Preoperative considerations for Jehovah's Witness patients: a clinical guide

Christina Chae, Obianuju Okocha, and BobbieJean Sweitzer

Purpose of review
Jehovah's Witnesses have religious beliefs that preclude transfusion of blood products and certain medical interventions. This presents a unique dilemma and ethical challenge to healthcare providers, especially in a surgical setting.

Recent findings
The growing number of followers of this faith warrants a deeper look at the ethical, legal, and clinical implications of their beliefs. Advances in patient blood management now allow timely optimization before surgery.

Summary
Anticipating the challenges associated with managing and optimizing patients who refuse blood products allows for more favorable outcomes in the preoperative period.

Keywords
anemia, blood, coagulopathy, Jehovah's Witness, transfusion

INTRODUCTION

The Jehovah's Witness faith was founded in 1872 by Charles Taze Russell – an American minister from Pittsburgh, Pennsylvania. There are over eight million members worldwide governed by the Watchtower Society located in Brooklyn, New York. This governing body presides over medically relevant issues addressing blood transfusions, beliefs about organ transplants, and even vaccinations [1,2▪,3▪].

Doctrines about blood products were adopted in 1945 based on the belief that '*any soul, who eats blood, that soul must be cut off from his people*' [4▪]. Members who receive blood products are cast out of the religion because of the belief that their souls have been compromised. Typically, Jehovah's Witnesses refuse the four main components of blood – red blood cells, white blood cells, plasma, and platelets, and also autologous blood that has been removed from the body. There is less guidance regarding acceptance of certain fractions such as recombinant human erythropoietin, albumin, and factor concentrates [3▪,5]. The decision to accept these fractions can be left to the individual. Some Jehovah's Witnesses consent to receive autologous blood if it remains in continuity with the body as is the case with hemodialysis, cardiopulmonary bypass, or extracorporeal membrane oxygenation (ECMO) [3▪].

ETHICAL AND LEGAL CONSIDERATIONS

The American Medical Association defines informed consent as legal documentation obtained after a thorough communication between provider and patient in which the patient agrees to a medical intervention based on knowledge of the diagnosis, risks, and benefits of the intervention, and the patient's ability to understand the treatment and alternatives [6]. While patients have the right to autonomy, physicians determine patients' capacity to make medical decisions. It is important to note that only a court of law can determine a patient's competency.

ADULT PATIENTS

Consent from Jehovah's Witnesses needs to be obtained in a private, confidential manner so the patient can make a decision that is voluntary and free of coercion or influence by family, friends, or

Department of Anesthesiology, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA

Correspondence to BobbieJean Sweitzer, MD, FACP, 251 E. Huron Street, Feinberg 5-704, Chicago, IL 60611, USA. Tel: +1 312 695 2371; e-mail: bobbiejean.sweitzer@nm.org

Curr Opin Anesthesiol 2020, 33:432–440
DOI:10.1097/ACO.0000000000000871

KEY POINTS

- Jehovah's Witnesses are a religious organization whose members refuse blood products even in life-threatening situations.
- Document acceptable blood products and blood conservation techniques based on patient preference.
- Preoperative management is centered around early identification and correction of anemia and coagulopathy.
- Intravenous iron infusion and erythropoietin are well tolerated and effective options to treat anemia.

church members. Documentation in the medical record should clearly state the patient's preferences for or against specific blood components, blood conservation techniques, and also the risks of refusal. A limitation of consent for blood products form can be used (Fig. 1).

Advanced directives are legal documents outlining a patient's preferences for medical care in the event of incapacitation. The patient must have decision-making capacity at the time of signing, with a witness present, and clearly document what medical treatments are acceptable or not, otherwise the directive may not be valid [1].

A specific advanced directive used by Jehovah's Witnesses is the 'no blood card' or Durable Power of Attorney (DPA) card, which is renewed annually [7]. It is a wallet-sized portable document that states no blood be transfused under any circumstance even in life-saving situations (Fig. 2). In the event of an emergency, if the patient cannot provide informed consent and advance directives, such as a DPA card, are not available, blood may be transfused when indicated.

MINORS OR PATIENTS WHO LACK CAPACITY

The process of informed consent is complicated when minors are involved because they lack the capacity and competency to consent. In the United States, a child is legally granted the right to make their own decisions at age 18. However, before that age, parents or surrogates act as proxies. The exception is emancipated minors who consist of children, usually in their teenage years, who are legally granted decision-making capacity and can express understanding of risks, benefits, and alternatives of the proposed medical intervention [8▪]. The definition of emancipated minor varies from state to state; therefore providers should consult their institution's legal counsel.

In general, the law overrides parents' or guardians' refusal of transfusions for their children. A court order is not needed to transfuse a child with potentially life-saving blood products. The principle is that parental authority is not 'absolute' and may need to be regulated for the best interest of a child's well being. This special consideration does not apply to the fetus of Jehovah's Witness parents [9▪▪].

PATIENT BLOOD MANAGEMENT

Patient blood management is an evidence-based, multidisciplinary approach to patients who may potentially need blood transfusions or are having surgeries with anticipated major blood loss. The main concepts are as follows: early diagnosis and optimization of anemia, surgical techniques to minimize blood loss, intraoperative techniques for blood conservation, and reduction of blood draws and other iatrogenic blood loss. These concepts should be applied to all patients, especially Jehovah's Witnesses in an effort to improve clinical outcomes [10▪].

PREOPERATIVE CONSIDERATIONS

There is a growing focus on perioperative blood sparing and conservation techniques starting in the preoperative period. This is particularly important to accommodate the complexities surrounding medicolegal and ethical concerns of patients who refuse blood transfusion. Early screening for and preoperative optimization of anemia and coagulopathies may lead to decreased morbidity, mortality and the need for transfusions.

Location

Presurgical planning starts with designating an appropriate venue that can provide mechanisms to support blood sparing and conservation techniques for Jehovah's Witnesses undergoing major surgeries especially when significant blood loss is anticipated. This includes onsite laboratory testing with rapid turn-around time for complete blood count (CBC), prothrombin time (PT), activated partial thromboplastin time (aPTT), and arterial blood gas determinations, and appropriate postoperative resources.

Type of surgery

A multidisciplinary team discussion regarding the type of surgery may be prudent. When a

BLOOD COMPONENTS Blood carries oxygen and nutrients through the body. The 4 main parts (or components) can be separated and used for treatment.	
RED BLOOD CELLS (Other Names: Erythrocytes, RBCs) take oxygen from your lungs to your organs and tissues. They also take carbon dioxide back to your lungs to breathe out. We give RBCs if your blood count is too low.	☐ **Accept** ☐ **Decline**
WHITE BLOOD CELLS (Other Names: Leukocytes, WBCs) are one of your body's defenses against bacteria, viruses, and diseases the body produces. We give WBCs to help you fight certain diseases.	☐ **Accept** ☐ **Decline**
PLATELETS (Other Name: Thrombocytes) are small fragment of cells without a nucleus found in large numbers in blood. They help your blood make clots that prevent or stop bleeding. We give Platelets if your bleeding is hard to stop or if your Platelet count is very low.	☐ **Accept** ☐ **Decline**
PLASMA is the liquid part of blood. It is made of water, albumin, clotting factors, salts, sugars, fats, vitamins, and hormones. We give this if you need more Plasma or Clotting Factors. Plasma is frozen so it can be used later.	☐ **Accept** ☐ **Decline**

AUTOLOGOUS BLOOD are Donated blood to oneself.	
Autologous Red Blood Cells *(Donated by me in advance for my own use only)*	**Accept** ☐ **Decline**
Cell Salvage or Cell Saver®: Apparatus for collecting bleeding during surgery and returning the red blood cells. **(**Procedures that employ a closed circuit)	**Accept** ☐ **Decline**
Blood Conservation Systems: Apparatus to collect bleeding during or after surgery and return by transfusion. (Procedures that do not employ a closed circuit)	**Accept** ☐ **Decline**
Epidural Blood patch: Accomplished by injection of patient's own blood into the epidural space.	**Accept** ☐ **Decline**

FRACTIONATED BLOOD COMPONENTS are separated from whole blood components (Plasma and Synthetic-derived products:	
Albumin: Protein purified from plasma which helps maintain fluid in the circulation.	☐ **Accept** ☐ **Decline**
Cryoprecipitate: Concentrated solution of certain clot-building proteins, made from plasma.	☐ **Accept** ☐ **Decline**
Cryopoor Plasma (plasma with Cryoprecipitate removed): used for Thrombotic Thrombocytopenic Purpura (TTP)	☐ **Accept** ☐ **Decline**
Erythropoietin: Synthetic red blood cell growth stimulant. (Synthetic)	**Accept** ☐ **Decline**
Platelet-derived Wound Healing Factors: Proteins purified from platelets which stimulate wound healing	☐ **Accept** ☐ **Decline**
Anti-Inhibitor Coagulant Complex	**Accept** ☐ **Decline**
Antithrombin	**Accept** ☐ **Decline**
C1 Esterase Inhibitor	**Accept** ☐ **Decline**
Coagulation Factors: • Factor VIIa • Factor VIII (Human) • Factor VIII/ Von Willebrand Factor Complex • Factor X • Factor IX • Factor XIII	**Accept** ☐ **Decline** **Accept** ☐ **Decline** **Accept** ☐ **Decline** **Accept** ☐ **Decline** **Accept** ☐ **Decline** **Accept** ☐ **Decline**
Fibrinogen:	**Accept** ☐ **Decline**
Rh Immune Globulins: Antibodies purified from plasma, for preventing RhD antibody formation and future Rh hemolytic disease of newborn, or for treating idiopathic thrombocytopenic purpura (ITP)	**Accept** **Decline**
Prothrombin Complex Concentrate (Kcentra)	**Accept** **Decline**
Protein C Concentrate	**Accept** **Decline**
von Willebrand Factor	**Accept** **Decline**

Adapted from created by Northwestern Medicine

FIGURE 1. Limitation of consent for blood products form.

proposed surgery or procedure poses significantly increased risk due to limitations on blood transfusion, alternatives should be considered. This includes staging surgery if that confers less risk of bleeding, less invasive procedures such as laparoscopic or robotic versus an open approach, or use of tourniquets or clamps to slow blood flow and exploring nonsurgical options such as interventional radiology, radiotherapy, or medical management.

Anemia

Timely preoperative identification and optimization of anemia are crucial to identify patients who may benefit from early intervention. Preoperative assessment includes questions about current medications or supplements that may increase bleeding (e.g. nonsteroidal anti-inflammatory drugs, fish oil, anticoagulants) and complications from bleeding after dental or surgical procedures. Anemia evaluation as early as 6 weeks preoperatively allows appropriate treatment with iron and erythropoietin [11].

Advance Decision to Refuse Specified Medical Treatment

1. I, _____ (print or type full name), born _____ (date) complete this document to set forth my treatment instructions in case of my incapacity. **The refusal of specified treatment(s) contained herein continues to apply to that/those treatment(s) even if those medically responsible for my welfare and/or any other persons believe that my life is at risk.**
2. I am one of Jehovah's Witnesses with firm religious convictions. With full realization of the implications of this position I direct that **NO TRANSFUSIONS OF BLOOD or primary blood components (red cells, white cells, plasma or platelets)** be administered to me in any circumstances. I also refuse to predonate my blood for later infusion.
3. No Lasting Power of Attorney nor any other document that may be in force should be taken as giving authority to disregard or override my instructions set forth herein. Family members, relatives, or friends may disagree with me, but any such disagreement does not diminish the strength or substance of my refusal of blood or other instructions.
4. Regarding end-of-life matters: [initial one of the two choices]

   (a) _____ I do not want my life to be prolonged if, to a reasonable degree of medical certainty, my situation is hopeless.

   (b) _____ I want my life to be prolonged as long as possible within the limits of generally accepted medical standards, even if this means that I might be kept alive on machines for years.
5. **Regarding other healthcare and welfare instructions** (such as current medications, allergies, medical problems or any other comments about my healthcare wishes):

_____

_____

_____

_____

_____

_____

_____

FIGURE 2. Jehovah's Witnesses Durable Power of Attorney (DPA) card.

6. I consent to my relevant medical records and the details of my condition being shared with the Emergency Contact below and/or with member(s) of the Hospital Liaison Committee for Jehovah's Witnesses.

7. _____ ___ ___ ___ ____ _____ _____
Signature NHS No. Date

Address

8. **STATEMENT OF WITNESSES:** The person who signed this document did so in my presence. He or she appears to be of sound mind and free from duress, fraud, or undue influence. I am 18 years of age or older.

Signature of witness

Name Occupation

Address

Telephone Mobile

Signature of witness

Name Occupation

Address

Telephone Mobile

9. **EMERGENCY CONTACT:**

Name

Address

Telephone Mobile

10. **GENERAL PRACTITIONER CONTACT DETAILS:** A copy of this document is lodged with the Registered General Medical Practitioner whose details appear below.

Name

Address

Telephone Number(s)

Page 2 of 2

NO BLOOD

(signed document inside)

Advance Decision to Refuse
Specified Medical Treatment

Advance Decision to Refuse Specified Medical Treatment

(signed document inside)

NO BLOOD

FIGURE 2. (Continued).

A thorough evaluation includes a complete blood count (CBC), with iron studies including iron, ferritin, total iron binding capacity, transferrin saturation, and reticulocyte count. In addition, vitamin B_{12} and folate levels are measured. The preoperative clinic at our institution has guidelines to recommend anemia evaluation for patients based on the potential for significant blood loss, the planned procedure, a history of anemia, alcohol abuse, bleeding, liver or kidney disease, dyspnea,

hematologic disorders, malignancy, inflammatory bowel disease, BMI less than 16 kg/m^2, malnutrition, palpitations, or syncope. This anemia evaluation includes a CBC with platelet count, with reflex testing (when hemoglobin is less than or equal to 12 g/dl) for iron, ferritin, total iron-binding capacity, transferrin saturation, creatinine, estimated glomerular filtration rate, reticulocyte count, and vitamin B_{12} concentrations. This allows prompt diagnosis of easily treatable causes of anemia such as iron or vitamin B_{12} deficiency, without return visits for follow-up laboratory testing.

Low iron levels in addition to low ferritin (<30 ng/ml), or low transferrin saturation (<20%), are diagnostic of iron deficiency anemia (IDA), and these patients will benefit from iron infusions [12]. Cutoffs are higher with inflammation. Anemia of chronic disease, increasingly referred to as anemia of inflammation, can present similarly or coexist with IDA, and thus be hard to differentiate. In anemia of chronic disease, inflammation reduces iron incorporation during erythropoiesis even in the presence of adequate iron stores, creating a functionally iron deficient state [13].

Once a diagnosis of iron deficiency with or without anemia is made, dose of intravenous iron infusion can be determined using the Ganzoni formula:

$$Iron\ deficit\ (mg) = ideal\ body\ weight\ (kg)(\text{target}\ hemoglobin - actual\ hemoglobin\ g/dL) \times 2.4 + iron\ stores\ (mg)\ ^{*}For\ iron\ stores,\ use\ 500\ mg\ for\ adults\ and\ children\ \geq 35\ kg;\ use\ 15\ mg/kg\ if < 35\ kg$$

Preoperative intravenous iron infusions are well tolerated and have better efficacy than oral preparations [14] in the treatment of IDA (Table 1). Iron stores (indicated by serum ferritin levels) increase in approximately 1 week, with a rise in hemoglobin seen in 1–2 weeks; however, optimal effect of iron infusion therapy is at 22–28 days postinfusion [15]. Intravenous iron is not as effective in anemia of chronic disease. Correction of anemia of chronic disease is to manage the underlying disorder (infection, autoimmune disorders, malignancies, chronic kidney disease, inflammatory bowel disease) and to give erythropoietin. Some patients will respond to intravenous iron but not oral iron [13].

Supplementation with recombinant human erythropoietin such as epoetin beta or darbepoetin alfa is accepted by most Jehovah's Witnesses and is an effective therapy for IDA. Erythropoetin alpha contains a small amount of albumin, and this information should be disclosed to the patient. Intravenous iron and erythropoietin, when used together, potentiate the effectiveness of erythropoiesis, thereby achieving higher hemoglobin concentration [16]. Aiming for above normal hemoglobin concentrations before surgery is desirable because patients will better tolerate blood loss perioperatively.

Table 1. Available intravenous iron products and recommended dosing

Iron product	Dose
Ferric gluconate	125 mg per dose
Iron sucrose	Multiple doses of 200 to 300 mg
Ferric carboxymaltose	Weight ≥50 kg: Two doses of 750 mg, given seven or more days apart Weight <50 kg: Two doses of 15 mg/kg, given seven or more days apart
Ferumoxytol	Two doses of 510 mg, given three to eight days apart, or Single dose of 1020 mg
Low molecular weight iron dextran	Multiple doses of 100 mg, or Single dose of 1000 mg (diluted in 250 mL normal saline) given over one hour
Ferric derisomaltose	Weight ≥50 kg: 1000 mg Weight <50 kg: 20 mg/kg
Iron isomaltoside*	Up to three doses of 500 mg, given over seven days, or Single dose of 20 mg/kg

Dosage obtained from the National Library of Medicine http://dailymed.nlm.nih.gov/dailymed/ accessed 4/2/2020 *Not available in the United States, dosage obtained from https://www.medicines.org.uk/emc/files/pil.5676.pdf accessed 12/9/19.
*Not available in the United States.

Measuring reticulocyte count is a way to monitor response to therapy. Reticulocytes are immature red blood cells that have a higher turnover rate than mature red blood cells (2 vs. 120 days) and are a marker of erythropoiesis.

It is important to recognize that IDA is due to either inadequate iron intake or loss of iron in the form of blood loss. The most common cause of IDA is bleeding from gastrointestinal, gynecologic, or urologic sources. In young women, dysfunctional uterine bleeding and pregnancy are common causes. There is a strong association with gastrointestinal, renal, and bladder cancers in patients with IDA [17]. Malabsorption is another common cause of IDA as seen in gastric bypass patients and those with celiac disease [18]. A necessary component of managing IDA is not only treatment, but diagnosing the cause of the disease. This may include referral to hematology, gastrointestinal, or urology specialists as indicated. This is especially important when postoperative anticoagulation is planned.

Blood sampling should be limited to disease specific evaluations instead of empiric testing. Efforts should be made to avoid excessive testing [19,20]. These measures limit iatrogenic causes of IDA.

Coagulopathy

Evaluating both acquired and inherited coagulopathies is especially valuable for Jehovah's Witnesses. Thrombocytopenia, prolonged PT, or aPTT need to be explored, and referral to hematology may be necessary. Treatment with the thrombopoietin (TPO) receptor agonist, romiplostim [4▪], and repletion of deficient coagulation factors may be indicated. Anticoagulants, antiplatelet agents, vitamin K antagonists, direct oral anticoagulants, and herbal supplements that may increase bleeding should be appropriately discontinued in the preoperative period (Table 2). In patients with cardiovascular disease, careful consideration and discussion regarding discontinuing aspirin is necessary.

INTRAOPERATIVE BLOOD CONSERVATION

Pharmacologic and nonpharmacologic therapies may aid in blood conservation intraoperatively. Options are reviewed with the patient and surgical team, and delineated to allow appropriate planning and availability in the preoperative period.

Pharmacologic therapy

Antifibrinolytics such as tranexamic acid (TXA) and aminocaproic acid are synthetically manufactured lysine analogs that inhibit fibrinolysis by competitively displacing plasminogen from fibrin and preventing the breakdown of plasmin [21]. TXA is more potent than aminocaproic acid, and doses of 10 mg/kg every 6 h up to a rate of 100 mg/min improve clot formation, achieve hemostasis, and reduce perioperative transfusion requirements [1]. Although some clinicians may be concerned about hypercoagulopathy with use of antifibrinolytic therapy, studies have shown no significant increase in rates of thrombotic complications in major orthopedic, cardiac, and trauma surgeries [22].

Nonpharmacologic techniques

Intraoperative blood conservation techniques to reduce blood loss and the acceptability of each must be discussed preoperatively with patients who refuse blood products. Intraoperative deliberate hypotension has been shown to reduce blood loss. However, in patients with pre-existing comorbid conditions such as coronary artery, peripheral artery, and renal or cerebrovascular disease, increased risk is associated with mean arterial pressures less than 65 mmHg [23,24].

Table 2. Antiplatelet and anticoagulation agents*

Drug	Stop duration
Abciximab	2–5 days
Alteplase	10 days
Apixaban	3 days
Argatroban	8–10 h
Aspirin (and aspirin combinations)# @	7 days; secondary prophylaxis: continue
Cilostazol	2 days
Clopidogrel@	7 days
Dabigatran (CrCl $\geq$ 30)	5 days
Dabigatran (CrCl $<$ 30)	7 days
Dipyridamole	2 days
Enoxaparin	24 h
Eptifibatide	8–24 h
Fondaparinux	4 days
Heparin, Unfractionated SQ 5000 units BID or TID	No need to stop
Heparin, Unfractionated Intravenous	4 h
Prasugrel	7–10 days
Rivaroxaban	3 days
Reteplase	10 days
Streptokinase	10 days
Supplements	7 days
Tenecteplase	10 days
Ticagrelor	5–7 days
Tirofiban	8–24 h
Urokinase	10 days
Vitamins	Stop day of surgery
Warfarin&	5 days, target NR $<$1.5
NSAIDS	Stop based on $^{1/2}$ life
Diclofenac, Fenoprofen, Ibuprofen, Indomethacin	1 day
Ketoprofen, Meclofenamate	1 day
Flurbiprofen, Ketorolac	2 days
Diflunisal, Etodolac, Tolmetin	3 days
Naproxen, Sulindac	4 days
Meloxicam, Oxaprozin	5 days
Nabumetone	6 days
Piroxicam	11 days

*No need to stop these meds before cataract and many GI procedures (check with GI if unsure).
#If bleeding risk is high (intracranial/intraspinal) stop 7 days for all patients.
&Bridging therapy should be determined with prescribing physician.
@Do not stop if recent vascular stents without checking with prescriber.

Autologous blood transfusion, normovolemic hemodilution, or cell salvage may be acceptable to some Jehovah's Witness patients. Generally, the specific criterion for acceptance is the requirement that a closed loop circuit is used to maintain

continuity with the patient's circulation. Autologous blood transfusion has been associated with fewer complications when compared to allogenic blood transfusion [25]. Normovolemic hemodilution is achieved by removing whole blood before starting surgery and replacing it with crystalloid or colloid to maintain volume. The reserved blood is transfused during (preferably after blood loss has subsided) or after surgery. This intervention may not be appropriate in patients with ischemic vascular disease, ventricular dysfunction, impaired renal function, or anemia. Intraoperative cell salvage collects blood lost from the surgical field, which is filtered, washed, and reinfused to the patient. Cell salvage is safe in cardiac, orthopedic, and vascular surgeries. Safety concerns include bacterial or drug contamination, cancer surgery, cesarean section (potential for amniotic fluid embolism), sickle cell disease, and bone cement [25,26].

URGENT OR EMERGENCY PROCEDURES

Healthy individuals can compensate for blood loss and patients with hemoglobin as low as 2–5 g/dl have survived, especially with the aid of current surgical techniques and pharmacological options [10▪]. In emergency cases, when Jehovah's Witness patients present with acute anemia, preoperative planning is focused on maintaining a euvolemic state, and maintaining blood pressures and adequate tissue perfusion to prevent tissue hypoxia. This includes hemodilution such that further blood loss translates to minimal decrease in hemoglobin. These patients may need support in the form of increased oxygen (O_2) delivery, vasopressors, inotropic agents, and techniques to reduce O_2 requirement such as mechanical ventilation and muscle relaxation [10▪].

CONCLUSION

Jehovah's Witnesses pose a challenge to the perioperative team, especially when blood loss is anticipated or anemia is present. However, surgery can be safely performed with the right preoperative education, planning, and optimization. Clear communication and documentation of patient wishes, early preoperative evaluation to identify and correct anemia and coagulopathies, and intraoperative pharmacologic and blood conservation strategies are techniques to accommodate Jehovah's Witness patients in the surgical setting. A multidisciplinary approach can improve clinical outcomes for this unique population.

Acknowledgements

None.

Financial support and sponsorship

None.

Conflicts of interest

There are no conflicts of interest.

REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

- ▪ of special interest
- ▪▪ of outstanding interest

1. Lawson T, Ralph C. Perioperative Jehovah's Witnesses: a review. Br J Anaesth 2015; 115:676–687.
2. ▪ Crowe E, DeSimone R. Transfusion support and alternatives for Jehovah's Witness patients. Curr Opin Hematol 2019; 26:473–479.

This study describes the process of obtaining blood substitutes (hemoglobin-based oxygen carrier) which is, at present, not available in the United States, for compassionate use.

3. ▪ Klein A, Bailey C, Charlton A, *et al.* Association of anaesthetists: anaesthesia and peri-operative care for Jehovah's Witnesses and patients who refuse blood. Anaesthesia 2019; 74:74–82.

This study discusses the process of informed consent and provides a detailed look at preoperative optimization and management of anemia in Jehovah's Witness patients preparing for surgery.

4. ▪ Coltoff A, Shreenivas A. Single-institution experience of performing bloodless transplant in Jehovah's Witness patients. Hematol Oncol Stem Cell Ther 2019; 12:44–49.

This study is the first in the United States to incorporate the use of the thrombopoietin (TPO) receptor agonist, romiplostim, in poststem transplant patients to enhance platelet recovery. This approach is helpful in avoiding platelet transfusion.

5. McConachie S, Almadrahi Z, Wahby K. Pharmacotherapy in acutely anemic Jehovah's Witnesses: an evidence-based review. Ann Pharmacother 2018; 52:910–919.
6. Informed Consent. https://www.ama-assn.org/delivering-care/ethics/informed-consent. [Accessed 15 July 2019]
7. Chandrasekhar S. Jehovah's Witnesses. In: Mankowitz SK, editor. Consults in Obstetric Anesthesiology. New York: Springer International Publishing; 2018. pp. 335–337.
8. ▪ Shander A, Goodnough L. Management of anemia in patients who decline blood transfusion. Am J Hematol 2018; 93:1183–1191.

This is a comprehensive review of Jehovah's Witness' beliefs, techniques for bloodless medicine and surgery, and case reports of Jehovah's Witness patients in the perioperative setting.

9. ▪▪ Marshall M, Edmonds T, Filo A. Committee opinion no. 664: refusal of medically recommended treatment during pregnancy. Obstet Gynecol 2016; 127:175–182.

This study discusses ethical challenges associated with pregnant patients who decline medical treatment that can affect herself and her fetus.

10. ▪ Tan G, Guinn N, Frank S, Shander A. Proceedings from the society for advancement of blood management annual meeting 2017: management dilemmas of the surgical patient-when blood is not an option. Anesth Analg 2019; 128:144–151.

This study discusses legal and ethical matters relevant to Jehovah's Witness patients in the perioperative setting. It also details timing and appropriate dosing of medications for preoperative optimization of anemia in this patient population.

11. Chaturvedi S, Koo M, Dackiw L, *et al.* Preoperative treatment of anemia and outcomes in surgical Jehovah's Witness patients. Am J Hematol 2018; 94:55–58.
12. Lopez A, Cacoub P, Macdougall IC, *et al.* Iron deficiency anaemia. Lancet 2016; 387:907–916.
13. Ganz T. Anemia of inflammation. N Engl J Med 2019; 381:1148–1157.
14. Auerbach M, Munoz M, Macdougall I. Intraveous iron: out of sight, out of mind. Lancet Haematol 2018; 5:10–12.
15. Ellermann I, Bueckmann A, Eveslage M, *et al.* Treating anemia in the preanesthesia assessment clinic: results of a retrospective evaluation. Anesth Analg 2018; 127:1202–1210.
16. Major A, Mathez-Loic F, Rohling R, *et al.* The effect of intravenous iron on the reticulocyte response to recombinant human erythropoietin. Br J Haematol 1997; 98:292–294.

17. Joosten E. Iron deficiency anemia in older adults: a review. Geriatr Gerontol Int 2018; 18:373–379.
18. Camaschella C. Iron deficiency. Blood 2019; 133:30–39.
19. Lutz C, Cho H. Are we causing anemia by ordering unnecessary blood tests? Cleve Clin J Med 2016; 83:496–497.
20. Thavendiranathan P, Bagai A, Ebidia A, *et al.* Do blood tests cause anemia in hospitalized patients? The effect of diagnostic phlebotomy on hemoglobin and hematocrit levels. J Gen Inern Med 2005; 20:520–524.
21. Pabinger I, Fries D, Schöchl H, *et al.* Tranexamic acid for treatment and prophylaxis of bleeding and hyperfibrinolysis. Wien Klin Wochenschr 2017; 129(9–10):303–316.
22. Levy J, Koster A, Quinones Q, *et al.* Antifibrinolytic therapy and perioperative considerations. Anesthesiology 2018; 128:657–670.
23. Salmasi V, Maheshwari K, Yang D, *et al.* Relationship between intraoperative hypotension, defined by either reduction from baseline or absolute thresholds, and acute kidney and myocardial injury after noncardiac surgery: a retrospective cohort analysis. Anesthesiology 2017; 126:47–65.
24. Sessler D, Bloomstone J, Aronson S, *et al.* Perioperative quality initiative consensus statement on intraoperative blood pressure, risk and outcomes for elective surgery. Br J Anaesth 2019; 122:563–574.
25. Pinto M, Chedid M, Sekine L, *et al.* Intraoperative cell salvage with autologous transfusion in liver transplantation. World J Gastrointest Surg 2019; 11:11–18.
26. Swift A, Lucero H, Hamilton C, Carroll C. Strategies to avoid intraoperative blood transfusion. Anaesth Intens Care 2019; 20:142–146.