Postpartum Haemorrhage (PPH) Prevention and Management

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• Excluded	
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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 Te Whatu Ora | Te Toka Tumai Auckland.

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 flowchart in Primary PPH - ASSESS, ARREST, REPLACE section
- Provide safe ongoing care and follow up, with attention to all aspects of wellbeing – taha tinana/physical wellbeing, taha wairua/spiritual wellbeing, taha hinengaro/mental and emotional wellbeing and taha whānau/family and social well-being.

Te Toka Tumai Auckland endorses the Ministry of Health's 2022 National Consensus Guideline for Treatment of PPH.

3. Definitions

The following terms are used within this guideline:

Term	Definition
Postpartum haemorrhage (PPH)	**Blood loss >= 500 mL**
Primary	Within 24 hours of delivery
Secondary	After 24 hours postpartum
Major PPH	Blood loss >= 1000 mL and/or unstable: • Moderate = 1000 – 2000 mL • Severe >= 2000mL • Life-threatening >= 2500 mL
Estimated Blood Loss	Clinical assessment of volume of blood loss – best done by weighing and/or measuring.
Blood Volume	In pregnancy is about 100 mL/kg at term with a singleton

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 *Iron in Pregnancy and Post Partum* 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 possibility of placenta accreta. See *Placenta Praevia and Placenta Accreta Spectrum* Guideline.

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 *Intrapartum Care – Physiological Labour & Birth* guideline.

For all women the placenta should be checked for completeness.

Routine ecbolics for a woman without risk factors for PPH:

- Use 10 units IM oxytocin 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 (16 g depending on how significant a risk for the second IV cannula).
- Take blood for group and antibody screen, FBC, and ferritin 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 and oxytocin) if not contraindicated.
- After birth, even if no PPH, if risk factors for PPH exist, not for early discharge.

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 (Adult) (see Clinical forms).
- 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 *Intra-Operative Cell Salvage (IOCS) in Obstetrics* guideline.
- Review by the consultant obstetrician and anaesthetist at the onset of labour.

5. National consensus guideline

Te Kāwanatanga o Aotearoa
New Zealand Government

MINISTRY OF HEALTH
MANATŪ HAUORA

Treating Postpartum Haemorrhage

Initial early recognition and action

Call for help and consider involving other clinicians early

- Allocate roles.
  - Include care of baby, partner and whānau (including interpreting services and appropriate cultural support).

Assess and arrest bleeding

- Lie the woman/person flat.
- Massage fundus to expel clots.
- Administer oxytocin 10 units IM or 5 units IV, or Syntometrine® 1 mL IM (total Syntometrine® dose should not exceed 3 mL in 24 hours).
- Empty bladder.
- Deliver placenta.
- Place baby skin to skin.
- Measure cumulative blood loss and assess condition.

Identify cause

- Consider the 4 Ts:
  - **tone** – uterine atony
  - **trauma** – lacerations or rupture
  - **tissue** – retained placenta
  - **thrombin** – coagulopathy.

Minimise impact of blood loss

- Insert large bore IV cannula (16 g or 18 g).
- Take blood for FBC, group and hold, coagulation.
- Consult with specialist obstetrician.
- Start rapid IV fluid replacement with crystalloids (eg, sodium chloride 0.9%, Hartmann's).
- Consider tranexamic acid (1 g/10 mL IV at 1 mL per minute) for all PPH.

Maternal observations and clinical assessment*

- Use MEWS to assess and document:
  - blood pressure, pulse, respiratory rate, temperature, cumulative blood loss, fluid balance.

Blood loss stops and condition of woman/person is stable

- Continue observations and clinical assessments using MEWS.
- Document plan for ongoing care (including care location).
- Ensure adequate level of observation by health practitioner, or by partner or whānau with access to health practitioner or emergency services.
- Watch for further blood loss.
- Check haemoglobin via FBC.
- After the event, consider a culturally safe opportunity to discuss, reflect and debrief.

* Health professionals consistently underestimate blood loss; healthy people compensate: tachycardia and hypotension are late signs; agitation or restlessness indicates hypovolaemia.

Note:
FBC = full blood count;
IM = intramuscular;
IV = intravenous;
MEWS = Maternal Early Warning Score;
PPH = postpartum haemorrhage.

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Te Kāwanatanga o Aotearoa
New Zealand Government

MINISTRY OF HEALTH
MANATŪ HAUORA

Treating Postpartum Haemorrhage

Ongoing significant bleeding

Don't delay transfer to secondary/tertiary obstetric service

- Allocate care of baby and support for partner and whānau to suitable people.
- Start oxytocin infusion (40 units in sodium chloride 0.9% 500 mL over 4 hours).
- Reconsider the 4 Ts and apply bimanual compression to stop blood loss.
- Ask senior obstetric and midwifery team to attend immediately or be immediately available on arrival if transferring woman/person to a secondary/tertiary obstetric service.

Call for additional support

- Consult with obstetric and anaesthetic teams.
- Prepare theatre.
- Inform laboratory of major PPH.
  - Send blood to lab on arrival: FBC, cross-match, APTT and fibrinogen.
  - Point-of-care testing of haemoglobin and coagulation, where available
  - Request blood for transfusion.

Assess and arrest bleeding:

- Reconsider the 4 Ts and AFE.
- Measure cumulative blood loss and assess condition of woman/person.
- Insert second large-bore IV cannula (16 g or 18 g).
- Massage the fundus to expel clots and consider further bimanual compression (if needed).
- Insert indwelling catheter.
- Administer Syntometrine® 1 mL IM if not given already.
- Consider additional tranexamic acid (1 g/10 mL IV at 1 mL per minute) if ongoing bleeding after 30 minutes and if tranexamic acid has not already been administered.
- Administer carboprost* 250 micrograms IM or intrauterine every 15 minutes (maximum of 8 doses).
- Consider examination under anaesthetic for:
  - removal of retained placenta/products
  - repair of tears
  - intrauterine tamponade balloon or packing.

Resuscitation

- Give crystalloids (maximum 2–3 L).
- Give red cell transfusion as soon as possible (may require O negative blood until type-specific blood is available).

Maternal observations and clinical assessment

- Use MEWS to assess and document blood pressure, pulse, respiratory rate, temperature, cumulative blood loss, fluid balance.

Blood loss stops and condition of woman/person is stable

- Continue observations and clinical assessments using MEWS and monitor blood loss.
- Document plan for ongoing care (including care location).
- Ensure 1:1 care.
- Check haemoglobin via FBC.
- Consider IV iron replacement promptly, applying a low threshold for prescribing.
- After the event, ensure a culturally safe opportunity to discuss, reflect and debrief.

* Carboprost can cause severe bronchospasm: avoid use if woman/person has a history of asthma or bronchospasm.

Note:

AFE = amniotic fluid embolism
APTT = activated partial thromboplastin time
FBC = full blood count
IM = intramuscular
IV = intravenous
MEWS = Maternal Early Warning Score
PPH = postpartum haemorrhage

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Te Kāwanatanga o Aotearoa
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MINISTRY OF HEALTH
MANATŪ HAUORA

Treating Postpartum Haemorrhage

Ongoing uncontrolled bleeding

Call for additional help

- Transfer clinical responsibility for care to senior obstetrician and senior anaesthetist.
- Consult with haematologist/transfusion medicine specialist.
- Transfer to operating theatre.
- Ensure support for partner and whānau.

Assess and arrest bleeding

- Reconsider the 4 Ts and AFE.
- Consider other options if appropriate:
  - uterine compression suture (with or without tamponade balloon/packing)
  - uterine artery ligation
  - internal iliac embolisation
  - aortic compression.
- Consider laparotomy.
- Consider early recourse to hysterectomy.

Resuscitation

- Initiate massive transfusion protocol where available.*
- Assess coagulation status including fibrinogen.
- Administer blood and blood products guided by laboratory and point-of-care tests of haemoglobin and coagulation (aim for APTT <40 s, PR <1.5, platelets >75 x 109/L, fibrinogen >2 g/L).
- Avoid hypothermia, hypocalcaemia and acidosis by keeping patient warm and warming all fluids and blood products (if warming facilities are available).
- Consider cell salvage.

Maternal observations and clinical assessment

- Consider arterial line or central venous line.
- Use MEWS to assess and document blood pressure, pulse, respiratory rate, temperature, oxygen saturation:
  - document cumulative blood loss and accurate fluid balance (hourly urine output).
  - FBC and coagulation studies at least hourly until blood loss stops.

Blood loss stops and condition of woman/person is stable

- Make plan for ongoing care.
- Consider transfer to intensive care unit, high dependency unit or acute observation unit.
- Consider IV iron replacement promptly, applying a low threshold for prescribing.
- After the event, ensure a culturally safe opportunity to discuss, reflect and debrief.

Ongoing culturally safe communication

- Communicate with woman/person, partner and whānau to ensure informed consent.
- Explain what is happening.
- Answer questions about risks/benefits of treatment, escalation, etc.
- Provide for appropriate cultural practices where possible.

* Many units use an MTP. The underlying principle of all MTPs is early recognition and prevention of worsening coagulation.

Note:
AFE = amniotic fluid embolism; **APTT** = activated partial thromboplastin time; **FBC** = full blood count; **IV** = intravenous; **MEWS** = Maternal Early Warning Score; **MTP** = massive transfusion protocol; **PR** = prothrombin ratio.

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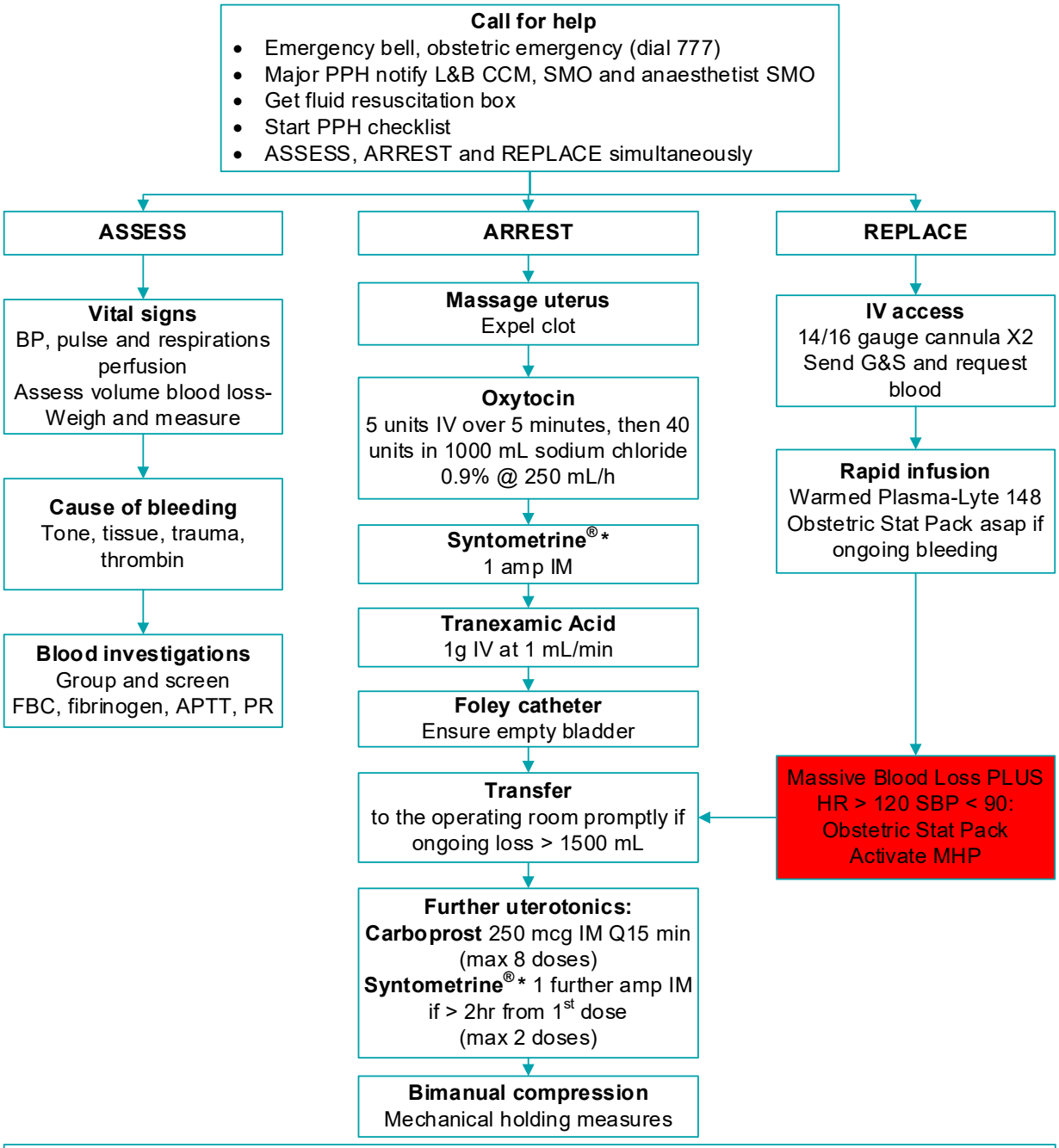
6. Primary PPH - ASSESS, ARREST, REPLACE



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, no more than 2L, give blood asap if resuscitation required
- 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
- Follow PPH Checklist

*Ergometrine is contra-indicated in the presence of maternal hypertension
Syntometrine® = oxytocin 5 units/mL + ergometrine 0.5 mg/mL

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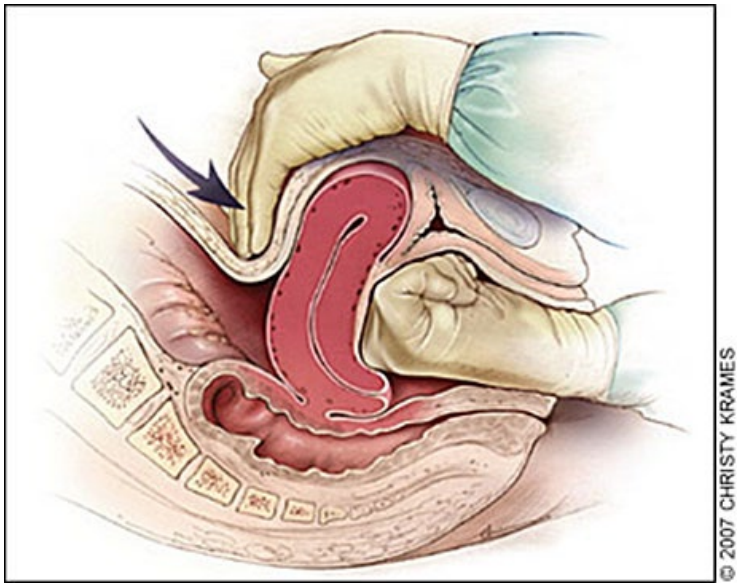
7. Immediate management from Labour and Birthing Unit

7.1 Internal bi-manual compression



7.2 Tissue

- Retained placenta with postpartum haemorrhage.
- Urgent transfer to the operating room for manual removal:
  - If >= 1000 mL lost, actively bleeding or unstable, book as category 1 case
- Consider possibility of placenta accreta.

7.3 Trauma

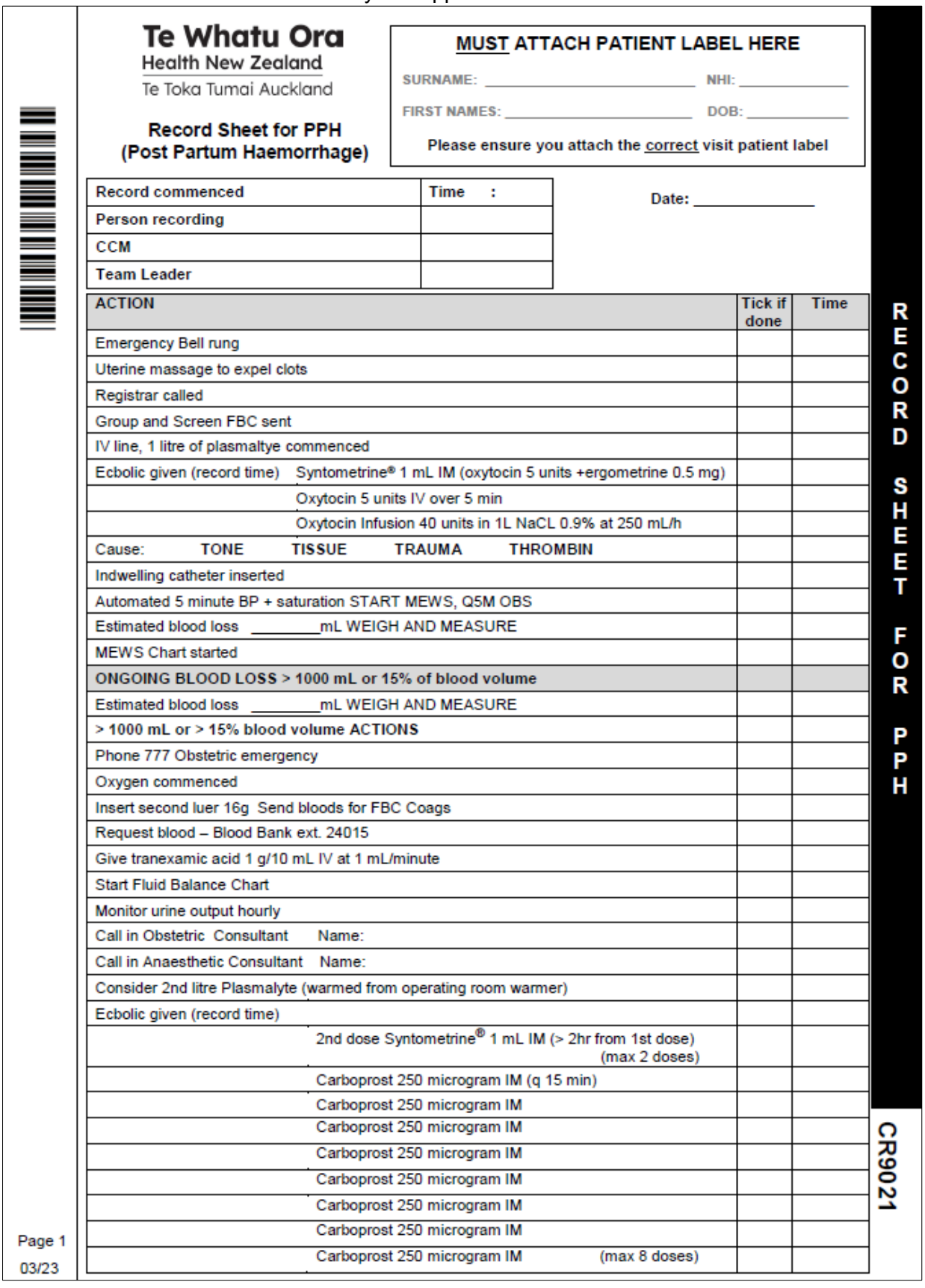
- Repair the tear:
  - Apply pressure as initial measure.
  - Stabilise the woman, and
  - Repair the tear/lacerations as soon as possible (the operating room may be required).
  - Ensure that swab and instrument counts are correct in all cases.

7.4 Thrombin

- Check coagulation results:
  - O&G staff members to consult as soon aspossible 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.

8. PPH checklist

Available from the Clinical Forms Library on Hippo



Te Whatu Ora
Health New Zealand
Te Toka Tumai Auckland

Record Sheet for PPH
(Post Partum Haemorrhage)

MUST ATTACH PATIENT LABEL HERE

SURNAME: _____ NHI: _____

FIRST NAMES: _____ DOB: _____

Please ensure you attach the correct visit patient label

Record commenced	Time :
Person recording	
CCM	
Team Leader	

Date: _____

ACTION		Tick if done	Time
Emergency Bell rung			
Uterine massage to expel clots			
Registrar called			
Group and Screen FBC sent			
IV line, 1 litre of plasmaltye commenced			
Ecbolic given (record time)	Syntometrine® 1 mL IM (oxytocin 5 units +ergometrine 0.5 mg)		
	Oxytocin 5 units IV over 5 min		
	Oxytocin Infusion 40 units in 1L NaCL 0.9% at 250 mL/h		
Cause: TONE TISSUE TRAUMA THROMBIN			
Indwelling catheter inserted			
Automated 5 minute BP + saturation START MEWS, Q5M OBS			
Estimated blood loss _____mL WEIGH AND MEASURE			
MEWS Chart started			
ONGOING BLOOD LOSS > 1000 mL or 15% of blood volume			
Estimated blood loss _____mL WEIGH AND MEASURE			
> 1000 mL or > 15% blood volume ACTIONS			
Phone 777 Obstetric emergency			
Oxygen commenced			
Insert second luer 16g Send bloods for FBC Coags			
Request blood – Blood Bank ext. 24015			
Give tranexamic acid 1 g/10 mL IV at 1 mL/minute			
Start Fluid Balance Chart			
Monitor urine output hourly			
Call in Obstetric Consultant	Name:		
Call in Anaesthetic Consultant	Name:		
Consider 2nd litre Plasmalyte (warmed from operating room warmer)			
Ecbolic given (record time)			
	2nd dose Syntometrine® 1 mL IM (> 2hr from 1st dose) (max 2 doses)		
	Carboprost 250 microgram IM (q 15 min)		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM		
	Carboprost 250 microgram IM (max 8 doses)		

RECORD SHEET FOR PPH

CR9021

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RECORD SHEET FOR PPH

CR9021

Te Whatu Ora
Health New Zealand
Te Toka Tumai Auckland

Record Sheet for PPH
(Post Partum Haemorrhage)

MUST ATTACH PATIENT LABEL HERE

SURNAME: _____ NHI: _____

FIRST NAMES: _____ DOB: _____

Please ensure you attach the correct visit patient label

ACTION	Tick if done	Time
Notify obstetric physician if pre-eclampsia/heart disease		
ONGOING BLOOD LOSS > 1500 mL or 20% of blood volume		
Estimated blood loss _____mL WEIGH AND MEASURE		
> 1500 mL or > 20% blood volume ACTIONS		
Send for blood - call Blood Bank ext. 24015, request Obs Stat Pack		
Rapidly infuse Plasmalyte whilst awaiting blood, no more than 3 litres in total		
Give rpt tranexamic 1 g/10 mL IV stat at 1 mL/minute after > 30 min		
Blood transfusion commenced?		
Transfer to operating room		
ONGOING BLOOD LOSS AND SHOCK – SBP < 90 + HR > 120		
Estimated blood loss _____mL WEIGH AND MEASURE		
Obstetric stat pack if not already		
Activate MHP		
Call in second obstetrician. Name:		
Call in anaesthetic consultant. Name:		
Transfer to OR immediately		

Other Considerations	Tick if done	Time
• Consider contacting other specialties: ○ vascular surgeon ○ interventional radiologist ○ obstetric physician ○ haematologist		
• Record all fluids and Record all fluids and blood products on fluid balance chart		

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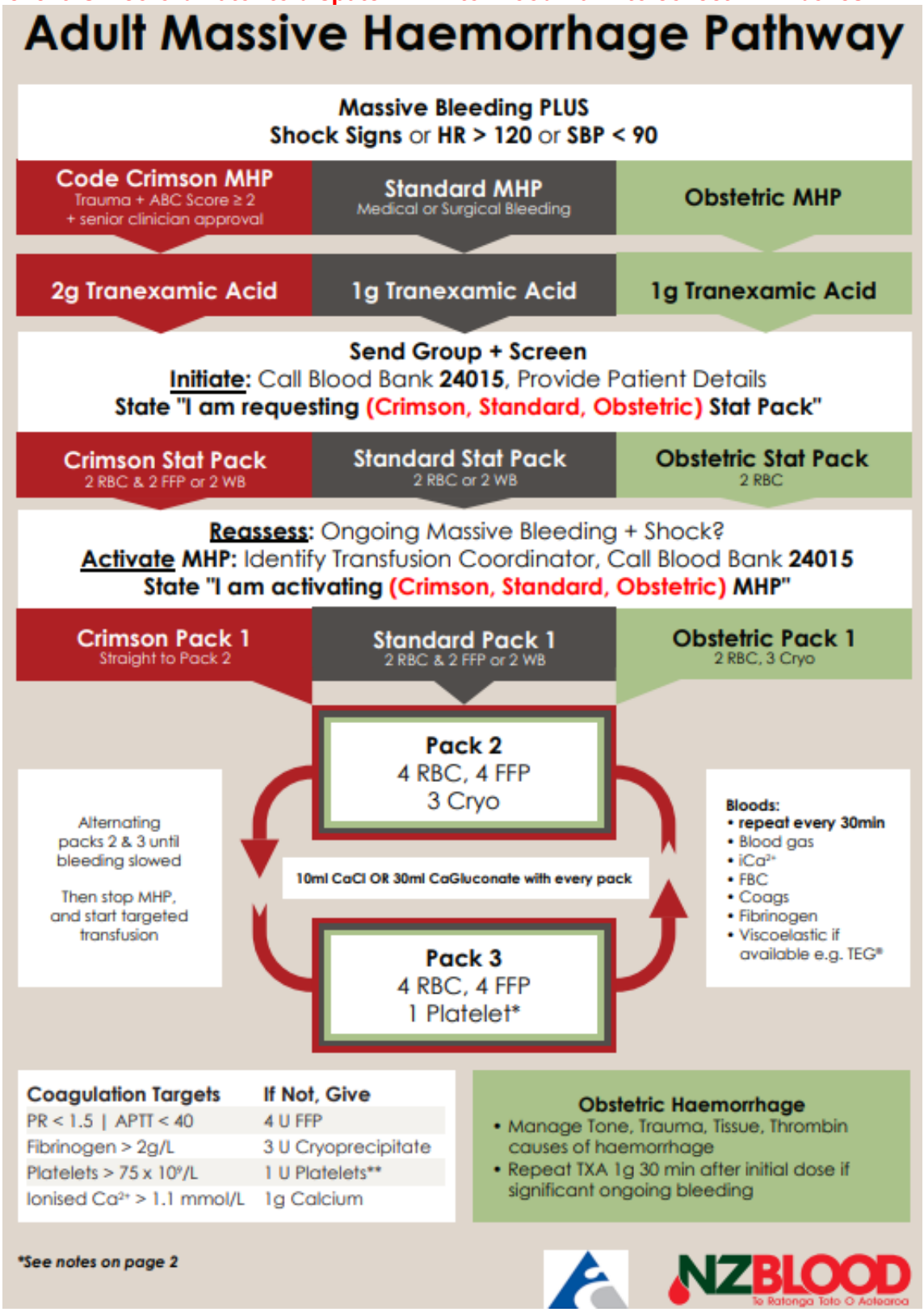
9. Massive Haemorrhage Pathway (use Obstetric MHP)

Call Blood Bank for Obstetric stat pack first, then activate MHP if needed. Obstetric stat pack will arrive in Lamsen tube.
Call Level 9 OR co-ordinator to dispatch HCA to Blood Bank to collect MHP boxes.



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CODE CRIMSON - ABC Score

- **Penetrating** mechanism = 1
- **SBP ≤ 90** mmHg = 1
- **Positive eFAST*** ** = 1
- **HR ≥ 120 bpm** = 1

Code Crimson requires senior clinician approval and input, as activation identifies the highest risk trauma patients and needs a multi-service approach.

****eFAST** scan accuracy relies on the skill level of the practitioner*

Team Leader of the Resuscitation

- The team leader is the decision maker including activation of the MHP once the stat packs have been transfused
- Send urgent group & screen to blood bank
- Ensure Tranexamic Acid is administered, as a bolus through a fast flowing IV line

Transfusion Coordinator (e.g. Guardian, Coordinator)

- Supports the team leader
- Once the MHP has been activated, communicate with the blood bank team

Tasks (Delegated as Necessary)

- Once Stat Packs have been transfused - reassess the patient in conjunction with the team leader
- If required after stat pack - activate MHP, state which MHP pathway (i.e. code crimson/standard/obstetric MHP)
  - If senior clinician requests MHP activation immediately, stat pack is still issued while the blood bank prepares pack 1/pack 2
- Ensure blood bank have your name and contact number
- Organize adequate orderly/health care assistant support
- Repeat MHP bloods every 30mins
- With every MHP pack, ensure 10mL Calcium Chloride 10% or 30mL Calcium Gluconate 10% is given as a bolus through fast flowing line
- Hand-over coordination role if patient location changes; ensure blood bank notified of new coordinators name and number
- Cease MHP once the patient is clinically stable, inform blood bank, move to targeted therapy
- Ensure transfusion documentation / checklists maintained; all swing labels retained

***Smaller Centres should** check Full Blood Count BEFORE giving platelets, avoid transfusing if PLT > 75 x 10⁹/L

Blood Bank Roles

- Process urgent group and screen
- Liase with transfusion coordinator
- Release Stat Pack and MHP Packs as per protocol / SOP
- Notify NZBS TMS as per SOP & manage inventory
- Ensure Blood Bank Tracking Sheet / Checklist documentation and eTraceline records maintained

Smaller Centres BEFORE releasing Pack 3, liaise with MHP coordination role to confirm PLT count is < 75 x 10⁹/L

MHP Runner

- This can be HCA/Orderly/RN or anyone else available to collect blood products from blood bank
- Liaise with the transfusion coordinator regarding product collection
- Stay with the MHP until you are released by the transfusion coordinator
- Return blood products to blood bank as directed by the transfusion coordinator

Infusion Standards

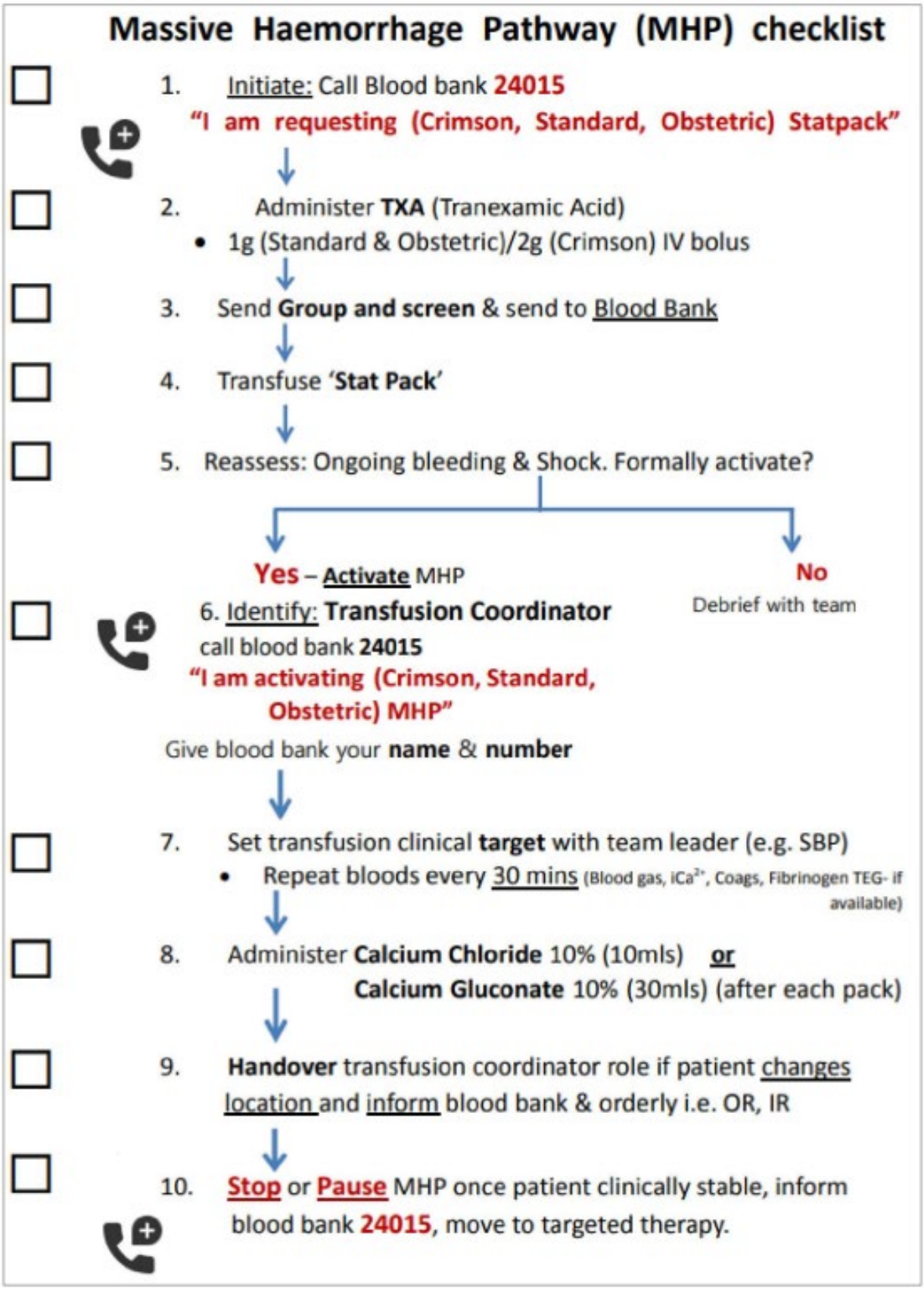
- RBC, FFP, Cryoprecipitate:
  - warmed
  - standard blood infusion set
- Platelets:
  - warmed or room temp
  - new infusion set preferred, not essential

Clinical Targets

- Surgical/radiological **control of bleeding** ASAP
- Normal **pH/base deficit**
- Normal body **temperature**
- **A lower MAP** may be tolerated until bleeding slowed
  - unless brain injury

NZBLOOD
Te Ratonga Toto O Aotearoa

Checklist available from Hippo → Clinical Toolkit → Patient Blood Management



Massive Haemorrhage Pathway (MHP) checklist

☐ 1. Initiate: Call Blood bank **24015**
"I am requesting (Crimson, Standard, Obstetric) Statpack"

↓

☐ 2. Administer **TXA** (Tranexamic Acid)
- 1g (Standard & Obstetric)/2g (Crimson) IV bolus

↓

☐ 3. Send **Group and screen** & send to Blood Bank

↓

☐ 4. Transfuse '**Stat Pack**'

↓

☐ 5. Reassess: Ongoing bleeding & Shock. Formally activate?

↓ **Yes** – **Activate** MHP

↓ **No** – Debrief with team

☐ 6. Identify: **Transfusion Coordinator**
call blood bank **24015**
"I am activating (Crimson, Standard, Obstetric) MHP"
Give blood bank your **name** & **number**

↓

☐ 7. Set transfusion clinical **target** with team leader (e.g. SBP)
- Repeat bloods every 30 mins (Blood gas, iCa^{2+}, Coags, Fibrinogen TEG- if available)

↓

☐ 8. Administer **Calcium Chloride** 10% (10mls) **or**
Calcium Gluconate 10% (30mls) (after each pack)

↓

☐ 9. **Handover** transfusion coordinator role if patient changes location and inform blood bank & orderly i.e. OR, IR

↓

☐ 10. **Stop** or **Pause** MHP once patient clinically stable, inform blood bank **24015**, move to targeted therapy.

10. On-going monitoring and care when blood loss controlled and condition stable

10.1 General monitoring and considerations

- Weigh and measure blood loss, and document.
- Use the national Maternity Vital signs and Early Warning Score record during and after all PPH.
- During the PPH, use Dynamap and perform observations every 5 minutes.
- After PPH, minimum frequency of observations hourly, medical staff to advise.
- Record urine output and fluid balance.
- Think about plan for thromboprophylaxis. PPH >1000 mL is a risk factor for thrombosis – see *Venous Thromboemblism in Pregnancy - Prevention* guideline.
- Arrange Hb check day 2.
- Consider U&E and follow up coagulation tests.
- Consider intravenous iron replacement – see *Iron in Pregnancy and Postpartum* guideline.
- After any PPH, discharge from the hospital can only occur after medical review.
- A woman who has had a PPH is by definition under secondary care until and unless a formal hand back to primary care occurs.

10.2 Monitoring following a PPH of 1000 – 2000 mL

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

- Must be admitted to hospital
- Non-invasive BP monitoring
- Pulse oximetry
- Strict fluid balance with hourly urine measures
- Observe in PACU/DU for two hours
- Must have O&G Registrar review prior to transfer to ward
- Must have MEWS 0 – 4 to be able to transfer to ward
- Ward must have usual staffing ratios and skillmix

10.3 With an intrauterine balloon and/or vaginal pack in situ

- No additional special measures are required
- Placement of patient will depend on blood loss and general condition
- Document plan for removal on the Action Alert Card and hand this over

10.4 With B-Lynch suture in situ

- No additional special measures are required
- Placement of patient will depend on blood loss and general condition

10.5 Additional recommendations following PPH of >= 2000 mL

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

- Consider placement in Maternity Complex Care Area
- Consider arterial line for repeat blood sampling and ongoing monitoring
- DCCM review in MCCA for “outreach”

10.6 Criteria for admission to Department of Critical Care

- Coagulopathy
- Requirement for ventilation
- Inotrope support
- Multi-organ failure
- Unplanned peripartum hysterectomy

10.7 Debrief

Offer a hot debrief to staff after major PPH event.

The patient must be given opportunity to debrief both on the ward and in an outpatient setting around four to six weeks postpartum. Major obstetric haemorrhage can be a terrifying event. Keep all whānau updated, comforted and included.

11. 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 6 L/minute, and blood cross-matching (four to six units) should be commenced. As soon as possible deep volatile 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 five minutes.
- Intravenous salbutamol 100 micrograms as a stat dose (**CHECK THE DOSE CAREFULLY – There are 2 strengths of Ventolin® Injection. Use 500 microgram/mL injection only.**). Dilute one 500 microgram/1mL ampoule of salbutamol sulfate for injection up to 10 mL with sodium chloride 0.9% (final concentration 50 micrograms/mL) and administer 100 micrograms (2 mL over one to two minutes; this dose may be repeated after five minutes.
- Subcutaneous terbutaline may be used if available, 250 microgram 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.

12. Secondary PPH

12.1 Definition

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

12.2 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.

12.3 Management details

There are no randomised controlled trials to inform the management of secondary PPH - see Alexander et al. (2002) in Supporting evidence.

The following is based on expert opinion.

12.3.1 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.

12.3.2 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 (e.g. 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.

12.3.3 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.

12.3.4 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.

13. Risk factors for PPH

The following table has been modified from the NSW framework - see NSW Health (2021) in Supporting evidence:

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 • Clot retention
	• 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)
	• Medicine induced hypotonia	• Magnesium sulfate, 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

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Cause	Etiology Process	Clinical Risk Factors
		and cervix • Placenta accreta, especially fundal • Congenital uterine weakness or anomalies • Antepartum use of magnesium sulfate 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%	• 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 • Severe infection • Abruption • Amniotic fluid embolus • Therapeutic anti-coagulation	• Bruising • Elevated BP, HELLP • Fetal death • Pyrexia, WBC • Antepartum haemorrhage (current or previous) • Sudden collapse • History of blood clot

Epidemiological risk factors - see Sheiner et al. (2005) in Supporting evidence (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 Stanco et al. (1993) in Supporting evidence.

Antidepressant exposure at time of delivery was associated with an increased risk of postpartum haemorrhage in a recent large cohort study – see Palmsten et al. (2013) in Supporting evidence.

14. Fluids and medicines used in PPH

- Warmed buffered crystalloid solution i.e. Plasmalyte is preferred for first line resuscitation.
- Replace blood loss with three to four times the EBL, up to a maximum of three 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 needs to be adequate.
- Rapid administration of oxytocin will cause hypotension especially in the presence of hypovolaemia, ensure that doses are given according to the guideline. Consider dose reduction if necessary.
- If the oxytocin infusion fails to achieve uterine contraction, additional medical treatment should be instituted rather than increasing the dose or rate of oxytocin.

14.1 Syntometrine® (oxytocin + ergometrine)

Syntometrine 1 mL (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 Ng et al. (2008) in Supporting evidence.

14.2 Carboprost

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

14.3 Misoprostol

There is evidence that misoprostol is effective in treating PPH, a dose of 800 microgram sublingual being equivalent to 40 units of oxytocin. At this dose, significant side effects of fever and shivering can occur. Misoprostil is less effective for treatment of PPH when prophylactic oxytocin has not been 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” – see NZCOM, (2010) in Supporting evidence.

14.4 Tranexamic acid

Tranexamic acid is part of the Massive Haemorrhage Pathway, give 1 g as a slow push. Non obstetric studies show a 15% reduction in haemorrhagic death. The WOMAN trial conducted internationally in women with PPH, found a reduction in maternal death from 1.9% to 1.5% overall, but only if given within three hours of delivery – see WOMAN Trial Collaborators, (2017) in Supporting evidence.

15. Management in the operating room

15.1 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 moment to complete time out and multidisciplinary plan - see *Surgical Safety Checklist* in Associated documents.
- 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.

15.2 Further measures

Consider:

- Inserting a central line and/or arterial line.
- Administering red blood cells, fresh frozen plasma, cryoprecipitate and platelet concentrates, guided by point of care testing (TEG and hemocue) and laboratory FBC and coagulation studies.
- Optimising coagulation through normothermia, normocalcaemia and avoiding
- The need for antibiotic prophylaxis and repeat antibiotic dosing if blood loss exceed 1500 mLs.
- Use of a cell saver.
- Calling for extra surgical assistance (e.g. 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:

- Syntometrine IM (maximum 2 mL (two ampoules)/24 hour).
- Carboprost IM (one ampoule = 250 microgram q15min up to eight doses i.e. 2 mg).
- Intramyometrial carboprost 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 250 microgram in 20 mL sodium chloride 0.9% via 22G spinal needle into three or four more myometrial sites, can be repeated if necessary, total dose 2 mg.

15.3 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 three to four gauze rolls together, soak in an iodine solution, and pack uterus and vagina. Document the number of rolls. Remove 24 hours later.

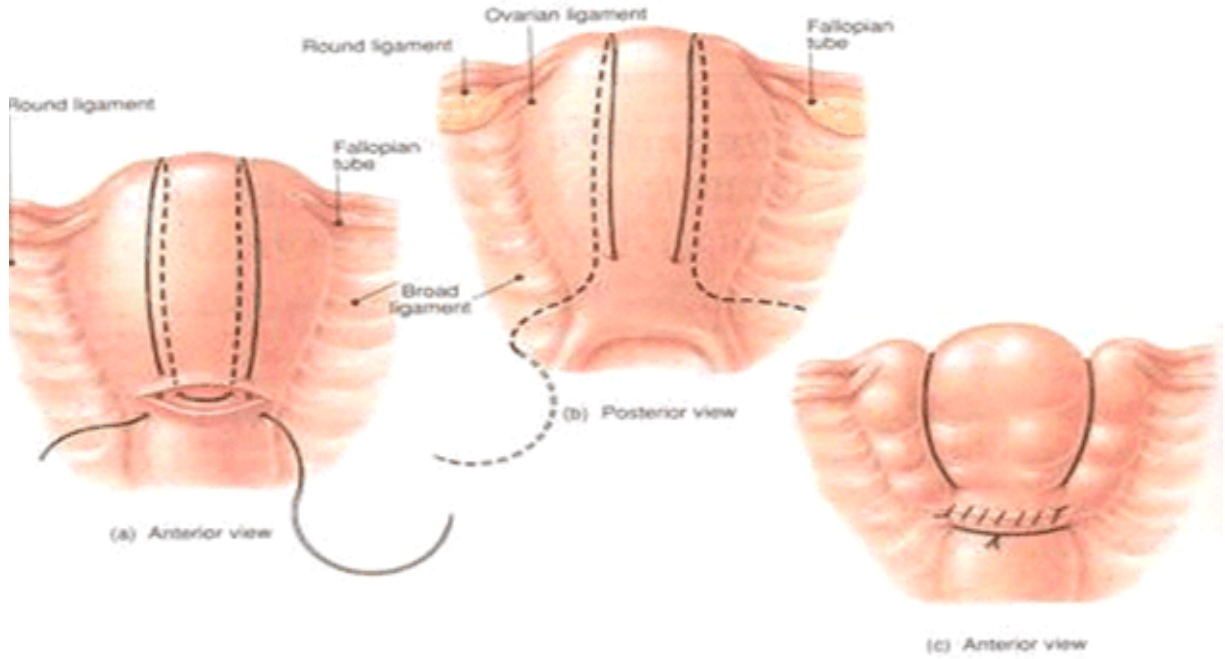
15.4 Laparotomy for further surgical measures

- B-Lynch suture or similar – see B-Lynch et al. (1997) in Supporting evidence.
- Uterine artery ligation (O'Leary stitch) – see O'Leary (1966) in Supporting evidence.
- Bilateral internal iliac artery ligation – see Allahbadia (1993) in Supporting evidence. This procedure should only be done by an experienced surgeon and will preclude the use of later embolization.

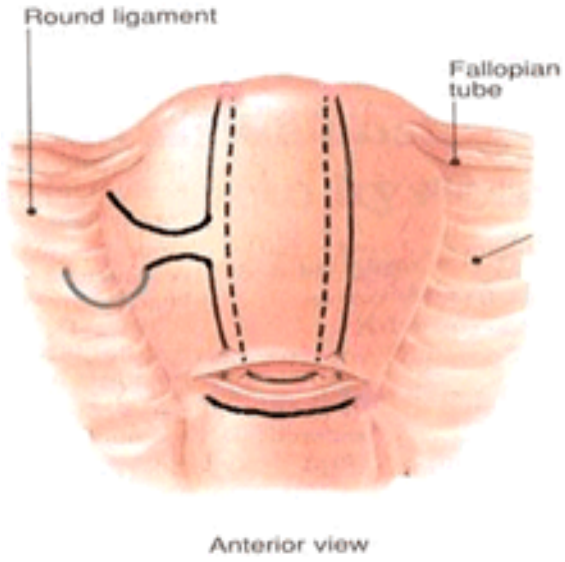
Hysterectomy is the definitive treatment and should be proceeded with if bleeding is not controlled quickly with other measures and blood loss is >2000 mL.

15.4.1 Original B-Lynch suture

- (Use 1 Vicryl on a CTX needle)



15.4.2 Modified B-Lynch suture



16. Other interventions

16.1 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 *Femoral Arterial Sheath and Iliac Occlusion Balloon Management* for further information).

17. Supporting evidence

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18. Associated documents

- Antepartum Haemorrhage
- Blood Components and Blood Products Administration
- Femoral Arterial Sheath & Iliac Occlusion Balloon Management in Level 9 Operating Rooms
- Group & Screen Requirements in Maternity
- Informed Consent
- Intra-Operative Cell Salvage (IOCS) in Obstetrics
- Intrapartum Care – Physiological Labour & Birth
- Iron in Pregnancy and Post-partum
- Massive Haemorrhage Pathway - Adult
- Medications – Prescribing
- Placenta Praevia and Placenta Accreta Spectrum
- Retained Placenta Management
- Surgical Safety Checklist – Perioperative
- Venous Thromboemblism in Pregnancy - Prevention

Clinical forms
- CR2231 Refusal/Consent with restrictions for use of blood products
- CR4113 Obstetric Theatre Alert
- CR9021 Record sheet for PPH

Other resources
- https://www.clinicaldata.nzblood.co.nz/resourcefolder/index.php?dhbid=1

19. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Te Toka Tumai Auckland 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.

20. 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 Document Control without delay.