MINISTRY OF HEALTH & WELLNESS

MOHW-DOC- 800-1-3

THE PROTOCOL FOR THE MANAGEMENT OF POSTPARTUM HAEMORRHAGE

POLICIES, PROCEDURES AND PROTOCOLS MANUAL
MATERNAL HEALTH GUIDELINE NO. 2

FAMILY HEALTH UNIT

MINISTRY OF HEALTH & WELLNESS
JAMAICA

MOHW-DOC-

POSTPARTUM HAEMORRHAGE

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JAMAICA

OCTOBER 2019

Director, Family Health Unit

Director, Health Services, Planning and Integration

Chief Medical Officer

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3	07/2021	Final	Guideline Development Committee	CL/ME	NW
2	02/2020	Issued for Use	Guideline Development Committee	CL/ME	NW
1	10/2019	Draft	Guideline Development Committee	CL/ME	
Revision Issue	**Date**	**Issue Description**	**Prepared by**	**Checked by**	**Approved by**

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Policy: Postpartum Haemorrhage		
Date Revised:	Distribution to all Birthing Facilities	Index:
Approved by: Health Services Planning & Integration Branch		

Purpose and Scope of Maternal Health Guidelines

This is the first Edition of this guideline. The guideline was developed by the National Guideline Development Committee for Maternal Health under the direction of the Family Health Unit at the Ministry of Health & Wellness Jamaica. The committee consists of experts from across the island of Jamaica and the composition of the team varies based on the multidisciplinary requirements of the topic under consideration.

The information contained herein is designed to aid practitioners in making decisions about appropriate obstetric care. The guideline takes into consideration the unique challenges that may exist in the context of medical practice in developing countries.

Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations of an institution.

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Structure of the Guidance

This guideline is structured according to the following:

Introduction of Disorder
Comprise of a brief summary of the condition. Definition and importance based on relevant local and international epidemiological data.

Description of Disorder
Aetiology, pathogenesis and pathophysiology of the condition.

Diagnostic Management of Disorder
Clinical manifestation of the disease, syndromes, specific symptoms and signs associated with the condition. There will be an outline with:

- investigations both general and specific
- discussions on the options for low resource settings or contingencies where minimum standards are not available

Therapeutic Management of Disorder
This section will be divided into:

- initial/resuscitative
- specific management
- surveillance
- follow-up

Where relevant a comment will be made on screening, prevention or risk reduction if a separate document does not exist or is to be developed to address this.

The level of evidence are highlighted in this document.

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List of Acronyms

PPH	Postpartum Haemorrhage
WHO	World Health Organization
MMR	Maternal Mortality Ratio
MOHW	Ministry of Health and Wellness
DIC	Disseminated Intravascular Coagulation
TRALI	Transfusion Related Acute Lung Injury
ARDS	Acute Respiratory Distress Syndrome
GDC	Guideline Development Committee
MOHWGDC	Ministry of Health and Wellness Guideline Development Committee
PT/PTT	Prothombin/ Partial Prothrombin Time
CBC	Complete Blood Count
AVPU	Alert, response to voice, responds to pain, unresponsive
BP	Blood Pressure
SBP	Systolic Blood Pressure
PR	Pulse Rate
IV	Intravascular
GXM	Group and Cross Match
LFT	Liver Function Test
U+E	Urea and Electrolyte
FFP	Fresh Frozen Plasma
HES	Hydroxyethyl Starch
AKI	Acute Kidney Injury
MAP	Mean Arterial Pressure
Hb	Haemoglobin
IM	Intramuscular
BUT	Balloon Uterine Tamponade

B-Lynch	Brace suture
PRBC	Pack Red Blood Cells
EBL	Estimated Blood Loss
PCC	Prothrombin Complex Concentrate

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Definition of Postpartum Haemorrhage

Evidence Level

All women have some degree of blood loss after delivery. When this blood loss becomes excessive it poses a risk of inducing a spectrum of morbidity ranging from mild anaemia to severe anaemia and/or hypovolaemic shock. Having a clear diagnostic definition for PPH is therefore important in order for the clinician to identify patients who are at risk of such morbidity and also for the purposes of statistical analysis and epidemiological evaluation.

Postpartum haemorrhage (PPH) should be diagnosed in any case in which any of the following criteria are present:

- blood loss from the genital tract of greater than 500mls after vaginal delivery
- blood loss from the genital tract of greater than 1000mls after caesarean section
- ANY blood loss that results in the patient becoming symptomatic of hypovolemia, hypoperfusion, and/or anaemia

Postpartum haemorrhage (PPH) may be classified as early (primary) or late (secondary), depending on whether it occurs in the first 24 hours, or between the second post-partum day and the end of the puerperium, respectively.

Importance of PPH

Obstetric haemorrhage is one of the most common causes of maternal deaths worldwide, particularly in the developing world, and is a major cause of maternal morbidity worldwide. The World Health Organization (WHO) states that post-partum haemorrhage is the leading direct cause of maternal mortality worldwide, accounting for 25% of maternal deaths[1], however, the country specific incidence varies widely:

In the USA, haemorrhage accounts for 10% of maternal mortalities where total Maternal Mortality Ratio (MMR) is approximately 28 deaths per 100,000 live births, as of 2014.[2,3] In Jamaica PPH accounts for 18% of maternal deaths.[4] Data from the Ministry of Health & Wellness (MOHW) indicate that PPH is the second leading cause of maternal mortality in Jamaica over the last two decades (Figure 1). It is clear that reduction of PPH related morbidity is critical to reducing maternal mortality locally.

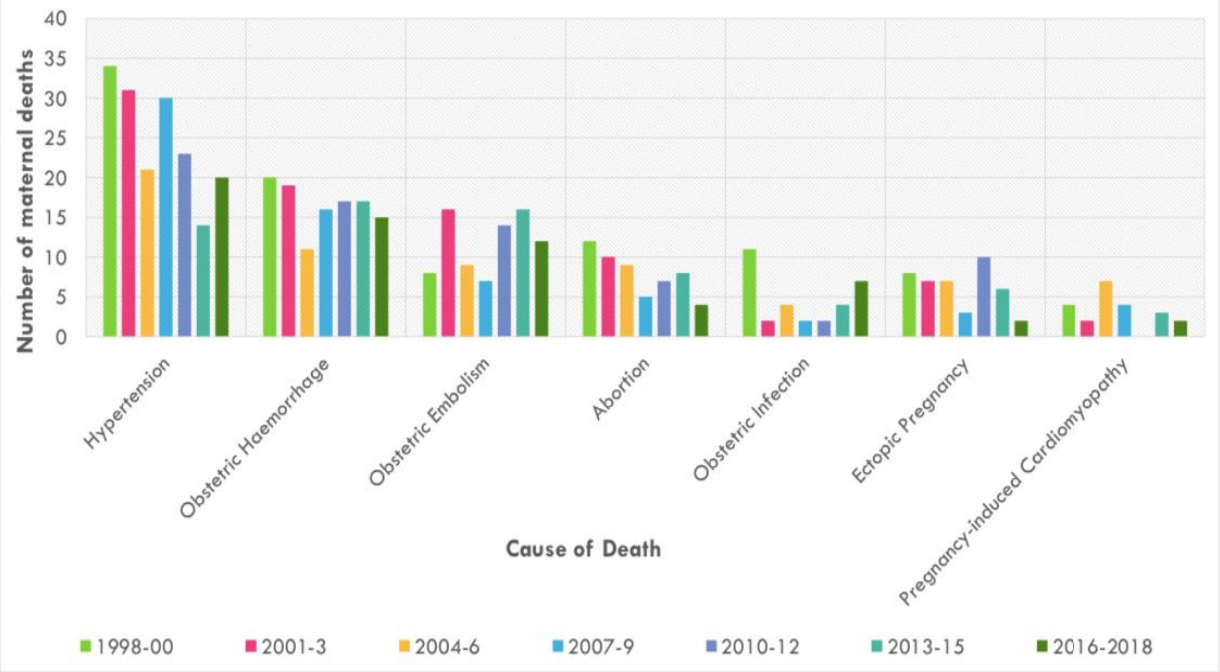

Figure 1. Direct causes of maternal mortality in Jamaica by triennium, 1998-2018

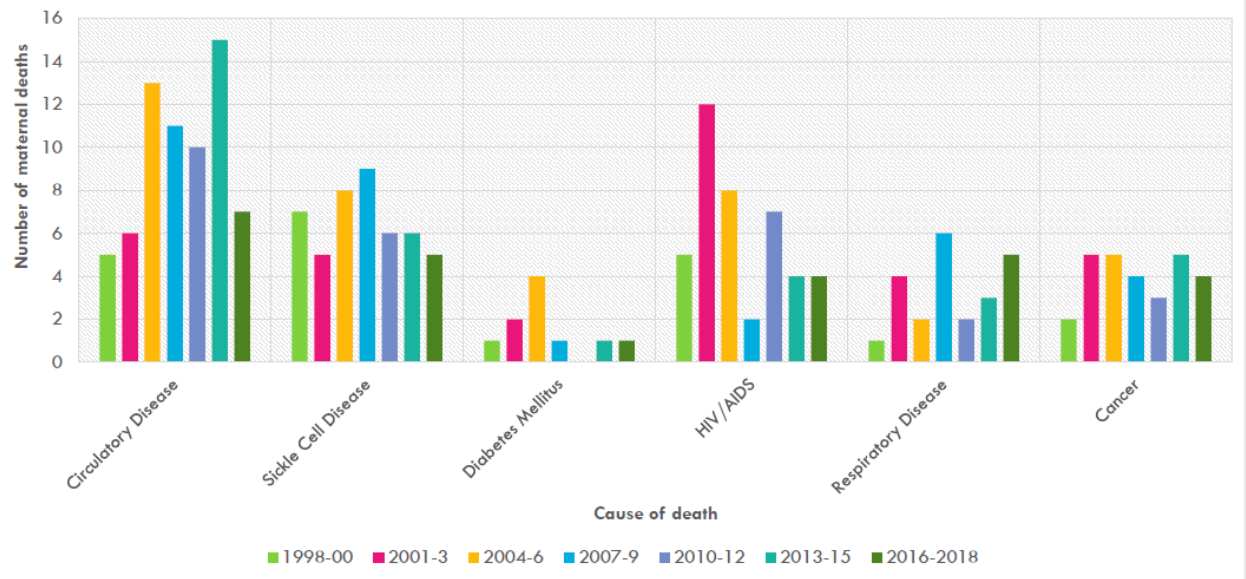

Figure 2. Indirect causes of maternal mortality in Jamaica by triennium, 1998-2018

Risk factors for PPH

Postpartum Haemorrhage in almost all cases arises as a consequence of one of four (4) mechanisms often referred to as the four 'T's: **T**one (uterine hypotonia or atony), **T**rauma (laceration, excoriation, abrasion or incision of genital tract tissues), **T**issue (retained products of conception), **T**hrombus (Thrombogenic dysfunction arising consequent to congenital or acquired coagulator dysfunction). Predisposing factors or risk factors are simply factors that lead to or contribute to one or more of these four pathological mechanisms.

There can be both antepartum and intrapartum risk factors for PPH.

These include [5-9]:

- history of post-partum haemorrhage (previous pregnancy)
- history of antepartum haemorrhage (current pregnancy)
- uterine overdistension (multiple gestation / foetal macrosomia / polyhydramnios)
- primigravida
- grand multiparity / advanced maternal age
- preterm births
- genital tract injuries
- non-use of oxytocic agents for PPH prophylaxis
- induction of labour
- caesarean delivery (previous and current pregnancy)
- uterine fatigue (precipitate labour / prolonged labour)
- Intra-uterine fetal deaths, particularly in the context of placental abruption.
- uterine fibroids
- use of anticoagulant medication
- chorioamnionitis
- operative vaginal deliveries

It is important to note that over 20% of patients who develop PPH have no risk factors, so providers must be prepared to treat it at every delivery.[10]

Aetiology and Pathophysiology of PPH

Uterine atony is responsible for the majority (75%) of cases of PPH.[11] The process of placental formation eliminates the ability of the underlying blood vessels to vasoconstrict, as their smooth muscle walls are destroyed. Thus, in the immediate post-partum period it is the contraction of the uterus, with the external compression of the vessels by the interlacing myometrial fibres, which provides most of haemostasis in the short term.

A fibrin clot is subsequently produced to cover the placental bed.

Loss of circulating blood volume leads to hypoperfusion and consequent dysfunction of tissues and organ systems. Thus, PPH may lead to secondary complications such as shock, acute kidney injury, cardiac failure, and post-partum pituitary necrosis (Sheehan's Syndrome). Haemorrhage that leads to blood transfusion is the leading cause of severe maternal morbidity in the United States[2] and both the primary haemorrhage and its management (plus any antecedent bleeding in the case of abruption) may lead to coagulopathies, including disseminated intravascular coagulation (DIC).[12] The transfusion of blood and blood products can further provoke complications such as transfusion related acute lung injury (TRALI) or acute respiratory distress syndrome (ARDS).[13]

Post-partum haemorrhage is a potentially dire emergency situation and must be recognized and managed as such in every circumstance.

Measures that should be put in place to reduce the risk of PPH during the Antenatal Period

Diagnosis, treatment and correction of Anaemia

All women should be screened for symptoms of anaemia at each antenatal visit.	**D**
All women attending for antenatal care should be offered a complete blood count at booking and again at ≥28 weeks to screen for anaemia.	**A**
If diagnosed anaemia should be appropriately investigated and treated in order to reduce attendant morbidity	**A**
Women with anaemia should be referred for assessment by a consultant lead team as per the recommendations of the Ministry of Health & Wellness Guideline Development Committee's (MOHW GDC) guideline on anaemia.	

Screening for coagulation/bleeding

Most women with coagulation/bleeding disorders will be diagnosed prior to presentation in pregnancy.	
All women should be screened, based on history, for pre-existing coagulopathy or anticoagulant therapy at initial booking visit.	**D**
A subset of women with coagulation/bleeding disorders may be undiagnosed prior to pregnancy.	
The platelet count should be reviewed for all women at booking and again when the CBC is repeated at ≥28 weeks.	**D**
Women with a history of unexplained multi-mucosal bleeding (e.g. unexplained menorrhagia, easy bruising, and epistaxis) should be offered a PT, PTT in addition to CBC.	**D**
Women with a suspected coagulopathy and those taking anticoagulant drugs require multidisciplinary care and should be managed by an Obstetrician led team.	**B**

Measures that should be put in place to reduce the risk of PPH at the time of labour and delivery

Management of PPH should be aimed towards primary prevention, and this is the basis of the principle of active management of the third stage of labour. Routine third stage interventions should include:

1. Administration of oxytocin at the birth of the anterior shoulder of the infant
2. Early clamping and cutting of the umbilical cord
3. Allowing spontaneous separation of the placenta prior to attempts at removal
4. Delivery of the placenta by controlled cord traction
5. Once the placenta has been delivered then:
    - the uterus should be massaged to facilitate it becoming firmly contracted
    - the placenta should be checked to ensure completeness
    - the lower genital tract should be examined for any evidence of trauma, and any wounds seen should be quickly repaired with the aid of a local anaesthetic

Clinical presentation of patients with PPH

Clinical presentation varies widely. The spectrum may range from patients who bleed heavily from the genital tract immediately during and after delivery, to patients who have a slower but persistent trickle for the days or weeks following delivery. In some cases, as with uterine rupture, there may be little or no bleeding from the genital tract but marked intra-abdominal haemorrhage.

Patients with postpartum haemorrhage should be managed like all emergency situations, with the history and physical examination occurring simultaneously while following standard resuscitation practice.

Information that can be obtained from the patient's history

A targeted history should be obtained from the patient and/or the attending obstetric staff to identify potentially modifiable risk factors, to quantify the volume of blood lost, to assess for signs of cardiovascular instability/decompensation, and to determine the likely aetiology of the bleeding.

Information should be obtained to assess the severity of bleeding:

- What has been the duration of the third stage of labour?
- What is the estimated blood loss?
- How long has the bleeding been heavy?
- Are symptoms of hypovolemia present (dizziness/light-headedness, changes in vision, palpitations, fatigue, orthostasis, syncope or presyncope)?
- What was the starting haemoglobin level?

Information should be obtained to assess for predisposing factors and identify potential aetiology:

Tone

- History of postpartum haemorrhage
- Gravidity, parity
- Number of foetuses for the most recent pregnancy
- Pregnancy complications (polyhydramnios, infection, vaginal bleeding, placental abnormalities)

Tissue

- Is the placenta delivered?
- If the placenta was delivered, was it spontaneous, or was manual delivery required?
- Did the placenta appear complete?

Trauma

- Was the labour precipitate?
- Was there instrumentation?
- Current and past history of vaginal delivery versus caesarean delivery
- Other uterine surgeries such as myomectomy

Thrombus

- Personal or family history of bleeding disorder
- Medications such as prescribed, over the counter, diet supplements, or vitamins (with particular attention to anticoagulants, platelet inhibitors, uterine relaxants, and antihypertensives)

Information that should be obtained from the patient's clinical exam

General observation

Evidence of cerebral hypoxia or hypoperfusion

- What is the consciousness level? AVPU score (alert, response to voice, responds to pain, unresponsive) Confused/agitated?

Evidence of hypovolaemia/Anaemia

- Peripheries cold and clammy
- Pulse rate increased
- Pulse volume decreased
- Blood pressure reduced
- Mucosae pink or pale
- Estimation of blood loss. Number of gauze swabs used. Incontinence pads soaked. Blood pooling on bed/sheets/floor (Appendix 3-Figure 5)

Specific examination

Abdominal examination

- Boggy uterus (at or above the umbilicus) is suggestive of atony
- Pain/tenderness/distension and peritonism (concerning for intra-abdominal bleeding)

Perineal examination

- Is there active bleeding seen from vagina?
- Are there any perineal lacerations noted?

Speculum examination

- Careful inspection of the cervix and vagina may reveal the presence and extent of lacerations.

Cervical examination

- If cervical laceration is suspected, then the cervix should be visualized and examined in its entirety utilizing atraumatic ring forceps. Examination under anaesthesia may be required to achieve this.

Digital examination

- Placental examination findings
- Examine the placenta for missing portions, which suggest the possibility of retained placental tissue.

Investigations that may be needed to confirm the diagnosis of PPH

The diagnosis of PPH is made clinically.

However, investigations such as ultrasound and laboratory evaluation of blood samples may be useful to further define the aetiology and severity of the haemorrhage, as well as to rule out or confirm any associated complications.

Initial resuscitative management that should be undertaken in a case of PPH

Resuscitative management should follow a systematic approach (ABCDE) and should include

1. CALL FOR ADDITIONAL HELP!
2. A 'scribe' must be assigned
3. **A**irways and **B**reathing
    a. Ensure patency of the Airway
    b. Administer supplemental oxygen (10L via face mask)
4. **C**irculation
    a. Assess and initiate management of circulation
        i. Vital signs to be (re)assessed
            - Features of hypovolaemic shock include:
                a. Systolic Blood Pressure (SBP) <90mmhg
                b. Fall in BP as compared to admission BP in hypertensive women
                c. PR >100/min
                d. Decreased pulse volume ('thready' pulse)

- (Appendix 3, Figure 6.) “Advance Trauma Life Support classification of hypovolaemic shock”

ii. Site two large bore (18G [green] or 16G [grey]) IV cannulas, preferably in the antecubital fossae

iii. Have blood samples taken for CBC, GXM, and PT/PTT at a minimum. Do bedside clotting time(2-8 minutes). Do Fibrinogen levels if available.
   - Other investigations include U+Es, creatinine, uric acid and LFTs may be indicated based on clinician’s judgement

iv. Request two (2) to four (4) units of packed red blood cells and at least 1.5 litres of fresh frozen plasma (FFP) available for transfusion, if necessary

v. Bladder catheter to be placed to monitor urine output. (Urine output should be maintained $\geq$0.5ml/kg/hr)

vi. Bolus at least a litre of normal (0.9%) saline or Lactated Ringer’s over no more than 10 - 15 minutes to replace lost circulating volume

vii. Vitals should be re-assessed after initial bolus

viii. An additional 500cc bolus may be given if signs of shock develop, or fail to improve

ix. Vitals should be reassessed after each 500cc bolus to assess for resolution of hypovolaemia

x. Additional boluses of crystalloids should be given until resolution of hypovolaemia to a maximum of 3L beyond this point resuscitation should continue with colloids* (ideally fresh frozen plasma [FFP]).

xi. If additional administration (>3L) of crystalloids is required, consideration should be given to the associated increased risk of pulmonary oedema. Ideally by this point the anaesthetic team should be on site to assist with fluid management as invasive monitoring and airway management may be required.

*Use of hyperoncotic starch solutions (e.g. pentastarch, hydroxyethyl starch (HES) has been associated with increased risk of morbidity such as acute kidney injury (AKI), severe refractory pruritic crisis, anaphylaxis and in some studies, increased mortality.[12-15]

The use of hyperoncotic starch solutions (e.g. pentastarch, hydroxyethyl starch (HES) should be avoided.	**A**

5. **D**rugs

Administer uterotonic drugs (Oxytocin is first line, see uterine atony below)	**A**

Uterine atony accounts for over 75% of cases of PPH. Empiric administration of uterotonic drugs is therefore to be offered early in the management of all cases of PPH

Administer tranexamic acid 1g as soon as possible for patients with ongoing bleeding.	**A**

- Administration: 10 mL of a 100mg/mL solution) is infused over 10 to 20 minutes, as infusion

N.B. >1 mL/minute can cause hypotension

Tranexamic acid reduces death due to bleeding in women with post-partum haemorrhage with no adverse effects.[16]

Tranexamic acid is an anti-fibrinolytic drug. Hyperfibrinolysis and fibrinogen depletion are common in the early stages of major postpartum and traumatic bleeding. Delay in treatment, even if short, reduces the benefit of tranexamic acid administration.

If bleeding persists after 30 minutes, a second 1 g dose may be administered. The antifibrinolytic effect lasts up to 7 to 8 hours in serum.

6. **E**xamination
    a. A systematic examination should be performed to identify the specific cause(s) of PPH
        i. Assess for uterine tone, massage the uterus and attempt to expel any retained clots/blood
        ii. Ensure adequate exposure and lighting is available for proper examination of genital tract
        iii. Assess for any perineal, vaginal or cervical lacerations
        iv. Assess the placenta for completeness

What are the targets for resuscitative management of patients with PPH?

Clinical Targets

All patients should be assessed clinically at intervals for improved mean arterial pressure (MAP), urine output, heart rate, respiratory rate, skin colour, temperature, pulse oximetry, and mental status.

Specific clinical targets

1. MAP: ≥65 mmHg (MAP = [(2 x diastolic) + systolic]/3)
2. Urine output: ≥0.5ml/kg/hr

Specific Investigative targets:

Hb: > 7.5g/dl

Platelet count > 50 x 10^9/L

PT: >1.5 x control

PTT: >1.5 x control

Fibrinogen greater than 300 mg/dL

Bedside clotting time(2-8 minutes)

Specific therapies that should be instituted in a case of PPH

Specific therapies will be instituted depending on the cause of the haemorrhage.

Uterine Atony

Uterine atony should be suspected when abdominal palpation does not reveal a firm well contracted uterus or when genital tract examination fails to identify a laceration which adequately explains blood loss.

Initial management should include External uterine massage and administration of uterotonic agents.

Oxytocin should be given as first line therapy	**A**

An oxytocin infusion of 20 – 40 units in 500mls of normal saline or lactated ringers should be administered at a moderate rate to aid uterine contraction.

Methylergonovine may be given if there is inadequate response to oxytocin. Once there are no contraindications (e.g. hypertension, coronary or cerebral artery disease, Raynaud's Syndrome)

Ergometrine/Methylergonovine (Methergin®) 0.2 mg should be given IM or IV (slowly over a period of no less than 60 seconds)	
Misoprostol 800 – 1000 µg (4 or 5 tablets, respectively) may be inserted per rectum as adjunctive therapy.	**D**
Bimanual uterine compression should be attempted for women who fail to adequately respond to the initial management	**D**
Bimanual compression of the uterus involves external massage coupled with compression of the uterus between the external hand and the other fist of the examining practitioner, which is inserted into the vagina up to the level of the cervix. This should be maintained until the uterus remains firm and bleeding has abated. If the desired effect is not achieved, then bimanual compression should be maintained while other interventions are being initiated.	
Minimally Invasive Surgical Techniques	
Balloon uterine tamponade (BUT) should be utilized in cases of suspected uterine atony when clinical measures fail to abort haemorrhage. (*Appendix 5) "placement of intrauterine balloon"*	**B**
Balloon Uterine Tamponade treats PPH by compressing and occluding the bleeding vessels at the placental implantation site as well as reducing uterine artery perfusion.[17] The use of BUT in women with PPH has been associated with lower estimated blood loss, higher haemoglobin, less frequent packed red blood cell transfusion, fewer intensive care unit admissions, and fewer hysterectomies.[18] The Bakri postpartum balloon catheter should be used for this intervention. Alternatively, a Rusch urologic hydrostatic balloon catheter can be used, or a condom can be placed over the end of a Foley catheter. In the latter case a suture is tied tightly around the base of the condom to prevent leakage. Other devices such as the BT-Cath and the ebb Complete Tamponade system are appropriate but unlikely to be available locally.	**IIB**
The effectiveness of the intrauterine balloon should be assessed by the "tamponade test". If bleeding promptly stops or is minimal, after insertion and inflation of the intrauterine balloon then the test is positive (successful), and the inflated balloon is left in place. A negative (unsuccessful) test is defined as bleeding not controlled with inflation of the balloon.	**C**

The tamponade test rapidly identifies patients who are likely to require additional surgical intervention.[19-20]	**III**
Women with a negative (unsuccessful) tamponade test should be offered laparotomy and invasive surgical intervention.	**C**

Invasive surgical techniques

The patient who continues to bleed heavily or shows signs of continued instability despite treatment of uterine atony in the absence of an obvious lower genital lesion should be via laparotomy. Potential concerns to be assessed include intra-abdominal haemorrhage and intractable uterine atony.

At laparotomy, the following measures may be undertaken:

- Internal uterine massage
- Application of brace sutures (e.g. B-Lynch)
- Bilateral uterine artery ligation +/- four pedicle ligation
- Bilateral internal iliac artery ligation
- Hysterectomy

The decision regarding choice of surgical intervention should be directed by the obstetrician in attendance and should take into account, severity of haemorrhage, availability of blood products, support and expertise.	**D**

Genital Tract Lacerations

Any wounds seen in the lower genital tract should be quickly repaired (with the aid of a local anaesthetic)

General anaesthesia may be required to facilitate repair complicated (high or extensive) vaginal and cervical lacerations	**D**
Transabdominal repair via laparotomy should be considered for vaginal lacerations extending into the fornix.	**D**

Coagulopathy or Platelet Dysfunction

Coagulopathy or platelet dysfunction can contribute to PPH in women with an inherited or acquired bleeding diathesis and can be a result of PPH when there is a severe reduction of clotting factors due to persistent heavy bleeding and haemodilution of the remaining clotting factors.

The management of women with confirmed or suspected coagulopathy should achieve the following:

1. Treat the underlying cause
2. Correct coagulation factor or platelet deficiency

Evidence of coagulopathy include:

1. Petechiae, Ecchymoses
2. Bleeding from IV access sites
3. Increased bedside clotting
4. Reduced Fibrinogen
5. Deranged PT/PTT

Patients with evidence of coagulopathy should receive transfusion of clotting factors.

Lack of availability or undue delay in receiving the results of investigations should not delay the administration of potentially lifesaving blood products.

Empiric transfusion of Fresh Frozen plasma should be considered when the risk of coagulopathy is high e.g. in cases of abruption, amniotic fluid embolism.

Women with blood loss in excess of 2L should be treated empirically with Fresh frozen plasma.

Approach to transfusion therapy

There is wide variation in the literature with regards to the approach to transfusion of blood products in the context of haemorrhage. Protocols for transfusion should be tailored to the

Packed Red Blood Cells (PRBC)

Where available transfusion of PRC should be guided by the Hb value.

The transfusion of PRBC should be targeted to maintain Hb >7.5g/dl

Clinicians should be aware that the Hb level may not accurately reflect actual deficits in patients with rapid ongoing blood loss. In such cases the clinical judgement of the multidisciplinary team should take precedence.

Empiric transfusion of 2 units of PRBC should be considered for women with EBL >1.5L regardless of initial Hb. For women with starting Hb <10g/dl transfusion of PRBC should be considered even prior to this threshold.

It is widely held rule that the transfusion of 1unit of PRBC should raise the Hb by 1g/dl. The clinician should be aware, however, that this rule may not hold in the face of ongoing haemorrhage.

Fresh Frozen Plasma (FFP)

FFP contains all soluble plasma proteins and clotting factors.

In cases of suspected or proven factor deficiency the transfusion of FFP should be the first line therapy.	**D**

An initial dose of 10-20 mls/Kg should be given for correction of factor deficiency. This dose will raise the level of any factor, including fibrinogen, by close to 30%, which is typically sufficient for haemostasis.

Cryoprecipitate

Cryoprecipitate is rich in Fibrinogen, factors VIII and XIII as well as von Willebrand factor.

Cryoprecipitate should be transfused in women who demonstrate evidence of coagulopathy despite therapeutic doses of FFP or in women with critically low levels of Fibrinogen (<300mg/L).
Due to the higher concentration of factors such as fibrinogen, Cryoprecipitate provides a particular advantage for factor replacement in patients who may have had adequate volume repletion but remain factor deficient.
In some cases of massive PPH critically low fibrinogen levels cannot be returned to normal using only FFP without the use of cryoprecipitate
An initial dose of 5-10 units of Cryoprecipitate should be administered depending on the patient's body weight. A dose of 1 unit/10 kg body weight will raise plasma fibrinogen by approximately 50 mg/dL.

Stored Plasma

Stored plasma is inferior to FFP in its coagulation factor content. As a result, the use of stored plasma in the treatment of massive PPH is not recommended.
In the absence of FFP stored plasma may be used as a temporizing measure for plasma expansion.

Platelets (PLT)

In the absence of factor deficiency adequate platelet function for clotting can be maintained even at levels <100 x 10^9 /L. It is imperative therefore that the correction of factor deficiency be considered paramount during the resuscitative process. Platelet function becomes less predictable at values < 50 x 10^9/L, especially in the face of ongoing haemorrhage.
Platelet transfusion should be considered in addition to factor replacement in women with platelet counts < 50 x 10^9/L.
Five (5) to six (6) units of whole blood-derived platelets or 1 unit of apheresis platelets will raise the platelet count by approximately 30 x 10^9/L in an average-sized adult.

The use of factor concentrates in management of PPH

The use of Fibrinogen concentrate, Recombinant Factor VIIa and Prothrombin Complex Concentrate (PCC) may provide distinct advantages in the management of women with massive PPH. Advantages include reduced risk of volume overload, no need for thawing or blood group typing, and a reduced risk for transfusion-related acute lung injury and allergic reactions. Disadvantages include very high cost and potential increased risk of thrombosis particularly with PCC.

The high cost, lack of availability and lack of experience with the use of these options in the local settings preclude recommendation for routine use at this time.

The use of such interventions should be based on availability and the experience of the managing multidisciplinary team in select cases where relevant.

Staff that should be in attendance for a case of PPH

One or more nurses with midwifery training should be in attendance for any woman who is undergoing delivery.

Two or more nurses with midwifery training should be in attendance for any woman with EBL >500mls.

A medical officer should be in attendance for any patient with ongoing bleeding and EBL >500mls or any woman who is symptomatic after delivery regardless of EBL.

One or more specialist obstetrician(s) should be in attendance for any patient with ongoing bleeding and EBL >1L.

A clinician with anaesthetic training should be in attendance for any patient with ongoing bleeding or evidence of hypovolaemia despite initial bolus of crystalloids of $\geq$2L or for any woman for whom intensive fluid or airway management is anticipated.

A specialist anaesthetist should be in attendance for any woman with ongoing haemorrhage with coagulopathy who requires laparotomy or for any woman for whom coordination of intensive management of airway, intravascular volume and coagulation status is anticipated.
Support staff in the form of porters, nursing aids and theatre technical staff should be available if necessary, in all cases.

How soon should transfusion therapy be considered?

It is imperative that consideration regarding the potential need for blood products be given as early as possible in the course of management of the woman with PPH in order to avoid unnecessary and untimely delays in administration of potentially life-saving intervention.
Even when available blood products may take some time to be prepared for use.
Frozen blood products (FFP, Cryoprecipitate) take 10 to 30 minutes to thaw. It may take 30 minutes to perform an uncomplicated crossmatch.
In some cases, blood product may need to be transported from other sites remote from the point of care. Clinicians should be aware of the realities prevailing in the local setting and that a proactive approach is taken to securing blood as soon as possible.

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Special considerations and circumstances

Transfers

Every effort should be made to abort bleeding and stabilize the patient with PPH prior to transfer.

Where expertise is not available for intervention to abort bleeding (e.g. home delivery setting) then temporizing mechanism such as transabdominal aortic compression should be utilized during transfer.	**C**
Transabdominal or aortic compression has been shown to be effective and may reduce morbidity if utilized during transfer.[21,22]	**III**

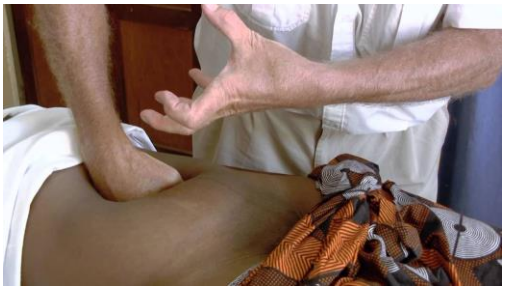

Figure. 3 Transabdominal (external) aortic compression

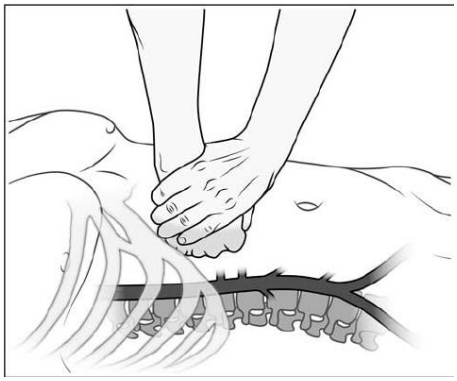

Figure. 4 Transabdominal (external) aortic compression

It is imperative that appropriate risk stratification be conducted for all women during the antenatal period so as to ensure that women at high risk of PPH are delivered in the appropriate setting.	**C**

Recommendations for Research and Auditing

1. Active management of the third stage
2. Percentage of patients receiving first and third trimester screening for anaemia
3. Early use of tranexamic acid

Training and Capacity Building

1. Simulation based training early recognition and response to PPH
2. Institutional drills
3. Improved capacity for blood products support
4. Training in invasive procedures such as internal iliac artery ligation

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Appendices

Appendix 1
Guideline development process

Step 1. Selection of condition/disorder
MOHW based on need identified having reviewed existing public health and epidemiological data.
Step 2. Identification of Committee.
Step 3. Development of questions to be answered by guideline.
Step 4. Dissemination of questions to specific committee members (initiator) for literature review and answers. The assignment of questions to committee members will take into account factors such as area of specialization. Where there are areas of controversy the chair should consider assigning such questions to a team member with some degree of indifference towards the issue under discussion. Individuals with strong feelings or advocates of a particular view point may wittingly or unwittingly add bias to the process. The aim is to identify the most appropriate, evidence-based answers to the questions proposed.
Step 5. Development of initiators draft. This initiators draft will consist of questions followed by answers, each question based on current observed local and regional practices compared with foreign or international bodies. The initiators draft should include references for each answer where relevant. Each answer should be bulleted with reference (s) bulleted below.

E.g.

1. Question
    a. Answer
        i. References

While the final document will be written in sentences and paragraphs, this approach will facilitate ease of viewing the information being presented. At the end each can be converted into proper citations and references. Referencing and citation should be done using the Vancouver method.

During the process of developing the draft the initiator may identify additional questions that may be relevant to the guideline. In such cases these new questions may be added as an addendum to the end of the draft document so that they can be discussed when the committee meets to review the evidence.

Step 6. Initiators Draft finalized and returned to Chair by email.
Step 7. Work retreat- Committee will come together to review each initiators draft. This review process will involve examination of the evidence presented. An in-depth review of literature will be conducted. The committee will come to agreement on each specific issue or recommendation to be covered by the guideline, based on the available evidence and the applicability to the local demographic and socioeconomic setting.
Recommendations will be qualified based on evidence in support of same. (see table)

Assessment of recommendations for investigation and therapy will generally be assessed as follows:
What is the evidence to support this recommendation?
Are alternative options also available?
Are any of these options more applicable in a context where resources are limited?
What is the evidence to support these options?
Is there adequate evidence to support these options being included as recommendations for alternate courses of action where resources are limited or exigencies dictate?

Step 8. Committee draft finalized and submitted to MOHW Guideline Steering Committee.
Step 9. Committee draft reviewed and edited for grammatical errors.
Step 10. Committee draft presented to stakeholders.
Step 11. Recommendations of stakeholders reviewed by Guideline Development Committee for incorporation into final document.
Step 12. Editing of final document for grammatical errors.
Step 13. Final document submitted to Chief Medical Officer for approval.
Step 14. Publication. Hard copy documents sent to health services institutions. PDF copies available on MOHW website.

Appendix 2

Table 1. Classification of evidence and recommendations.

Classification schemes

Category of evidence:

Ia-evidence for meta-analysis of randomized controlled trials.

Ib-evidence from at least one randomized controlled trial.

IIa-evidence from at least one controlled study without randomization.

IIb-evidence from at least one other type of quasi-experimental study.

III-evidence from non-experimental descriptive studies, such as comparative studies, correlation studies, and case-control studies.

IV-evidence from expert committee reports or opinions or clinical experience of respected authorities, or both.

Strength of recommendation:

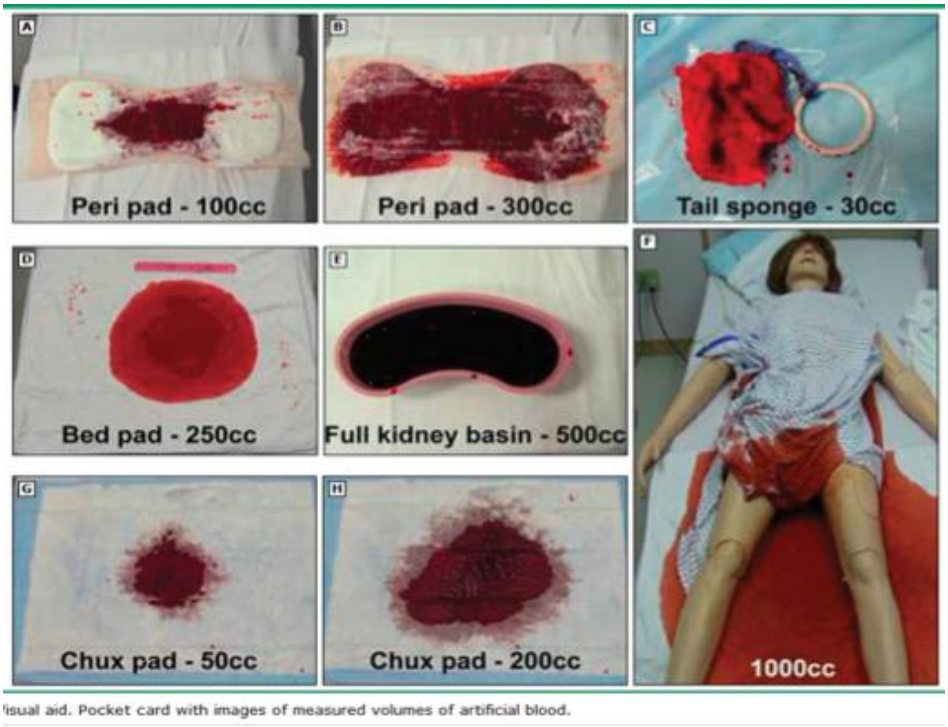
A-directly based on category I evidence.

B-directly based on category II evidence or extrapolated recommendation from category I evidence.

C-directly based on category III evidence or extrapolated recommendation from category I or II evidence.

D-directly based on category IV evidence or extrapolated recommendation from category I, II or III evidence.

Appendix 3



'isual aid. Pocket card with images of measured volumes of artificial blood.

Figure 5. Visual assessment of blood loss

Appendix 4

Stages of hypovolemic shock	
Grade 1	Up to 15% blood volume loss (750mls) Blood pressure maintained Normal respiratory rate Pallor of the skin
Grade 2	15-30% blood volume loss (750 - 1500mls) Increased respiratory rate Blood pressure maintained Increased diastolic pressure Narrow pulse pressure Sweating
Grade 3	30-40% blood volume loss (1500 - 2000mls) Systolic BP falls to 100mmHg or less Marked tachycardia >120 bpm Marked tachypnoea >30 bpm Decreased systolic pressure
Grade 4	Loss greater than 40% (>2000mls) Extreme tachycardia with weak pulse Pronounced tachypnoea Significantly decreased systolic blood pressure of 70 mmHg or less

Figure 6. Advanced trauma life support classification of hypovolaemic shock

Appendix 5

Procedure for Placement of intrauterine balloon

After vaginal delivery

1. Ensure that the bladder is empty by placing a bladder catheter.
2. Fill a sterile basin with the maximum volume of sterile fluid that can be instilled, but at least 500mL. Alternatively, a 1 L crystalloid infusion system can be used. The balloon should not be insufflated with air or carbon dioxide due to the risk of air embolism.
3. Cleanse the cervix and vagina with an antiseptic solution, such as povidone iodine.
4. Perform a second visual inspection of the vagina and cervix to ensure the absence of bleeding lacerations as the source of the haemorrhage. Bleeding lacerations should be repaired.
5. Check the placenta to ensure that it is complete. Perform a gentle digital examination of the uterine cavity to make sure it is empty. Ultrasound can also be used to evaluate for retained placenta.
6. Grasp the anterior lip of the cervix with ring forceps and apply gentle traction to align the direction of the cervical canal to that of the uterine cavity. Use long dressing forceps to insert the balloon catheter into the uterine cavity, above the level of the internal cervical os, as high in the uterine cavity as possible without exerting any force. Alternatively, the catheter can be inserted manually. At times, resistance is felt within the proximal part of the uterine cavity after negotiating the cervical canal. This is due to non-alignment of the direction of the cervical canal to that of the uterine cavity and can be managed by gentle pressure antero-posteriorly over the uterine fundus by a hand on the abdomen.
7. Ultrasound, if available, is useful to confirm correct placement in the uterine cavity (ie, exclude extrauterine placement as might occur with uterine rupture). On post-insertion ultrasound examination, the balloon may be in the lower segment and the upper segment may be well contracted with a thin endometrial shadow. Ultrasound

examination is also useful to evaluate for significant residual placental tissue, which should be removed if present.

8. Avoid excessive force when placing the device, as perforation of the uterus is theoretically possible. If resistance is encountered, catheter placement should be readjusted, or the procedure abandoned.
9. If an assistant is available, the assistant can perform real-time imaging to guide balloon placement.
10. Once correct position is confirmed, inflate the balloon with warm sterile fluid (warmth promotes the clotting cascade) until slight resistance is encountered to further instillation (this usually occurs between 250 and 300 mL) and bleeding slows down or stops. The maximum recommended volume to be instilled depends on the specific device (eg, 500 mL for the Bakri tamponade balloon catheter and BT-Cath, 750 mL for the ebb Complete Tamponade System); however, larger volumes can be infused if needed to control haemorrhage (e.g. Bakri tamponade balloon can hold 1300 mL).
11. If an assistant is available, he/she can inflate the balloon while the operator holds the vaginal portion in position, which helps to keep the intrauterine portion from popping out. After cessation of bleeding, instilling an extra 50 to 100 mL of fluid helps to retain the balloon in position. If it herniates into or prolapses through the cervix despite the extra fluid, a vaginal pack can be placed to keep the balloon in position (if bleeding has stopped).

After caesarean delivery

1. Insert the end of the catheter through the open uterine incision, place the balloon in the uterine cavity, and pass the stem of the catheter through the cervix and then into the vagina. Ask an assistant to pull the end of the catheter out of the introitus.
2. Close the uterine incision, taking care not to puncture the balloon.
3. Ask the assistant to inflate the balloon with sterile fluid while the surgeon inspects the uterus from above. The balloon should not be insufflated with air or carbon dioxide due to the risk of air embolism.

4. Alternatively, the uterus can be closed, and an assistant can then insert the balloon catheter from below and inflate it while the surgeon watches from above. This eliminates the risk of accidental needle perforation during uterine closure.