Postpartum Haemorrhage (PPH) Prevention and Management

Document Type	Guideline
Function	Clinical Practice
Healthcare Service Group (HSG)	National Women's Health
Department(s) affected	Maternity
Applicable for which patients, clients or residents?	All maternity women
Applicable for which staff members?	All clinicians in maternity including access holder lead maternity carers (LMCs)
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Contents

1. Purpose of guideline

The purpose of this guideline is to facilitate the safe and effective care of a woman by reducing the risk of, and responding promptly and effectively to, a postpartum haemorrhage (PPH) within Auckland District Health Board (Auckland DHB).

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2. Guideline management principles and goals

The principles of this guideline are:

- Reduce risk of PPH
- Identify PPH
- Get help
- Assess, arrest and replace bleeding simultaneously – see primary PPH flowchart section

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3. Definitions

The following terms are used within this guideline:

Postpartum haemorrhage	Blood loss >=500 mL
Primary	Within 24 hours of delivery
Secondary	After 24 hours postpartum
PPH	Blood loss > 500 mL
Major PPH	Blood loss >=1000 mL and/or unstable: • Moderate = 1000 – 2000 mL • Severe > = 2000 mL • Life-threatening > = 2500 mL

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4. Prevention and planning

For all women: antenatal risk assessment and documented plan, offer active management of third stage.

A pregnant woman should be offered screening for anaemia and appropriate investigations and therapy commenced as soon as possible, in order to optimise the haemoglobin prior to the onset of labour. The most common cause of anaemia in pregnancy is iron deficiency. Iron should be replaced orally first line; however iron infusion can be safely administered in pregnancy as indicated (see associated Auckland DHB documents section for Iron in Pregnancy guideline).

Discuss any concerns regarding blood transfusion antenatally as part of birth planning.

A woman with a previous caesarean section should be offered a scan as soon as practicable, to have placental site localised, and if anterior should be referred to a tertiary scanning centre to assess possibly of placenta accreta.

There is high quality evidence that active management of the third stage reduces the incidence of PPH. For a full description of active management of third stage, see associated Auckland DHB documents section for the Intrapartum Care - Normal Labour & Birth guideline.

Routine ecbolics for a woman without risk factors for PPH

- Use 10 IU IM oxytocin (Syntocinon) as the primary ecbolic
- Misoprostol is not recommended for prevention of PPH

For a woman with risk factors for PPH the following is recommended in early-established labour. See risk factors for PPH section for a full description of risk factors.

- Reassess risk on admission in labour, update plan and document
- Insert two IV lines (16g depending on how significant a risk for the second IV cannula)
- Take blood for group and antibody screen and FBC on admission to hospital
- A maternity inpatient with a positive antibody screen automatically has a cross match initiated – please contact the Blood Bank to check if this is complete since it can take at least an hour
- Be prepared for a PPH: inform senior staff members and document the third stage plan, second person at birth, prepare ecbolic
- Active management of the third stage of labour – consider Syntometrine (ergometrine & oxytocin) if not contraindicated
- Check completeness of placenta
- Weigh and measure blood loss and document
- After birth, close monitoring of PV loss , and record vital signs: pulse, BP and respiratory rate on an Early Warning Score chart

For a woman who has stated a wish not to receive blood products (Centre for Maternal and Child Enquiries (CMACE)):

- Ensure specific wishes are documented on the clinical form CR2231: Refusal / Consent with restrictions for use of blood products (see associated Auckland DHB documents section)
- Offer screening and treatment of iron deficiency with low threshold for iron infusion antenatally or in the immediate postpartum period
- Consider erythropoietin
- Obtain informed consent for red blood cell salvage and infusion (see associated Auckland DHB documents section for Intraoperative Cell Salvage (IOCS) - Obstetrics guideline)
- Review by the consultant obstetrician and anaesthetist at the onset of labour

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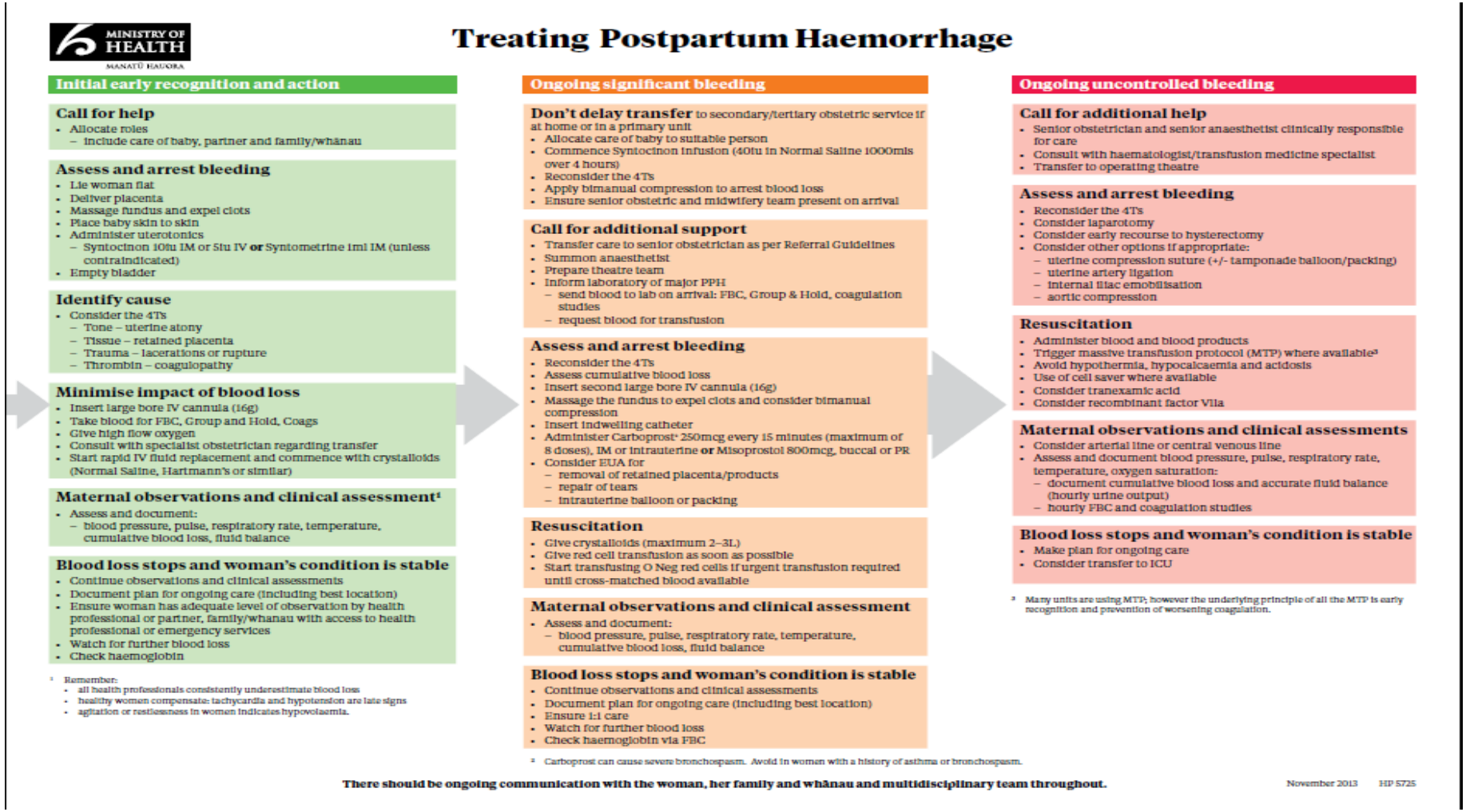
5. National Consensus Guideline



MINISTRY OF HEALTH
MANATŪ HAUORA

Treating Postpartum Haemorrhage

Initial early recognition and action

Call for help
- Allocate roles
  - Include care of baby, partner and family/whānau

Assess and arrest bleeding
- Lie woman flat
- Deliver placenta
- Massage fundus and expel clots
- Place baby skin to skin
- Administer uterotonics
  - Syntocinon 10iu IM or 5iu IV **or** Syntometrine 1ml IM (unless contraindicated)
- Empty bladder

Identify cause
- Consider the 4Ts
  - Tone – uterine atony
  - Tissue – retained placenta
  - Trauma – lacerations or rupture
  - Thrombin – coagulopathy

Minimise impact of blood loss
- Insert large bore IV cannula (16g)
- Take blood for FBC, Group and Hold, Coags
- Give high flow oxygen
- Consult with specialist obstetrician regarding transfer
- Start rapid IV fluid replacement and commence with crystalloids (Normal Saline, Hartmann's or similar)

Maternal observations and clinical assessment[1]
- Assess and document:
  - blood pressure, pulse, respiratory rate, temperature, cumulative blood loss, fluid balance

Blood loss stops and woman's condition is stable
- Continue observations and clinical assessments
- Document plan for ongoing care (including best location)
- Ensure woman has adequate level of observation by health professional or partner, family/whanau with access to health professional or emergency services
- Watch for further blood loss
- Check haemoglobin

[1] Remember:
- all health professionals consistently underestimate blood loss
- healthy women compensate: tachycardia and hypotension are late signs
- agitation or restlessness in women indicates hypovolaemia.

Ongoing significant bleeding

Don't delay transfer to secondary/tertiary obstetric service if at home or in a primary unit
- Allocate care of baby to suitable person
- Commence Syntocinon infusion (40iu in Normal Saline 1000mls over 4 hours)
- Reconsider the 4Ts
- Apply bimanual compression to arrest blood loss
- Ensure senior obstetric and midwifery team present on arrival

Call for additional support
- Transfer care to senior obstetrician as per Referral Guidelines
- Summon anaesthetist
- Prepare theatre team
- Inform laboratory of major PPH
  - send blood to lab on arrival: FBC, Group & Hold, coagulation studies
  - request blood for transfusion

Assess and arrest bleeding
- Reconsider the 4Ts
- Assess cumulative blood loss
- Insert second large bore IV cannula (16g)
- Massage the fundus to expel clots and consider bimanual compression
- Insert indwelling catheter
- Administer Carboprost[2] 250mcg every 15 minutes (maximum of 8 doses), IM or intrauterine **or** Misoprostol 800mcg, buccal or PR
- Consider EUA for
  - removal of retained placenta/products
  - repair of tears
  - intrauterine balloon or packing

Resuscitation
- Give crystalloids (maximum 2–3L)
- Give red cell transfusion as soon as possible
- Start transfusing O Neg red cells if urgent transfusion required until cross-matched blood available

Maternal observations and clinical assessment
- Assess and document:
  - blood pressure, pulse, respiratory rate, temperature, cumulative blood loss, fluid balance

Blood loss stops and woman's condition is stable
- Continue observations and clinical assessments
- Document plan for ongoing care (including best location)
- Ensure 1:1 care
- Watch for further blood loss
- Check haemoglobin via FBC

[2] Carboprost can cause severe bronchospasm. Avoid in women with a history of asthma or bronchospasm.

Ongoing uncontrolled bleeding

Call for additional help
- Senior obstetrician and senior anaesthetist clinically responsible for care
- Consult with haematologist/transfusion medicine specialist
- Transfer to operating theatre

Assess and arrest bleeding
- Reconsider the 4Ts
- Consider laparotomy
- Consider early recourse to hysterectomy
- Consider other options if appropriate:
  - uterine compression suture (+/- tamponade balloon/packing)
  - uterine artery ligation
  - internal iliac embolisation
  - aortic compression

Resuscitation
- Administer blood and blood products
- Trigger massive transfusion protocol (MTP) where available[3]
- Avoid hypothermia, hypocalcaemia and acidosis
- Use of cell saver where available
- Consider tranexamic acid
- Consider recombinant factor VIIa

Maternal observations and clinical assessments
- Consider arterial line or central venous line
- Assess and document blood pressure, pulse, respiratory rate, temperature, oxygen saturation:
  - document cumulative blood loss and accurate fluid balance (hourly urine output)
  - hourly FBC and coagulation studies

Blood loss stops and woman's condition is stable
- Make plan for ongoing care
- Consider transfer to ICU

[3] Many units are using MTP; however the underlying principle of all the MTP is early recognition and prevention of worsening coagulation.

There should be ongoing communication with the woman, her family and whānau and multidisciplinary team throughout.

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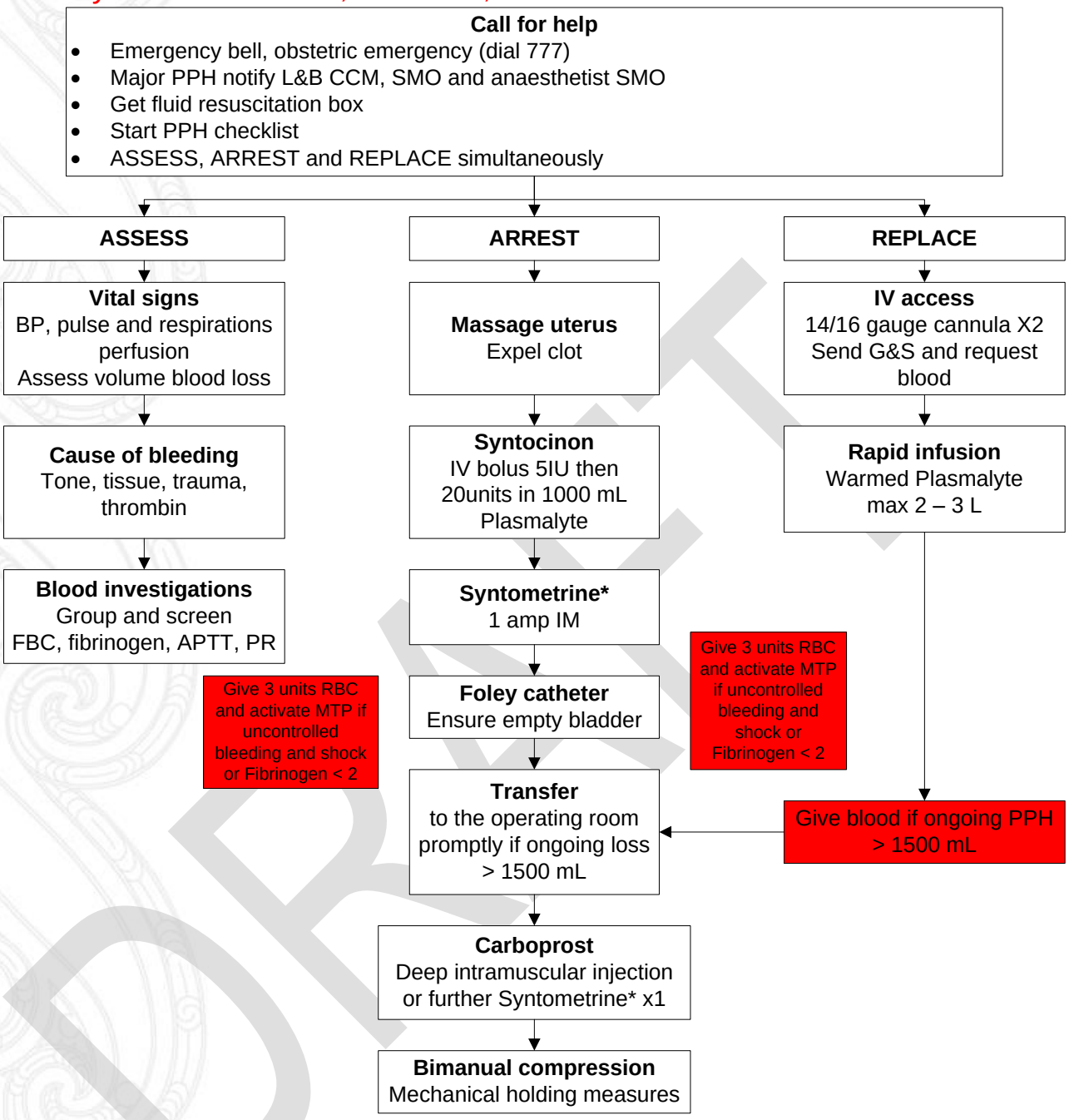
6. Primary PPH – ASSESS, ARREST, REPLACE



Immediate management key points

- ASSESS, ARREST, REPLACE simultaneously
- Early involvement of senior staff members – midwifery, obstetric, anaesthetic, haematology, physician, vascular
- Rapid assessment – assess for signs of shock
- Rapid replacement with warmed crystalloid
- Keep the woman warm
- Request O negative blood if compatible blood is not available immediately when requested
- If maternal collapse – dial 777 adult Code Red or Blue and obstetric emergency

Note *ergometrine is contra-indicated in the presence of maternal hypertension

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7. PPH checklist

Record commenced	**Time :**
Person recording	
CCM	
Team Leader	

Record Sheet for PPH

Patient Label

ACTION	TICK IF DONE	DETAILS
Emergency bell rung		
Uterine massage expel clots		
Registrar called		
Group and Screen FBC sent		
IV line litre of plasmaltye commenced		
Ecbolic given (record time) Syntometrine IM		
Syntocinon 5IU IV		
Syntocinon Infusion 20IU/L		
Cause **ATONY TISSUE TRAUMA THROMBIN**		
Indwelling catheter inserted		
Automated 5 minute BP + saturation		
Estimated blood loss ……..mL		
Early Warning Score Chart started		
ONGOING BLOOD LOSS		
Estimated blood loss……..mL		
>1000 mL		
phone 777 Obstetric emergency		
Oxygen commenced		
Insert second luer 16g. Send bloods for FBC Coags		
Start Fluid Balance Chart		
Monitor urine output hourly		
Call in obstetric consultant		
Call in anaesthetic consultant		
2nd litre Plasmalyte (warmed from operating room warmer)		
Ecbolic given (record time)		
2nd dose Syntometrine (max 2 doses)		
Carboprost 250mcg IM (q 15 min)		
Carboprost 250mcg		
Carboprost 250mcg		
Carboprost 250mcg		
Carboprost 250mcg		
Carboprost 250mcg		
Carboprost 250mcg		
Carboprost 250mcg (max 8 doses)		
Notify obstetric physician if pre-eclampsia/heart disease		
ONGOING BLOOD LOSS		
Estimated blood loss……..mL		
> 1500 mL Send for blood		
3rd litre warmed Plasmalyte		

Check blood results – do you need MTP?		
Consider blood transfusion		
Blood transfusion commenced?		
Transferred to operating room		
		Please turn page
ONGOING BLOOD LOSS		
Estimated blood loss ……mL		
>**2000 mL**		
Commenced blood transfusion emergency blood, or		
X-matched blood		
Call in second obstetrician. Name:		
Call in anaesthetic consultant. Name:		
Notify Blood Bank. Activate massive transfusion protocol		
Consider surgical options		

BLOOD RESULT GUIDELINES	**FOR ACTION**	
HB	If <80 give blood	
Platelets	If <100 consult	
Fibrinogen	If <1.5 consult	
APTT	If >40 consult	
PR	If >1.5 consult	

OTHER CONSIDERATIONS
Transfuse blood if shocked (BP ≤90) OR after 3 litres Plasmalyte
Consider contacting vascular surgeon, radiologist, obstetric physician
Record all fluids and blood products on fluid balance chart

Time of arrival	**Status**	**Name**

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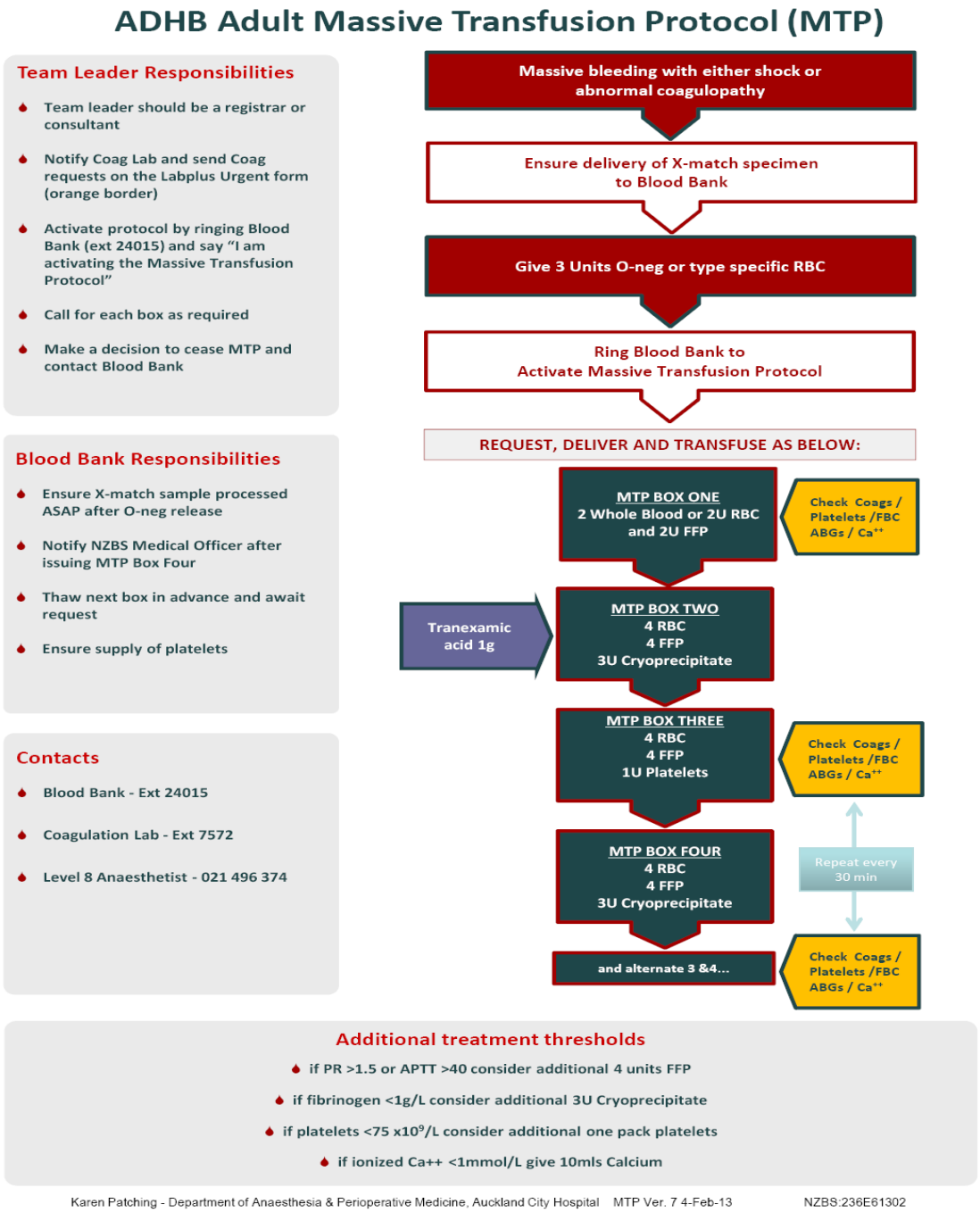
8. Massive transfusion protocol

The Massive Transfusion Protocol should be used if the woman has uncontrolled bleeding and shock or coagulopathy:



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9. Immediate management from labour and birthing

Call for help early

- For all PPH, call the clinical charge midwife and registrar
- If > 1000 mL and ongoing or clinical concerns push the emergency bell and dial 777 and state: “obstetric emergency, level 9, Labour and Birthing, room ….”
- 777 obstetric emergency personnel: on call registrar and SHO, CCM, CMA, operating room level 9 coordinator
- 1000 - 1500 mL and ongoing call in the obstetric consultant, notify the anaesthetic consultant
- 2000 mL and ongoing call in the 2nd obstetric consultant and anaesthetic consultant
- Ongoing bleeding and >1500 mL give blood
- Activate the Massive Transfusion Protocol and give 3 units red cells if uncontrolled bleeding with shock or coagulopathy (fibrinogen < 2, abnormal TEG)
- If pre-eclampsia or significant medical history, notify the obstetric physician

Delegate tasks and roles

- Identify the team leader
- Documentation: PPH checklist and Early Warning Score chart, medication and fluid charts
- ABC, vital signs and communication with the woman and team leader
- IV lines and bloods - 2X 14/16 gauge cannulae, FBC, Group and Screen, Fibrinogen, Coag screen, TEG if EBL > 1000 mL
- Fluid and blood infusions
- MTP Activation – team leader to make decision and delegate phone call to Blood Bank to team member
- Runner - fluid resuscitation box/warmed fluid from the operating room/Dynamap/O neg blood - sticker down Lamson tube and phone call to Blood Bank/extra equipment/phone call to Blood Bank re MTP
- Communicate with partner and family
- Keep the woman warm

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10. ASSESS bleeding

Rapid evaluation

- Shock is a late sign
- Tachycardia is an early sign
- Blood pressure, pulse, respirations, peripheral perfusion, colour, cerebral function
- Estimate blood loss and keep ongoing record
- Document blood and blood products as requested and actually transfused
- Document laboratory results
- Use automated BP and SpO_2 monitoring every 5 minutes
- Beware the combination of moderate blood loss and epidural analgesia, there is potential for earlier decompensation and collapse

Degree of shock (see SOGC reference)				
	Compensation	Mild shock	Moderate shock	Severe shock
Blood loss	500 – 1000 mL 10 – 15%	1000 – 1500 mL 15 – 25%	1500 – 2000 mL 25 – 35%	2000 – 3000 mL 35 – 45%
BP change (systolic pressure)	none	Slight fall (90 – 100 mmHg)	Marked fall (70 - 80 mmHg)	Profound fall (50 - 70 mmHg)
Signs and symptoms	Palpitations Dizziness Tachycardia	Weakness Sweating Tachycardia	Restlessness Pallor Oliguria	Collapse Air hunger Anuria

Four T's

- Tone: Uterine massage, beware uterine inversion (see uterine inversion section)
- Tissue: Check placenta complete
- Trauma: Examine perineum, cervix, vagina, uterine scar
- Thrombin: Think coagulation

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11. ARREST bleeding

Tone

- Massage the uterus firmly, expel any clots
- Exclude and manage uterine inversion before giving ecbolics (see uterine inversion section)

First –line drug therapy

Oxytocin 5 units IV slow push.

IV infusion oxytocin (20 units in 1000 mL Plasmalyte at 250 mL/hour). If the oxytocin infusion fails to achieve uterine contraction, additional medical treatment should be instituted rather than increasing the dose or rate of oxytocin.

Second line drug therapy

Syntometrine one ampoule IM (if not already given and no history of hypertension)

Third line drug therapy

Carboprost IM 250 mcg Q15min up to 8 doses.
Further Syntometrine IM/ergometrine IV slowly - only one more dose.

See fluids and drugs used in PPH section.

Insert indwelling urinary catheter and attach to hourly urine bag.

Internal bi-manual compression

Tissue

Retained placenta with postpartum haemorrhage
Urgent transfer to the operating room for manual removal:

- Acuity One if >=1000 mL, actively bleeding or unstable
- Consider possibility of placenta accreta

Trauma

Repair the tear:

- Apply pressure as initial measure
- Stabilise the woman, and
- Repair the tear/lacerations as soon as possible (the operating room may be required)
- Ensure that swab and instrument counts are correct in all cases

Thrombin

Check coagulation results:

- O&G staff members to consult asap if initial results show
  - PR > 1.5; APTT > 40; fibrinogen < 2.0; platelets < 100; Hb < 80
- A TEG gives a rapid evaluation of coagulation status and should be done for all PPH > 1500 mL and ongoing. This test is done by the anaesthetic team
- For treatment of coagulopathy activate the MTP

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12. REPLACE volume and blood

- Administer oxygen by mask 6L/min
- Keep the woman warm
- Act: give fluid (see more detail on fluids and drugs used in PPH section)

a. Insert two 14/16 gauge cannulae;

b. Intraosseous needles are available from operating room if access is poor;

c. Draw blood for group and Ab screen, send to Blood Bank - if never been sent prior URGENT STICKER;

d. Draw blood for FBC & coagulation, send to Haematology - URGENT STICKER;

e. PHONE Blood Bank and Haematology to process urgently;

f. Plasmalyte first line;

g. Infuse one litre rapidly, ASSESS response as above;

h. Infuse 2nd or 3rd litre if indicated – warmed for all ongoing fluids (obtain from operating room);

i. Use blood pump set or pressure infusers where available;

j. If further fluid required after 3L crystalloid give BLOOD.

Act: give blood (see Murphy, MF, et al. 2001 reference in supporting evidence section).

- Blood should be given as soon as possible > 1500 mL with ongoing bleeding
- Activate the Massive Transfusion Protocol if uncontrolled bleeding with shock or coagulopathy
- If no ongoing bleeding then Hb can be used to guide transfusion requirements - transfuse one unit then check Hb
- Note: Group and Ab screen takes 40 minutes but then if negative Ab screen, compatible blood can be issued quickly
- Phone Blood Bank, request blood, specify amount and timeframe, advise them of active bleeding and need for ongoing support
- If compatible blood is not available after a blood loss of 2000 mL or haemodynamically unstable then uncross matched blood (desperate blood or emergency blood) should be given
- To get emergency blood, complete Blood Bank issue sheet and send sticker down the tube. Phone blood bank and give woman's name and doctor's name. State "we need blood NOW"
- Give 3 units of red cells and activate the Massive Transfusion Protocol if uncontrolled bleeding plus shock or coagulopathy, link to MTP
- Aim to keep the fibrinogen above 2 g/L

The transfusion medicine specialist is available for consultation 24/7 (via Blood Bank).

Obstetric physicians on call 24/7 – recommend call if pre-eclampsia or cardiac disease.

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13. On-going monitoring and care

Use an Early Warning Score record after all PPH.

Think about plan for thromboprophylaxis.

After a PPH of 1000 – 2000 mL, the following are recommended for ongoing monitoring:

- Non – invasive BP monitoring
- Pulse oximetry
- ECG
- Strict fluid balance with hourly urine measures

After a PPH of > = 2000 mL the following are recommended in addition to the above:

- HDU care
- Arterial line

A woman who has had a PPH is by definition under secondary care until and unless a formal hand back to primary care occurs.

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14. Uterine inversion

The only simple way to deal with acute inversion is immediate manual replacement within a few seconds of the event occurring. It is preferable not to attempt to remove the placenta first as bleeding is lessened if the placenta remains attached. In this emergency situation, swift action without taking complex actions to provide pain relief is vital. If this manoeuvre is successful, the associated shock should rapidly disappear.

In the event that immediate replacement is not possible, or is unsuccessful, resuscitation measures involving intravenous fluids replacement, oxygen by Hudson mask at 6L/min, and blood cross-matching (four to six units) should be commenced. As soon as possible deep general anaesthesia should be instituted to allow attempted hydrostatic replacement of the inversion. Though originally described using a warm douche, the most usually available source of warmed fluid in the delivery unit or the operating room is intravenous fluids. Four drip sets of a warm crystalloid solution are set up and the open ends of the tubing held in the operator's hand. After replacing the inverted uterine fundus in the vagina the operator's hand is also placed in the vagina and the introitus blocked off around the operator's wrist using towels. The intravenous sets are all turned on to maximum flow and the increasing hydrostatic pressure in the vagina will be felt to expand the vagina and, importantly, dilate the constricted cervical ring, and the inversion suddenly disappears.

In the event that the cervical ring does not dilate easily acute tocolysis with sublingual GTN (glyceryl trinitrate) spray or a statum dose of intravenous salbutamol may be considered. In the event that either of these options is used the possibility of aggravation of hypotension/circulatory collapse should be born in mind. Sublingual GTN (glyceryl trinitrate) is more likely to produce hypotension than intravenous salbutamol.

- Sublingual GTN (glyceryl trinitrate) spray, 400 micrograms (product in form of sublingual spray [Glytrin®, Nitrolingual®]; one metered spray (= 400 micrograms) administered under the tongue; this dose may repeated after 5 minutes
- Intravenous salbutamol 100 micrograms as a stat dose (CHECK THE DOSAGE CAREFULLY – DO NOT USE 5 mg/5 mL Ventolin® Injection). Dilute one 500 microgram/1 mL ampoule of salbutamol sulphate for injection up to 10 mL in normal saline (final concentration 50 micrograms/mL) and administer 100 micrograms (2 mL of the preparation, above) over 1 - 2 minutes; this dose may be repeated after 5 minutes
- Subcutaneous terbutaline may be used if available, 0.25 mg SC

Techniques involving vaginal and abdominal surgical approaches to neglected or persistent inversion have been described, which are beyond the scope of a clinical guideline.

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15. Secondary PPH

Definition

Secondary postpartum haemorrhage is defined as excessive blood loss from the genital tract occurring more than 24 hours to 6 weeks after delivery.

Aetiology

- Retained products of conception
- Infection (often secondary to retained products)
- Lacerations, including episiotomy
- Others (rare): blood dyscrasias, trophoblastic disease, carcinoma of cervix, submucous fibroids (causing subinvolution), placental site causing subinvolution

Management details

There are no randomised controlled trials to inform the management of secondary PPH (see Cochrane reference, supporting evidence section).

The following is based on expert opinion.

Assess the woman

The diagnosis and management of a secondary postpartum haemorrhage primarily relies on a clinical assessment. Ultrasound, looking for retained products of conception, should play a minor secondary role, as it has high false positive rate (low specificity) which may lead to unnecessarily aggressive intervention with a significant risk of serious consequences. Ultrasound does not easily differentiate between retained products and blood clot.

- Estimate the total blood loss and measure Hb
- Vital signs: temperature, pulse, and blood pressure
- Resuscitation as required as per primary PPH guidelines
- Assess uterine size
- Check status of cervical os and take endocervical swab
- Consider B subunit HCG testing to exclude trophoblastic disease
- Consider a plain X-ray if concern about retained swab

Treat the cause – general principles of treatment

- Bed rest and antibiotics therapy are the mainstays of treatment
- Curettage is not performed routinely (risk of uterine perforation or Asherman's Syndrome). Evidence of retained products is suggested by subinvolution of the uterus, an open cervical os or ultrasound findings
- Oxytocics (eg. oral ergometrine) have almost no part in the management
- If vaginal bleeding continues following treatment for secondary postpartum haemorrhage, then consider the need for a pelvic trans-vaginal ultrasound scan

Retained products of conception

Bleeding in the first few days after delivery is probably due to retained products of conception. Gentle digital evacuation of the uterus under general anaesthesia should be performed. Antibiotic therapy is indicated prior to the procedure to reduce the risk of Asherman's syndrome.

Uterine infection

Bleeding occurring later in the puerperium may be due to infection of the uterus, for which antibiotics should be prescribed. If bleeding continues despite antibiotics, exploration of the uterus is indicated.

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16. Risk factors for PPH

The following table has been modified from the NSW framework (see supporting evidence section for reference):

Cause	Etiology Process	Clinical Risk Factors
Abnormalities of uterine contraction (Tone) 70%	• Atonic uterus	• Physiological management of third stage • Prolonged 3rd stage (> 30 min)
	• Over distended uterus	• Polyhydramnios • Multiple gestation • Macrosomia
	• Uterine muscle exhaustion	• Rapid or incoordinate labour • Prolonged labour (1st or 2nd stage) • Labour dystocia • High parity • Labour augmented with oxytocin
	• Intra-amniotic infection	• Pyrexia • Prolonged rupture of membranes(more than 24 hours)
	• Drug induced hypotonia	• Magnesium sulphate, nifedipine, salbutamol • General anaesthetic
	• Functional or anatomic distortion of the uterus	• Fibroid uterus • Uterine anomalies
Genital tract trauma (Trauma) 20%	• Episiotomy or lacerations (cervix, vagina or perineum)	• Labour induced • Labour augmented with oxytocin • Labour dystocia • Malposition • Precipitous delivery • Operative delivery (vacuum or forceps)
	• Extensions, lacerations at caesarean section	• Malposition • Deep engagement
	• Uterine rupture	• Previous uterine surgery
	• Uterine inversion	• Strong cord traction in 3rd stage, especially with fundal placenta • Short umbilical cord • High parity • Relaxed uterus, lower segment and cervix • Placenta accreta, especially fundal • Congential uterine weakness or anomalies • Antepartum use of magnesium sulphate or oxytocin

Retained products of conception (Tissue) 10%	• Retained products • Abnormal placenta • Retained cotyledon or succenturiate lobe	• Incomplete placenta at delivery • Placenta accreta or percreta • Previous caesarean or other uterine surgery • High parity • Abnormal placenta on U/S
Abnormalities of Coagulation (Thrombin) 1%	• Retained blood clots	• Atonic uterus
	• Coagulation disorders acquired in pregnancy • Idiopathic Thrombocytopenic Purpura (ITP) • Von Willebrand's disease • Haemophilia or carrier • Thrombocytopenia with pre-eclampsia • Disseminated Intravascular Coagulopathy (DIC) • Pre-eclampsia • Dead fetus in utero • Severe infection • Abruption • Amniotic fluid embolus	• Bruising • Elevated BP, HELLP • Fetal death • Pyrexia, WBC • Antepartum haemorrhage (current or previous) • Sudden collapse
	• Therapeutic anti-coagulation	• History of blood clot

Epidemiological risk factors (see supporting evidence section for Sheiner reference)
OR = odds ratio

- Previous PPH
- Maternal obesity (CEMACH)
- Hypertensive disorders OR 1.7
- LGA OR 1.9
- Antepartum haemorrhage including abruption
- Placenta praevia, with risk of accreta increasing with each previous CS
- Induction of labour OR 1.4
- Augmented labour OR 1.4
- Prolonged second stage OR 3.4
- Operative vaginal delivery OR 2.3
- Lacerations OR 2.4
- Retained placenta OR 3.5
- Placenta accreta OR 3.3

Caesarean section is strongly associated with peripartum hysterectomy (see supporting evidence section for Stanco et al reference).

Antidepressant exposure at time of delivery was associated with an increased risk of postpartum haemorrhage in a recent large cohort study in the BMJ in 2013 (see supporting evidence section).

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17. Fluids and drugs used in PPH

- Warmed buffered crystalloid solution ie Plasmalyte is preferred for first line resuscitation
- Replace blood loss with 3 to 4 times the EBL, up to a maximum of 3 litres. After this give blood
- Colloid is not required
- Warmed fluids reduce the risk of coagulopathy
- Resuscitation should commence early regardless of the availability of an anaesthetist
- If an anaesthetist is not available ensure there is an appropriate person in charge of fluid and/or blood resuscitation at all times with close attention to total blood loss
- Delivery of any drugs to the uterus, especially IM, will be compromised by poor circulation therefore fluid resuscitation should be effective
- Be cautious with use of oxytocin in the presence of hypovolaemia
- If the oxytocin infusion fails to achieve uterine contraction additional medical treatment should be instituted rather than increasing the dose or rate of oxytocin

Syntometrine one ampoule intramuscular if not already administered. This contains 500 micrograms of ergometrine. If ergometrine has already been administered (as ergometrine or Syntometrine) a second dose of 250 micrograms may be given, but beware of the hypertensive woman who may develop extreme hypertension following the administration of ergometrine. A second dose of ergometrine should only be used after consultation with the on call obstetrician. The total dose of ergometrine in 24 hours should not exceed 1000 micrograms. Ergometrine is contra-indicated with a history of maternal hypertension or pre-eclampsia regardless of actual BP readings during PPH (see supporting evidence section).

Carboprost has a high success rate (95% used with other ecbolics), but is third line due to side effects. Give 1 ampoule (250 mcg) IM Q15 minutes up to 8 doses. May be given intramyometrially with caution, this is best done in the operating room.

Misoprostol: Recent literature reviews do not support the use of misoprostol for prevention or treatment of PPH. There is particular concern regarding use of misoprostol for treatment of PPH when there has not been prophylactic oxytocin given in the third stage. Misoprostol is not licenced for use in PPH and the New Zealand College of Midwives has issued the following statement: “The NZCOM’s position is that drugs that are unapproved for use in maternity care or for the newborn should not be promoted or prescribed by a midwife on her own responsibility”

Tranexamic acid is part of the Massive Transfusion Protocol, give 1 g as a slow push. Ongoing trials are looking at use in less severe PPH. Non obstetric studies show a 15% reduction in haemorrhagic death. The WHO guidelines (see supporting evidence section) recommend tranexamic acid as third line after oxytocin and prostaglandins.

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18. Management in the operating room

Initial measures

- Continue bi-manual compression and/or firm pressure on perineum
- Consider applying aortal compression via pressure through the abdominal wall. This may be helpful as a temporary measure if the woman is in shock or during CPR.
- Take a minute for time out and multidisciplinary plan – see surgical safety checklist
- Request Blood Bank to send blood to the operating room immediately the woman arrives in the operating room
- Examination under anaesthetic to remove retained placenta/tissue and repair any tear. Beware uterine inversion and previously undiagnosed placenta accreta

Further measures

Consider:

- Inserting a central line and/or arterial line earlier rather than later
- Administering fresh frozen plasma, cryoprecipitate and platelet concentrates
- The need for antibiotic cover
- Use of a cell saver
- Calling for extra surgical assistance (eg senior gynaecologist, gynaecological oncologist, vascular surgeon or general surgeon). It is a mistake to leave these steps until the woman is in extremis. Prompt resuscitation including correction of coagulopathy should occur to support early recourse to surgery but coagulation factors do not of themselves stop surgical bleeding

Give further ecbolics as required:

- IM syntometrine (maximum 2 ampoules/24 hour)
- IM Carboprost (1 ampoule = 250 mcg q15min up to 8 doses ie 2 mg)
- Intramyometrial prostaglandin may be used in the presence of the obstetric consultant and appropriate anaesthetic staff members. Caution should be exercised to avoid intravascular injection which can cause collapse. Give 250mcg in 20 mL normal saline via 22G spinal needle into 3 or 4 more myometrial sites, can be repeated if necessary, total dose 2 mg)

Uterine/vaginal tamponade with balloon or gauze packing

Possible options include:

- Pack the uterus using a balloon device – Rusch or Bakri OR
  Gauze packing: tie 3 - 4 gauze rolls together, soak in an iodine solution, and pack uterus and vagina. Document the number of rolls. Remove 24 hours later.

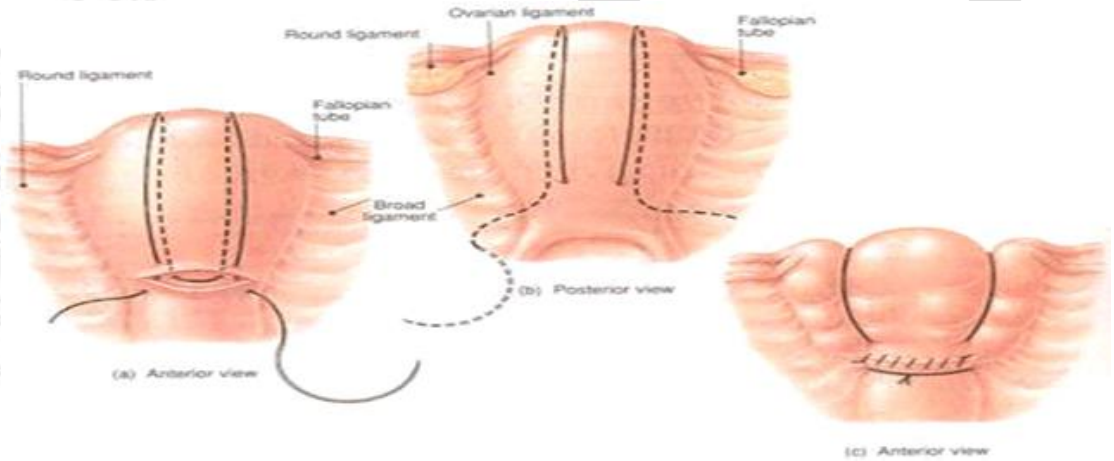
Laparotomy for further surgical measures

- B-Lynch suture or similar (for B-Lynch et al reference see supporting evidence section)
- Uterine artery ligation (O'Leary stitch) (for O'Leary reference see supporting evidence section)
- Bilateral internal iliac artery ligation (for Allahbadia reference see supporting evidence section). This procedure should only be done by an experienced surgeon and will preclude the use of later embolisation

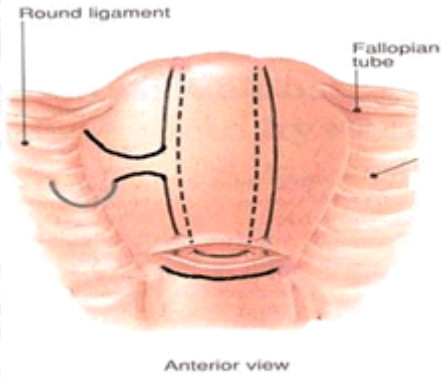
Hysterectomy is the definitive treatment and should be proceeded with if bleeding is not controlled quickly with other measures and blood loss is > 2000 mL.

Original B-Lynch suture

- (Use 1 Vicryl on a CTX needle)



Modified B-Lynch suture



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19. Other interventions

Interventional radiology

This technique needs discussion with the radiologist on call, and is best undertaken whilst the woman's condition is stable, since it usually involves transfer to the Interventional Radiology Suite. It may be more suitable for recurrent primary or secondary PPH where uterine conservation is desired or hysterectomy is too risky due to maternal medical condition.

If embolisation is expected to be required then femoral catheters with balloons can be electively placed prior to caesarean section. This can provide temporary control prior to formal embolisation and/or hysterectomy (see associated Auckland DHB documents section for Femoral Arterial Sheath and Iliac Occlusion Balloon Management).

Recombinant Factor VIIA (rFVIIA)

Though rFVIIA is no longer part of the Auckland DHB Massive Transfusion Protocol, European consensus guidelines confirm a role for rFVIIA as an adjunct to surgery for massive bleeding in certain situations. An American review group evaluated the literature for a number of indications including a small number of obstetric cases, and concluded that its use for PPH is appropriate only after attempted significant clotting factor replacement.

There are only a small number of cases (n = 65) where rFVIIA has been used for PPH and there are no randomised studies therefore the evidence base is limited. Cost is significant but cost neutrality is maintained if given relatively early ie after a 14-unit red cell transfusion.

If rFVIIA is to be used this should only be in conjunction with local massive transfusion guidelines and considered only as a lifesaving (or fertility saving) measure for PPH resistant to standard therapy (see supporting evidence section for Welsh et al reference).

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20. Supporting evidence

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- WHO guidelines for the Management of Postpartum Haemorrhage and Retained Placenta 2009
- WHO guidelines for the Prevention of Postpartum Haemorrhage and Retained Placenta 2009
- WHO Policy

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21. Associated Auckland DHB documents

- Blood Product Administration in Adults & Children
- Femoral Arterial Sheath & Iliac Occlusion Balloon Management - Perioperative
- Group & Screen Requirements in Maternity
- Informed Consent
- Intra-Operative Cell Salvage (IOCS) - Obstetrics
- Intrapartum Care - Normal Labour & Birth
- Iron Infusion in Pregnancy
- Massive Transfusion Protocol (Adult) - see Blood Components & Blood Product Administration
- Medications - Prescribing
- Retained Placenta Management
- Surgical Safety Checklist - Perioperative

Clinical forms

- CR2231: Refusal / Consent with restrictions for use of blood products
- Obstetrics and Gynaecology Theatre Alert form
- PPH checklist – draft only

Other resources

https://www.clinicaldata.nzblood.co.nz/resourcefolder/

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22. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

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23. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or the Clinical Policy Advisor without delay.

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