

## Review Article

# Caring for pregnant women for whom transfusion is not an option. A national review to assist in patient care

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Postpartum haemorrhage (PPH) is the leading cause of maternal mortality and morbidity globally. Obstetric bleeding can be catastrophic and management is challenging, involving a coordinated multidisciplinary approach, which may include blood products. In settings where blood transfusion is not an option, either because of patient refusal (most commonly in Jehovah Witnesses) or because of unavailability of blood, management becomes even more challenging. Observational studies have demonstrated an association between refusal of blood products in major obstetric haemorrhage and increased morbidity and mortality. This review draws upon evidence in the literature, physiological principles and expert opinion for strategies and guidance to optimise the outcomes of pregnant women in whom blood transfusion is either refused or impossible. The importance of a multidisciplinary antenatal and perinatal management plan, including optimisation of haemoglobin and iron stores pre-delivery, blood loss minimisation, early haemorrhage control and postpartum anaemia treatment, is discussed.

**Key words:** bloodless medical and surgical procedures, ethics, Jehovah's Witness, pregnancy, prenatal care.

## Introduction

While transfusion may play an important role in optimising maternal and fetal outcomes in pregnancy, there are some situations where the administration of blood or blood products is not a therapeutic option. This can arise where a woman has complex red cell antibodies or a rare blood group, because blood products are unavailable or because the woman concerned refuses transfusion for religious or other reasons. Irrespective of the reason why transfusion is not possible, it is critically important that these women receive optimal management. Unfortunately, there is an association between refusal of blood products and both increased morbidity and mortality in major obstetric haemorrhage and substandard

clinical care<sup>1</sup> with failure to utilise proven interventions that may improve outcomes.<sup>2</sup> This review aims to assist clinicians to develop a pragmatic approach to guide their clinical practice and to facilitate pre-emptive measures to minimise morbidity and mortality, including the optimisation of antenatal haemoglobin, the development of a clear plan for labour and birth to minimise blood loss and the adoption of strategies to secure haemostasis following haemorrhage, with early recourse to definitive surgery where indicated (Fig. 1).

## Methods, Scope, Evidence and Limitations

Good-quality evidence to inform management of pregnancy where transfusion is not an option is generally lacking. Small numbers of patients, geographical, cultural and political differences, clinical and haematological heterogeneity, and ethical principles preclude against level 1 or 2 evidence, so most data are drawn from cohort studies, cross-sectional studies, case series and case reports, as well as from physiological principles and expert opinions.<sup>3,4</sup> While this may limit the strength of any generalisations that can be drawn from the literature, these recommendations aim to

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provide a framework for the provision of optimal obstetric care in this challenging circumstance.

## Clinical, Ethical and Legal Context

In pregnancy, bleeding can be unexpected, rapid and massive. In the usual situation, packed red cells are given to correct hypovolaemia, shock and oxygen delivery, and platelet transfusions and fresh frozen plasma to correct platelet dysfunction, thrombocytopenia and coagulopathy. However, in some situations, transfusion may not be possible, either because patients have rare blood groups or complex antibodies, or, more commonly, where patients refuse transfusion of blood products for personal or religious reasons. Many such women have uneventful pregnancies. However, two observational studies from high-risk obstetric units suggest that refusal of transfusion in major PPH may be associated with a much higher risk of mortality (up to 44–65 times higher) compared to the general obstetric population.<sup>1,3,5</sup>

While patients with rare blood groups or complex antibodies will still be able to receive platelets and fresh frozen plasma, the management of patients refusing blood products is more complex due to fewer appropriate therapeutic options. Most commonly this occurs in women who are Jehovah's Witnesses.

The Jehovah's Witnesses are a Christian religious group founded in the 1870s, with over seven million worldwide, who believe the transfusion of blood products is prohibited by the Bible (Genesis 9:3-4; Leviticus 17:13-14 and Acts 15:19-21). Jehovah's Witnesses commonly divide blood products into two main groups: products that they will not accept – such as whole blood, red cells, plasma, platelets or white cells; and those decided upon by each person's individual conscience – such as immunoglobulins, coagulation-factor preparations, albumin, vaccines and solid organs (Table 1). Additionally, Jehovah's Witnesses generally do not accept pre- and intra-operative storage of blood for later autologous transfusion, but individuals may decide personally to accept haemodilution, haemodialysis, plasmapheresis, heart–lung bypass and blood salvaging techniques, provided that there is continuous extracorporeal circulation. The use of erythropoiesis stimulators and nonblood plasma expanders is generally accepted.<sup>6</sup>

Conflict between women who are Jehovah's Witnesses and health staff sometimes occurs when the healthcare team believes that the woman's best interests, and/or those of her fetus/child are served by blood transfusion but the patient refuses. Although health professionals may disagree with such refusals, it is generally accepted both that competent patients have the right to refuse any form of life-sustaining treatment and that health professionals have a continuing duty to provide care. Health professionals can only refuse to provide care where this decision does not adversely impact upon the woman's health and where an alternative caregiver has agreed to accept responsibility for ongoing care.<sup>6–8</sup>

While some doubts have been recently shed on the rights of pregnant women to refuse treatment in Australia, the overwhelming preponderance of authority is in favour of a pregnant woman's right to refuse treatment (Box 1). Irrespective of whether a decision to refuse blood products is made contemporaneously or in advance – the responsible healthcare professionals must satisfy themselves that the refusal of or consent to blood transfusion is valid, that is that the patient is competent to make decisions regarding their care, and that their decision is made freely and voluntarily and that the decision clearly applies to the circumstances that have arisen. Where the patient is not competent, it is important to establish whether the patient has left a clear record of instructions regarding their wishes regarding treatment for when they lack capacity (an advance directive or advance care plan). It is also important to establish who is authorised to make decisions for them in such situations. Different jurisdictions in Australia and New Zealand recognise different kinds of advance care directives (Table 2) and substitute decision-makers (Table 3). In all situations, the patient's preferences and the details of the consent process should be carefully documented, in accordance with local legal requirements. Some institutions may provide an institution specific consent form to unambiguously clarify which products and procedures are acceptable (Table 1) to the individual.

From a medical perspective, given that it is legally and ethically possible for a woman to refuse blood product support during pregnancy, it is even more important that a patient's wishes regarding transfusion are identified early so that clear strategies to reduce anaemia and bleeding can be developed that are acceptable to the patient, optimise obstetric care and improve maternal and fetal outcomes.<sup>1</sup>

## Recommendations

### *Antenatal management*

#### *Identify patients*

At the first antenatal visit, every woman should be asked whether she would accept or reject blood products, if required, during her pregnancy or following delivery. Refusal should be documented in the hospital record and patient held card where used, and the woman referred for discussion with a consultant obstetrician. Routine antenatal group and screen should identify most patients with complex red cell antibodies, and these women should be referred to a haematologist.

#### *Discuss and clarify blood product options*

The clinical focus is on the haemoglobin and bleeding risk – the higher the haemoglobin, the lower the risk of severe anaemia; the lower the haemoglobin, the fewer the choices in terms of risk minimisation and management. The aims are to maximise the haemoglobin, to establish a clear plan

1. *Identify patients*
  - Ask all patients
  - Document
2. *Early pregnancy visit with senior clinician (usually consultant obstetrician)*
  - Discuss and document which blood products are acceptable
  - Decide on model of care
  - Decide on planned location of delivery
  - Develop and implement a plan for optimising haemoglobin through pregnancy
  - Ask patient to write detailed legally binding advanced care directive, where needed
3. *Mid pregnancy visit with senior clinician*
  - Review blood results and need for additional therapy
  - Review advanced care directive and discuss with patient
  - Organise anaesthetic review
  - Organise haematology review
4. *Late pregnancy visit with senior clinician*
  - Review risk factors for post-partum haemorrhage
  - Re-consider location of birth
  - In very high risk cases consider review by gynaecology oncology or interventional radiology
  - Document clear intrapartum and postpartum care plan
5. *Management in labour*
  - Alert clinicians, intravenous access
  - Active management of 3<sup>rd</sup> stage of labour, monitor closely for blood loss
6. *Management of active haemorrhage*
  - Involve consultants
  - Early definitive management (\*see text)
  - Communication between team members, record losses
7. *Management of Postpartum Anaemia*
  - Optimise haematinic status & oxygenation, minimise venesection
  - Consider intravenous iron  $\pm$  ESA

**Figure 1** Algorithm for managing women in pregnancy for whom transfusion is not an option.

**Table 1** Products and procedures to clarify with woman antenatally

Product or procedure	Detail	Usual Jehovah's Witness stance
Major blood components	Red blood cells Platelets Fresh frozen plasma White blood cells	Refusal
Blood fractions	Cryoprecipitate Albumin Prothrombinex Biostat Fibrinogen concentrate	Individual decision
RhD immunoglobulin (Anti-D)	Processed from Human Blood Donors	Individual decision
Autologous blood donation	Own blood stored	Refusal
Recombinant products	Epoetin, Darbepoetin (ESAs) Recombinant Factor 7	Usually accept
Intra-operative measures	Intra-operative blood salvage Acute normovolaemic haemodilution	Individual decision
Measures to treat complications	Haemodialysis	Individual decision

ESA = Erythropoiesis stimulating agents.

for managing pregnancy, labour and birth, minimising blood loss and to establish explicit strategies for managing haemorrhage, including early stabilisation and referral for surgical intervention as indicated. Each of these goals can only be achieved by early and clear communication throughout the antenatal and postnatal period involving the patient, their family and the multidisciplinary care team, including obstetric, midwifery, anaesthetic and haematology staff. Ideally the medical staff should be senior clinicians with experience in this area. The patient must be counselled about the potential catastrophic nature of post-partum haemorrhage (PPH) and the subsequent increased risk of morbidity and mortality, and possible strategies to decrease this. Specifically, the woman must be advised that the inability to administer blood products may increase her risk of death or disability following major haemorrhage and that even with optimal prenatal care and the implementation of nonblood management strategies these risks remain.

Following discussion, it is important to clearly document in the patient record and/or antenatal card a summary of the issues discussed; a summary of the products and interventions that are acceptable (Table 1); and the details regarding the patient's advance care plan and/or substitute decision-maker. If copies of the patient's advance care plan and appointment of a substitute decision-maker is available, this should also be filed in the patient record. Contact with the local hospital Jehovah's Witness Liaison Officer is recommended.

### *Consultant led care*

Senior medical staff should be part of the antenatal multidisciplinary management team, which should be led by the patient's obstetrician and include a haematologist and anaesthetist. In selected cases, the opinion of an interventional radiologist may need to be sought. Where antenatal care is midwifery led, frequent consultation with an obstetrician is advisable and the development of any risk factors should prompt timely referral for senior medical review.

### *Assess optimal location for delivery*

Some maternity services may decide to refer these women to higher level facilities depending on their service capability. Delivery in a facility unable to perform hysterectomy may be inadvisable in some cases. If an institution is unable to provide the potential level of care required in case of massive haemorrhage, the patient's care should generally be transferred to a higher level obstetric unit. A level 4 or higher obstetric unit would generally be recommended for women at standard risk. Women at high risk (e.g. placenta praevia) should be referred to a tertiary facility in early pregnancy for pregnancy planning and delivery.

### *Minimise other causes of anaemia and blood loss*

**Optimise haemoglobin, iron, B<sub>12</sub> and iron stores.** The haemoglobin and ferritin should be monitored regularly, at least at booking, 28 and 36 weeks' gestation. Folate and B<sub>12</sub> levels should be assessed at booking. Haematinic deficiency should be aggressively replaced. We would recommend all women receive iron (100–200 mg elemental iron/day) and folate (0.5 mg daily), with a target ferritin of 100 µg/L.<sup>9</sup> Intravenous iron should be used if oral iron therapy is ineffective or if the woman is intolerant of oral iron. It must be recognised that iron deficiency can be present with a normal haemoglobin and that adequate reserves of iron, B<sub>12</sub> and folate are particularly important for women who are unable to be transfused as they are required for erythropoiesis, which will be relied on in the event of haemorrhage.

**Minimise blood loss.** Reduce iatrogenic blood loss antenatally with a restrictive phlebotomy approach.

**Antiplatelet and anticoagulant drugs.** Antiplatelet and anticoagulant drugs (e.g. aspirin, enoxaparin) should be withheld for the appropriate time prior to delivery. The data on the role of erythropoiesis-stimulating agents (ESAs), such as epoetin and darbepoetin, in this setting are limited and uncertain.

### *Assess for higher risk of postpartum haemorrhage*

Risk factors for PPH should be assessed in the third trimester (Table 4).<sup>10</sup> The mode of delivery should be

**Box 1** Cases on the right to refuse treatment

- 1 In *St George's Healthcare NHS Trust v S* [1998] 3 All ER 673, a pregnant woman refused a caesarean section when she was suffering from pre-eclampsia. After refusing treatment, she was declared mentally ill by staff and detained. The hospital sought a court order authorising treatment but misinformed the trial judge and the patient and her solicitors were not informed of the hearing. After receiving the court order and performing the operation, the hospital released her. On appeal, the Court of Appeal found that the unborn child's need for medical attention could not override the patient's express and competent refusal. Even where the interference with the woman's body is minor and the refusal of treatment unreasonable, the court will not sanction treatment because the promotion of the woman's autonomy is paramount.
- 2 In *Hunter and New England Area Health Service v A* [2009] NSWSC 761, Mr A was a Jehovah's Witness who had completed an advance directive in which he had indicated his wish not to be given kidney dialysis. In June 2009, A was admitted to the hospital suffering septic shock. His kidneys failed, and he was being kept alive on a ventilator and dialysis machine. McDougall J upheld A's right to refuse treatment and found that even though there was no express provisions for advance directives in *Guardianship Act 1987* (NSW), s 33 of the Act recognised the importance of the patient's previously express decisions regarding treatment. Nor was it necessary for health professionals to have to advise patients before they could refuse treatment. However, McDougall J did mention in passing that there had been occasions when the right to refuse treatment might be denied if it lead to death of a viable fetus, but he did not refer to the case of *St George's Healthcare NHS Trust* discussed above.
- 3 In *X v The Sydney Children's Hospitals Network* [2013] NSWCA 320, a mentally competent, Jehovah's Witness who was 17 years and 8 months old, refused blood and platelet transfusions which were a necessary part of his treatment for Hodgkin's disease. The patient was suffering severe anaemia but refused to be treated with blood or platelets. The Court of Appeal ordered treatment to go ahead arguing that children do not have the right to refuse treatment which is in their best interests.
- 4 In *Re JS* [2014] NSWSC 302, the patient was 27 years of age and had been a ventilator dependent quadriplegic since the age of seven. JS decided that he no longer wanted to be treated and made an advance directive refusing treatment to take effect on his twenty-eighth birthday. The court upheld JS's decision.

dictated according to conventional obstetric standards: spontaneous labour and normal vaginal delivery is preferred, and interventions discouraged unless indicated. A final discussion with the woman should include the measures that may be required in case of severe PPH, including postdelivery hysterectomy. In very high-risk cases, planning should include consideration of cell salvage and placement of percutaneous balloon catheter in iliac arteries predelivery in a facility with these services, following consultation with anaesthetics and interventional radiology.

**Table 2** Australian and New Zealand legislation on advance care directives

Legislation	
ACT	<i>Medical Treatment (Health Directions) Act 2006</i>
NSW	No legislation – common law applies
Qld	<i>Powers of Attorney Act 1998</i>
SA	<i>Advance Care Directives Act 2013</i>
Vic	<i>Medical Treatment Act 1988</i>
WA	<i>Guardianship and Administration Act 1990</i>
NT	<i>Natural Death Act 1988</i>
NZ	<i>Code of Health and Disability Services Consumer's Rights</i>

### Management in labour

When a woman in whom transfusion is not an option presents in labour, the Advance Care Plan and blood management plan should be reviewed. The senior obstetrician, anaesthetist and haematologist should be informed when the woman has been admitted in labour. The minimisation of risk factors for PPH, including length of labour, should be considered in intrapartum management. A large bore cannula should be placed if there is a high risk of haemorrhage.

Active management of the 3rd stage of labour is generally advised, with rapid stepwise management of third stage complications. Following delivery, ensure careful and regular monitoring of vital signs, fundal height and blood loss, with accurate documentation of cumulative blood loss.

### Management of active haemorrhage

#### Early definitive management

Early definitive management may be life-saving, because blood products will not be available to assist in optimising oxygen delivery, cardiac output and haemostasis. Involve the consultant obstetrician, anaesthetist and haematologist early. The decision to take the patient to theatre for definitive management

**Table 3** Substitute decision-makers and their powers to make end-of-life decisions

SDM	Substitute decision-makers and their powers to make end-of-life decisions
ACT	<p><i>Guardians</i> Appointed by the Supreme Court or ACAT Have the power to consent to medical procedures but they do not have an express power to refuse treatment: <i>Guardianship and Management of Property Act 1991</i>, s 7. Arguably, guardians can refuse treatment in the same as way they can in NSW</p> <p><i>Enduring attorneys</i> Appointed by the patient in writing Have the power to make decisions to withhold or withdraw medical treatment, if it can be said on reasonable grounds that the patient would have made the decision to refuse treatment had they been able to make a rational and considered judgment: <i>Powers of Attorney Act 2006</i>, ss 12, 42(2)(b) Must consult with a doctor regarding the patient's condition and treatment options prior to refusing treatment: s <i>Powers of Attorney Act 2006</i>, 46(2)(a)</p> <p><i>Health attorneys</i> Automatically allocated in the absence of a formal appointment to spouse or domestic partners, carers or close friends and relatives Have the power to consent to treatment but should they refuse to consent the matter must be referred to the Public Advocate: <i>Guardianship and Management of Property Act 1991</i>, s 32H. Arguably this requires refusals of treatment to be reviewed by the Public Advocate, although it would seem unlikely that the Public Advocate would become involved in cases where the treating team and health attorney agree that treatment should be limited. Cases of dispute should be referred to the ACAT or to the Supreme Court</p>
NSW	<p><i>Guardians</i> Appointed by the Supreme Court or NCAT Have the power to refuse treatment if they have been granted a plenary power, healthcare function or a specific power to consent to treatment being withdrawn or withheld: <i>FI v Public Guardian</i> [2008] NSWADT 263</p> <p><i>Enduring Guardians</i> Appointed by the patient in writing Have the power to refuse treatment if they have been granted a plenary power, healthcare function or a specific power to consent to treatment being withdrawn or withheld in the instrument of their appointment: <i>FI v Public Guardian</i> [2008] NSWADT 263</p> <p><i>Persons responsible</i> Includes guardians and enduring guardians but also spouses, carers and friends and relatives who have not been formally appointed <i>Persons responsible</i> who have not been formally appointed as guardians or enduring guardians are unlikely to be able to refuse treatment as they must consent to treatments which 'promote and maintain health and wellbeing': <i>Guardianship Act 1987</i>. A decision to withhold treatment does not appear to fall within the <i>Guardianship Act</i> with deals with treatment provisions not treatment limitation: <i>FI v Public Guardian</i> [2008] NSWADT 263 Arguably, If there is no guardian, the treatment team and substitute decision-makers may agree to withhold/withdraw treatment in the patient's best interests. In cases of conflict, resort should be had to the NCAT or Supreme Court to seek advice</p>
NT	<p><i>Guardians</i> Appointed by the courts <i>Guardians</i> are given plenary powers as if they were the parent of the patient and may consent to treatment in the patient's best interests: <i>Adult Guardianship Act</i> s 17. Arguably this includes end-of-life functions as parents can make end-of-life decisions for children: <i>Re Baby D (No 2)</i> [2011] FamCA 176. NT does not have legislation allowing enduring powers of attorney or persons responsible. Decisions to limit treatment would presumably be made by the treatment team based on an assessment of the patient's best interests. That assessment should ordinarily include consultation with the patient's family/friends: <i>Inquest into the death of Paulo Melo</i> [2008] NTMC 080; <i>Melo v Superintendent of Royal Darwin Hospital</i> [2007] NTSC 71</p>
Qld	<p><i>Guardians</i> Appointed by the Supreme Court or QCAT <i>Guardians</i> have clear powers to withhold and withdrawal life-sustaining treatments: <i>Guardianship &amp; Administration Act 2000</i>, Sch 2, s 5</p> <p><i>Enduring attorneys</i> Appointed by the patient in writing Have power to make decisions to withhold or withdrawal medical treatment: <i>Powers of Attorney Act 1998</i>, Sch 2. A decision-makers to withdraw or withhold life-sustaining treatment will not be effective unless continued treatment is 'inconsistent with good medical practice': <i>Guardianship and Administration Act 2000</i>, s 66A. This would not apply to decisions to refuse blood transfusions as they are not defined to be a 'life-sustaining measure.'</p>

Table 3 (Continued)

SDM		Substitute decision-makers and their powers to make end-of-life decisions
	<i>Statutory health attorneys</i>	Automatically allocated in the absence of a formal appointment to spouse, carer, close friend or relation Have the power to refuse treatment: <i>Powers of Attorney Act 1998</i> , Sch 2. Healthcare professionals must seek consent from these decision-makers to limit 'life-sustaining measure' but this term does not include blood transfusions. A decision by substitute decision-makers to withdraw or withhold treatment will not be effective unless continued treatment is 'inconsistent with good medical practice': <i>Guardianship and Administration Act 2000</i> , s 66A. This would not apply to decisions to refuse blood transfusions as they are not defined to be a 'life-sustaining measure' In cases of conflict, the Public Advocate automatically is appointed as the substitute decision-maker. Alternatively, orders can be sought from the QCAT or Supreme Court
SA	<i>Guardians</i>	Appointed by the Supreme Court or Guardianship Board <i>Guardians</i> are given plenary powers at law and in equity: <i>Guardianship and Administration Act 1993</i> , s31. Arguably this includes powers to refuse treatment
	<i>Substitute decision-makers</i>	Appointed via an 'advance directive' completed by the patient Have the power to consent to the withholding or withdrawal of treatment: <i>Advance Care Directives Act 2013</i> , s 22. They cannot refuse the administration of drugs to relieve pain or distress or the natural provision of food and liquids by mouth: s 23
	<i>Persons responsible</i>	Automatically allocated in the absence of a formal appointment of a guardian or substitute decision-maker <i>Persons responsible</i> include a spouse or domestic partner, an adult relate by blood or marriage, an adult related by adoption or an adult related by indigenous kinship, a parent (including adoptive parents and people in <i>loco parentis</i> , adult friends and an adult in charge of the day to day supervision, care and well-being of the patient <i>Persons responsible</i> can refuse treatment but their decisions must 'reflect the decision that the patient would have made in the circumstances had his or her decision-making capacity not been impaired': <i>Guardianship and Administration Act 1993</i> , s 14C
Tas	<i>Guardians</i>	Appointed by Supreme Court or Guardianship Board <i>Guardians</i> are given plenary powers as if they were the parent of the patient and may consent to or refuse treatment in the patient's best interests: <i>Guardianship and Administration Act 1995</i> , s 25(2)(e). Arguably this includes end-of-life functions as parents can make end-of-life decisions for children: <i>Re Baby D (No 2)</i> [2011] FamCA 176
	<i>Enduring Guardians</i>	Appointed by the patient in writing <i>Enduring guardians</i> can also be appointed and will have the same functions as plenary guardians, subject to any lawful directions in the instrument: <i>Guardianship and Administration Act 1995</i> , s 32(5)
	<i>Persons responsible</i>	Includes guardians and enduring guardians but also spouses, carers and friends and relatives who have not been formally appointed <i>Persons responsible</i> who are also not guardians or enduring guardians may consent to treatment but there is no express power to refuse treatment: <i>Guardianship and Administration Act 1995</i> , s 39. Arguably the position is the same as NSW. If the treatment team and substitute decision-makers agree to withhold/withdraw dialysis in the patient's best interests then arguably there are no legal barriers to doing so. In cases of conflict, resort should be had to the Guardianship Tribunal or Supreme Court to seek advice
Vic	<i>Guardians</i>	Appointed by the Supreme Court or VCAT <i>Guardians</i> may refuse consent to treatment when it is not in the patient's best interests: <i>Guardianship and Administration Act 1986</i> , s 42H. Guardians can also execute a refusal of treatment certificate under the <i>Medical Treatment Act 1986</i> when: <ol style="list-style-type: none"> <li>1 the medical treatment would cause unreasonable distress to the patient; or</li> <li>2 there are reasonable grounds for believing that the patient, if competent, and after giving serious consideration to his or her health and well-being, would consider that the medical treatment is unwarranted</li> </ol>
	<i>Enduring guardians</i>	<i>Enduring guardians</i> can be appointed by patients: <i>Guardianship and Administration Act 1986</i> . If the instrument is silent on consent issues, the enduring guardian may consent to treatment in the patient's best interests

**Table 3** (Continued)

SDM	Substitute decision-makers and their powers to make end-of-life decisions
<i>Medical Agents</i>	Appointed by patients via an enduring power of attorney (medical treatment) <i>Medical Agents</i> may employ a refusal of treatment certificate under the <i>Medical Treatment Act</i> 1986. Medical agents can only execute a refusal of treatment certificate (under s 5B) when: <ol style="list-style-type: none"> <li>3 the medical treatment would cause unreasonable distress to the patient; or</li> <li>4 there are reasonable grounds for believing that the patient, if competent, and after giving serious consideration to his or her health and well-being, would consider that the medical treatment is unwarranted</li> </ol>
<i>Persons responsible</i>	Includes guardians and enduring guardians but also spouses and domestic partners, carers and nearest relatives who have not been formally appointed Arguably persons responsible (who are not guardians or enduring guardians) can refuse consent when it is in the patient's best interests: <i>Guardianship and Administration Act</i> 1986, s 42H. However, they are not permitted under the <i>Medical Treatment Act</i> to issue a refusal of treatment certificate
WA <i>Guardians</i>	Appointed by the Supreme Court or WASAT <i>Guardians</i> are given plenary powers as if they were the parent of the patient and may consent to or refuse treatment in the patient's best interests: <i>Guardianship and Administration Act</i> 1990, ss 45, 110ZJ
<i>Enduring guardians</i>	Appointed by the patient in writing <i>Enduring guardians</i> can also be appointed and will have the same powers as plenary guardians, subject to any lawful directions in the instrument: <i>Guardianship and Administration Act</i> 1990, s 110ZJ
<i>Persons responsible</i>	<i>Persons responsible</i> (spouse, carer, close friend or relative) may make treatment decisions which include decisions to consent or refuse consent to a treatment: <i>Guardianship and Administration Act</i> 1990, s 3
NZ <i>Welfare guardian</i>	Appointed by the High Court or Family Court Welfare guardians are expressly forbidden from refusing 'standard treatments' to preserve life or prevent serious damage to the patient's health: <i>Protection of Personal and Property Rights Act</i> 1988: s 18(1)(c)
<i>Powers of attorney over personal care and welfare</i>	Appointed by the patient Attorneys are expressly forbidden from refusing 'standard treatments' to preserve life or prevent serious damage to the patient's health: <i>Protection of Personal and Property Rights Act</i> 1988: s 98(4)

should generally be made earlier than usual. To arrest significant haemorrhage, the definitive procedure is generally hysterectomy.

### **Obtain haemostasis as quickly as possible**

Activate local PPH protocols with rapid progression to the next intervention if haemorrhage is not controlled.

**Table 4** Factors to consider in assessing postpartum haemorrhage risk

Previous pregnancy complications	Previous caesarean section, esp with anterior placenta Previous post-partum haemorrhage Previous precipitate labour
Placentation	Placenta praevia Placenta accreta
Uterine tone	Multiple pregnancy Polyhydramnios Macrosomia
Medical comorbidities	Diabetes Coagulopathy Personal and family bleeding history Uncorrectable anaemia

### **Record**

Record ongoing losses in a systematic way to enable recognition and early response. Ensure clear documentation and handover, especially if the patient moves between delivery suite, operating theatres and intensive care. Slow but persistent blood loss requires prompt action and should not be ignored.

### **Early definitive management**

- 1 Operative management: intrauterine balloon tamponade, B-Lynch uterine brace suture, subtotal hysterectomy, bilateral ligation of the uterine arteries and embolisation.
- 2 Cell salvage, if available and acceptable to the woman.
- 3 Pharmacologic agents, including tranexamic acid, recombinant factor VIIa and topical haemostatic agents (Tisseel).
- 4 Cryoprecipitate, fibrinogen concentrate or prothrombin complex concentrate if available and acceptable to the woman.

### **Management of postpartum anaemia**

Haematinic status should be optimised with intravenous iron, vitamin B<sub>12</sub> and folic acid. Phlebotomy should be

minimised to reduce ongoing losses – reduce tests ordered and use paediatric sample tubes where possible. In severe acute postpartum anaemia, consider intravenous iron ± ESA. The use of hyperbaric oxygen therapy and synthetic oxygen carriers is controversial and may be considered on a case-by-case basis. In the case of severe acute postpartum anaemia (Hb < 70 g/L), management should be guided by early and ongoing expert advice.

**\*Further notes: practical advice, evidence and uncertainties**

***Postpartum intravenous iron***

Studies with various intravenous formulations of iron demonstrate a faster rise in haemoglobin from baseline but a similar endpoint, compared to fully compliant oral iron in postpartum iron deficiency anaemia.<sup>11–14</sup> Modern intravenous formulations have an acceptable adverse risk profile. In general, it should be assumed that women with moderate postpartum anaemia following PPH have a significant iron deficit and would benefit from iron replacement. The choice of iron formulation depends on the severity of anaemia, the desired rate of rise in the haemoglobin and the safety of the iron formulation.

***Erythropoiesis-stimulating agents: erythropoietin, darbepoetin***

There is no role for routine ESA use, but they may be considered in high-risk patients. While the data are conflicting, case reports document survival in JW patients with extremely low Hb levels (down to 10 g/L) with aggressive use of ESAs and/or other supportive measures.<sup>15,16</sup> The use of ESAs is at the discretion of the local unit, requiring local hospital drug committee authorisation and informed consent explaining the risks of hypertension and thrombosis. If an ESA is used, it should be combined with appropriate iron therapy.

***Tranexamic acid***

There is strong evidence supporting the use of tranexamic acid in bleeding surgical and trauma patients.<sup>17,18</sup> Interestingly, these studies also show a reduction in thrombotic complications. Several randomised control trials (RCTs) have been conducted in the maternity setting, and its early use (within three hours of haemorrhage onset) may be of benefit in PPH.<sup>19</sup>

***Cryoprecipitate and fibrinogen concentrate***

Recent reviews and case reports have proposed the supplementation of fibrinogen in the setting of ongoing bleeding. In Australia, this is most commonly achieved with *cryoprecipitate*. If the patient consents to this blood product, it should be considered in the context of ongoing bleeding.

Case reports using *fibrinogen concentrate* during obstetric bleeding have been published. However, it is not currently licensed in Australia for obstetric haemorrhage and use in this context would be considered ‘off label’.

***Intra-operative cell salvage***

Recent studies demonstrate safety of cell salvage in the obstetric setting, despite historical concerns for potential amniotic fluid embolism. If acceptable to the patient, its use should be pre-empted.<sup>19</sup>

***Intrauterine balloon tamponade***

The use of this technique is becoming increasingly popular. Expulsion of the balloon can be prevented by vaginal packing,<sup>20</sup> although this may conceal continuing bleeding around the balloon. If the balloon does not control haemorrhage or is repeatedly expelled, it should be abandoned. To minimise bleeding risk during removal, use graduated deflation – observing for bleeding – with reinflation if bleeding recommences.

***Subtotal hysterectomy***

Recommendations are for two consultant obstetricians to be present where practical,<sup>3</sup> to avoid hypothermia which would exacerbate coagulopathy (use fluid warmer, Bair™ hugger or similar) and have cell salvage available. A subtotal procedure may be quicker than total hysterectomy. However, the choice of procedure is by surgeon preference. A subtotal procedure may also fail to arrest haemorrhage from the lower segment in the case of placenta previa or morbidly adherent placenta.

***Hyperbaric oxygen***

Although rarely used, there are several successful case reports on the use of hyperbaric oxygen in severe blood loss anaemia.<sup>21</sup> Presumably, this therapy increases oxygen delivery to the tissues and may inhibit inflammatory cytokines. Appropriate patients need to be relatively stable and could be discussed with the local Hyperbaric Oxygen Therapy Unit.

***Fibrin sealant: Tisseel***

Tisseel is a fibrant sealant available in Australia. Fibrinogen and Thrombin are combined just prior to application to generate fibrin. It is TGA approved but not on the PBS. There are no RCTs in this population. It must be applied topically with potential adverse risks of anaphylaxis and systemic thromboembolism. Tisseel includes derivatives of human blood products and so may not be acceptable to some patients.<sup>22</sup>

***Aprotinin***

Aprotinin is not available in Australia.

### Haemoglobin-based oxygen carriers (HBOCs)

Haemoglobin-based oxygen carriers (synthetic blood) are not currently available in Australia. The FDA in USA has suspended trials due to adverse risk profile.<sup>23</sup> A large meta-analysis ( $n = 3711$ ) demonstrates increased mortality and morbidity with the use of HBOCs in RCTs.<sup>24</sup> The 'positive' studies are generally case reports.<sup>25,26</sup> But while there is little evidence to support their use, we acknowledge the difficulty of definitively arguing against their use when all other measures have failed, where death may be imminent and where the patient, or their substitute decision-maker has given consent to their use.

### Conclusion

Pregnancy and delivery are normal physiological processes which can have catastrophic outcomes in specific settings. Where a woman is unwilling or unable to be transfused, the healthcare team must work collaboratively with the patient to reduce morbidity and mortality. These guidelines provide direction to optimise materno-fetal outcomes in situations where transfusion is not an option.

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