 3rd: 4th: 5th: 6th: 7th: 8th:		
Misoprostol 1000mcg rectally **(or 800 mcg sublingual route - but only to be administered with caution after specific clinician request)**	1000mcg PR (800mcg SL)		

REQUEST FOR BLOOD AND BLOOD PRODUCTS

Name	No. of units	Time of request	Time of arrival
O negative blood			
Group specific blood			
Cross matched blood			
SHOCK pack 1 (4x PRC)			
SHOCK pack 2 (4x PRC + 4xFFP)			
SHOCK pack 3 (2x Cryoprecipitate + 1x Platelet + PRC/FFP ratio 6:4)			
FFP			
Platelets			
Cryoprecipitate			
Request for cell salvage			

BLOOD RESULTS

	Time	Time	Time	Time	Time
Pre-delivery Hb **Pre-delivery platelets**					
Hb **Platelets** **APTT** **PT** **Fibrinogen**					
Haemacue					
ROTEM **Fibtem** **Extem**					
VENOUS GAS **Hb** **pH** **BE** **Lactate**					

SECONDARY MEASURES

Transfer to theatre	**Decision time:**	**Time arrived:**
EUA	**Performed by:** **Grade:**	**Time:**
Perineal trauma	**Repaired by:** **Grade:**	**Time:**
Balloon tamponade	**Inserted by:** **Grade:**	**Time:**
Vaginal pack	**Inserted by:** **Grade:**	**Time:**
Laparotomy **- Haemostatic / brace sutures** **- Devascularisation** **- Hysterectomy**	**Performed by:** **Grade:** **Second Consultant present: Yes / No** **Name:**	**Time:**
Transfer to AOA / HDU / ITU	**Decision time:**	**Time arrived:**

CAUSE	TICK
Tone	
Trauma	
Tissue	
Thrombin	

Total EBL:

Decision for step down from MOH taken by:_____ **Time** _____

Haematology informed of step down: **Yes / No**

Family debriefed: **Yes / No** **Datix completed:** **Yes / No**

Signature of Scribe_____**Print**_____

Grade_____**Date and time**_____

Appendix 1:OBSTETRIC HAEMORRHAGE SCRIBE SHEET FOR ALL EBL ≥ 1000ml (WMUH)

PERSONNEL PRESENT

Grade	Name	Time contacted	Time responded	Time arrived
Senior Midwife/ coordinator				
Obstetric Registrar				
Obstetric Consultant				
2nd Obstetric Consultant				
Anaesthetic Registrar				
Anaesthetic Consultant				
Haematology Technician				
Consultant Haematologist				
Porter				
Other staff members				

Appendix 1:OBSTETRIC HAEMORRHAGE SCRIBE SHEET FOR ALL EBL ≥ 1000ml (WMUH only)

CIRCULATORY RESUSCITATION – Fluids and Blood products.

The scribe calls out at EVERY 15 mins: Observations and cumulative blood loss to the whole team asking for acknowledgement by Obstetric Lead/ Anaesthetist & OPD/ Scrub team

Time	Fluid or Blood Type	Volume	Blood Pressure	Pulse	O_2 Sats	Cumulative EBL	Urine output	Actions / procedures / Communication / results

MAJOR OBSTETRIC HAEMORRHAGE ≥1000 ml

Chelsea and Westminster Hospital NHS
NHS Foundation Trust

Patient label / sticker

Time of Call Out:	Ongoing / Controlled	Date:

	NAME	TIME ARRIVED
On-Call Obstetric Consultant		
On-Call Obstetric Senior Registrar		
On-Call Obstetric Registrar		
On-Call Obstetric SHO		
On-Call Anaesthetic Registrar		
On-Call Anaesthetic Senior Registrar		
On-Call Anaesthetic Consultant		
Laboratory Technician in Haematology		
ODP		
Porter		
Midwife		
Midwife		
Midwife		

FLUIDS / BLOOD PRODUCTS					
Time	Type	Vol	Time	Type	Vol
Total Input:					

BLOODS	TIME	RESULT
FBC		
X Match		
Clotting		
LFT's		
U+E's		
Rotem (Coag tube)		
Hemocue		

OBSERVATIONS (every 5 mins)										
Time	Pulse	BP	Sats	Temp	Time	Pulse	BP	Sats	Temp

Serial Venous / Arterial Blood Gas (every 15-30 minutes if ongoing bleeding)						
Time:						
Hb:						
Hct:						
pH:						
BE:						
Lactate:						

Name of Person Completing Form: _____

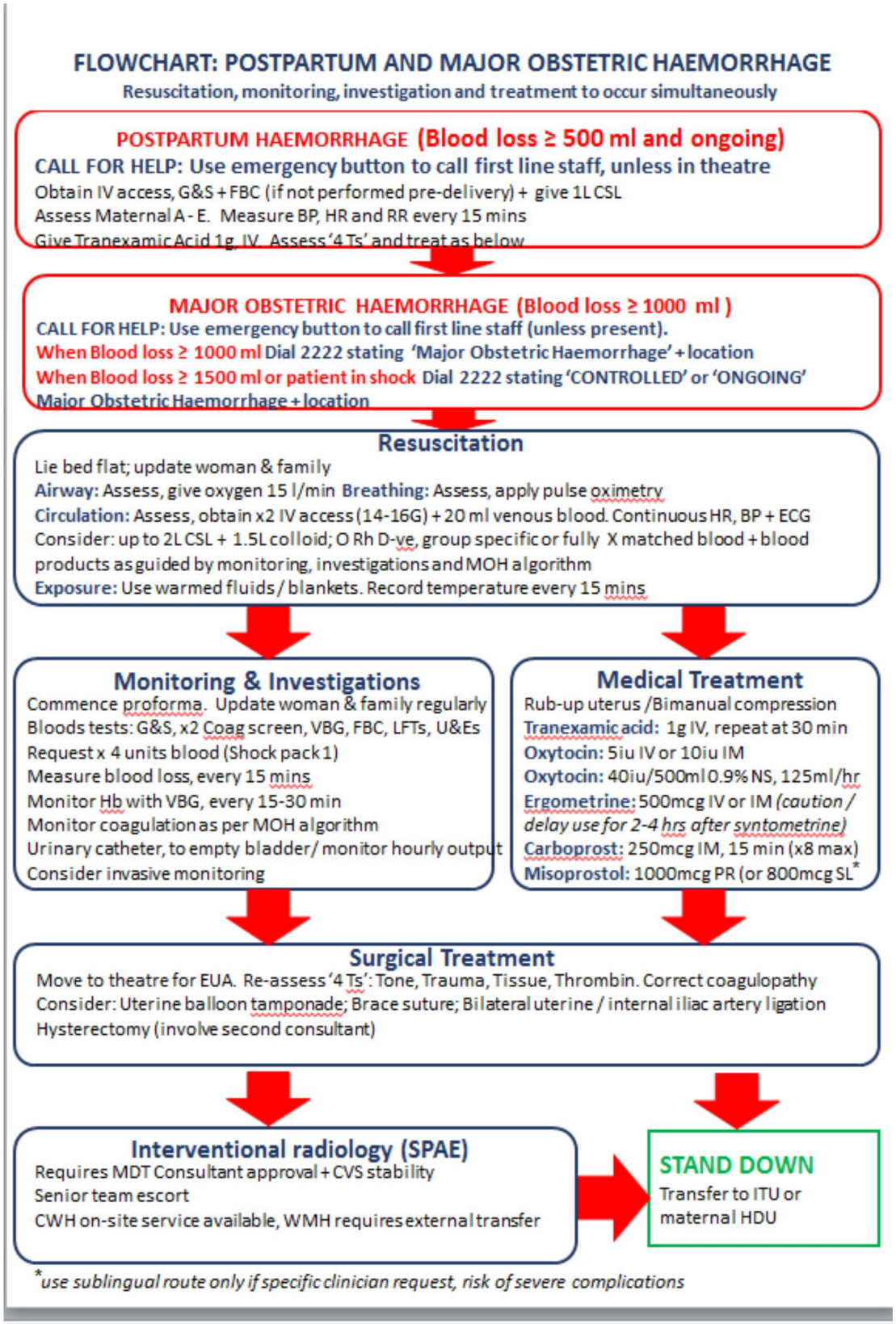
INITIAL MANAGEMENT
Oxygen 15L/min Time: **Lie Bed Flat** Time:
Cannula Time No. 1: Size ___G Time No. 2: Size ___G
Urinary Catheter / Urometer Time: **Total Urine Output**:
Uterine Massage Time: **Bimanual Compression** Time:
Refer to MOH Algorithm – request Shock packs if ongoing bleeding
Request Shock pack 1 (PRC: 4 units) Time:
Request Shock pack 2 (PRC: 4 units, FFP: 4 units) Time:
Request Shock pack 3 (Cryoprecipitate: 2 pools, plts: 1 pool, PRC:FFP (6:4))Time:

Causes of Bleeding	Ongoing EBL (to be completed every 15 minutes)			
Tone ☐ Trauma ☐	Time:	EBL:	Time:	EBL:
Tissue ☐ Thrombin ☐	Time:	EBL:	Time:	EBL:
Placenta Delivered/complete: Yes☐ No☐ Time:	Time:	EBL:	Time:	EBL:
Total EBL				

DRUGS		
DRUG	**DOSE**	**TIME**
Syntometrine	1 amp (IM) (if normal BP)	
Oxytocin	5 units (IV) or 10 units (IM)	
Ergometrine (in fridge) N.B. Caution/ delay if used after syntometrine	500mcg/1 amp (if normal BP) (IM or IV)	
Oxytocin Infusion	40 units in 500mls N/Saline (IV) via pump at 125 mls/hr	
Tranexamic Acid (if EBL≥500 ml at vaginal delivery or at increased risk or≥1000 ml at CS)	1g (IV)	
Tranexamic Acid (30 mins after 1st dose if bleeding ongoing)	1g (IV)	
Carboprost (in fridge) (every 15 minutes)	250mcg/1 amp (IM)	
Carboprost 1st dose:	**Carboprost** 2nd dose:	
Carboprost 3rd dose:	**Carboprost** 4th dose:	
Carboprost 5th dose:	**Carboprost** 6th dose:	
Carboprost 7th dose:	**Carboprost** 8th dose:	
Misoprostol (in CD cupboard)	1000mcg PR (or 800 mcg SL*)	

Drugs prescribed: Yes / No **Datix completed (EBL ≥ 1500ml):** Yes / No

**Sublingual misoprostol only to be administered with caution after specific clinician request*


FLOWCHART: POSTPARTUM AND MAJOR OBSTETRIC HAEMORRHAGE
Resuscitation, monitoring, investigation and treatment to occur simultaneously
POSTPARTUM HAEMORRHAGE (Blood loss ≥ 500 ml and ongoing)
CALL FOR HELP: Use emergency button to call first line staff, unless in theatre
Obtain IV access, G&S + FBC (if not performed pre-delivery) + give 1L CSL
Assess Maternal A - E. Measure BP, HR and RR every 15 mins
Give Tranexamic Acid 1g, IV. Assess '4 Ts' and treat as below
MAJOR OBSTETRIC HAEMORRHAGE (Blood loss ≥ 1000 ml)
CALL FOR HELP: Use emergency button to call first line staff (unless present).
When Blood loss ≥ 1000 ml Dial 2222 stating 'Major Obstetric Haemorrhage' + location
When Blood loss ≥ 1500 ml or patient in shock Dial 2222 stating 'CONTROLLED' or 'ONGOING' Major Obstetric Haemorrhage + location
Resuscitation
Lie bed flat; update woman & family
Airway: Assess, give oxygen 15 l/min Breathing: Assess, apply pulse oximetry
Circulation: Assess, obtain x2 IV access (14-16G) + 20 ml venous blood. Continuous HR, BP + ECG
Consider: up to 2L CSL + 1.5L colloid; O Rh D-ve, group specific or fully X matched blood + blood products as guided by monitoring, investigations and MOH algorithm
Exposure: Use warmed fluids / blankets. Record temperature every 15 mins
Monitoring & Investigations
Commence proforma. Update woman & family regularly
Bloods tests: G&S, x2 Coag screen, VBG, FBC, LFTs, U&Es
Request x 4 units blood (Shock pack 1)
Measure blood loss, every 15 mins
Monitor Hb with VBG, every 15-30 min
Monitor coagulation as per MOH algorithm
Urinary catheter, to empty bladder/ monitor hourly output
Consider invasive monitoring
Medical Treatment
Rub-up uterus /Bimanual compression
Tranexamic acid: 1g IV, repeat at 30 min
Oxytocin: 5iu IV or 10iu IM
Oxytocin: 40iu/500ml 0.9% NS, 125ml/hr
Ergometrine: 500mcg IV or IM (caution / delay use for 2-4 hrs after syntometrine)
Carboprost: 250mcg IM, 15 min (x8 max)
Misoprostol: 1000mcg PR (or 800mcg SL*
Surgical Treatment
Move to theatre for EUA. Re-assess '4 Ts': Tone, Trauma, Tissue, Thrombin. Correct coagulopathy
Consider: Uterine balloon tamponade; Brace suture; Bilateral uterine / internal iliac artery ligation
Hysterectomy (involve second consultant)
Interventional radiology (SPAE)
Requires MDT Consultant approval + CVS stability
Senior team escort
CWH on-site service available, WMH requires external transfer
STAND DOWN
Transfer to ITU or maternal HDU
*use sublingual route only if specific clinician request, risk of severe complications

MAJOR OBSTETRIC HAEMORRHAGE ALGORITHM (WMH and CWH)

Chelsea and Westminster Hospital NHS
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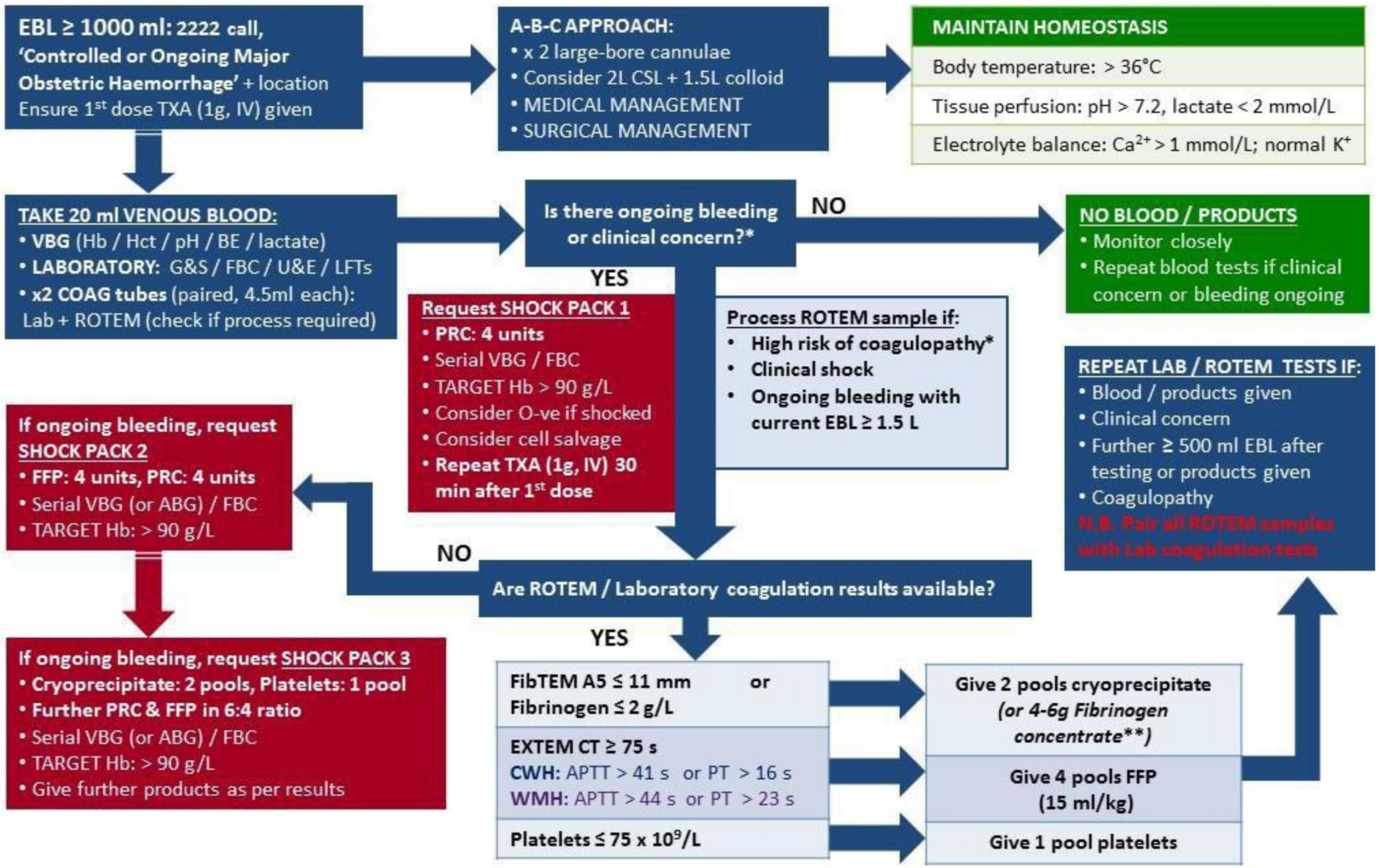
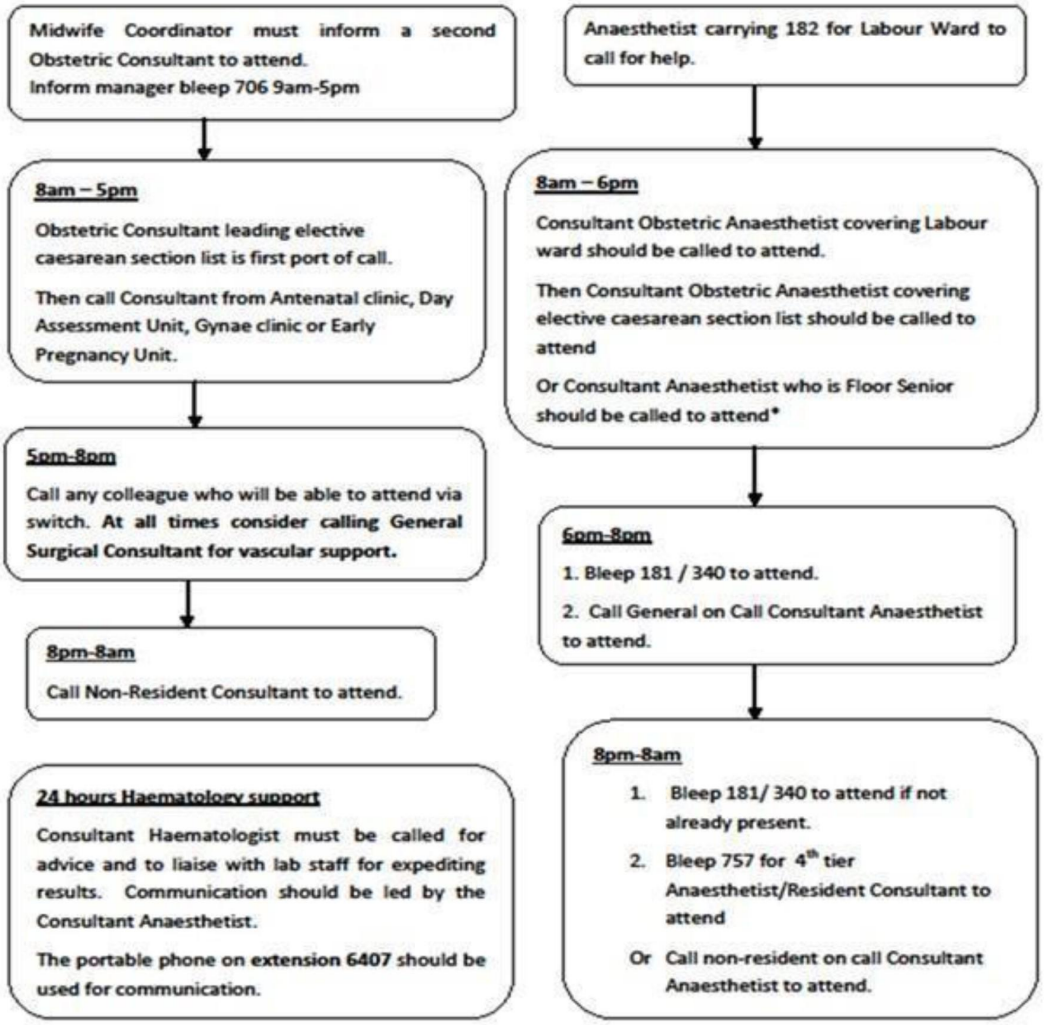


*Consider early use of FFP / cryoprecipitate if high risk of coagulopathy e.g. placental abruption, AFE

** Discuss with Haematology Consultant

Obstetric and Anaesthetic call out for MOH with blood loss 3000mls or more



*Contacting the Consultant Anaesthetist who is Floor Senior to attend – Person carrying bleep 182 knows the named consultant and should write the contact name and contact details on the Labour ward notice board every morning during handover