Helping Hands for
Blood Conservation Techniques
and Perioperative Planning

Part 9 May 2001

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Religious and Ethical Position on Medical Therapy, Child Care, and Related Matters

Abortion

Deliberately induced abortion simply to avoid the birth of an unwanted child is the willful taking of human life and hence is unacceptable to Jehovah's Witnesses. If, at the time of childbirth, a choice must be made between the life of the mother and that of the child, it is up to the individuals concerned to make that decision.

Adoption and Foster Care

Every effort is made to assist the natural parent(s) to care for their children and to preserve, to the extent possible, the integrity of the family. If custodial care by others is necessary, the best physical, emotional, and spiritual environment is desirable and encouraged. Witness families have provided adoptive and foster care for both Witness and non-Witness children.

Advance Directives

Jehovah's Witnesses carry on their person an Advance Medical Directive/Release that directs no blood transfusions be given under any circumstances, while releasing physicians/hospitals of responsibility for any damages that might be caused by their refusal of blood. When entering the hospital, release forms should be signed that state matters similarly and deal more specifically with the hospital care needed. Witness patients request medical alternatives to blood transfusion.
Alcohol, Narcotics, Medications
Moderate use of wine and other alcoholic beverages is not prohibited by the Bible. (Deuteronomy 14:26; Ephesians 5:18; 1 Timothy 5:23) Similarly, Bible principles of moderation and respect for one's life and mental faculties would rule out taking drugs for "highs" and thrills or to produce a form of drunkenness. The taking of mindaltering medications and drugs, including narcotics for severe pain, under the supervision of a physician, would be a matter for personal decision. Though one would not want to resort too quickly or without good cause to drugs that were addictive or hallucinatory if other effective methods of treatment were available or if endurance of temporary pain would be the wise and preferable course, 2 Corinthians 7:1.

Alternatives to Blood Transfusion
Use of allogeneic (donor) blood transfusion can be avoided by the systematic use of appropriate clinical strategies for managing hemorrhage and anemia without blood transfusion. These strategies use combinations of drugs, medical devices, and surgical/medical techniques to conserve the patient's own blood and to help his/her body act as its own blood bank. (Please refer to overview on page 4.) This is called blood conservation or "bloodless" medicine and surgery.

Autotransfusion
Autotransfusion is acceptable to many of Jehovah's Witnesses (this being a matter of conscience) when the equipment is arranged in a closed circuit that is constantly linked to the patient's circulatory system and there is no storage of the patient's blood. Jehovah's Witnesses do not accept preoperative collection, storage, and later reinfusion of blood.

Blood Transfusions
Jehovah's Witnesses believe that blood transfusion is prohibited by Biblical passages such as: "Only flesh with its soul-its blood-you must not eat" (Genesis 9:3, 4); "[You must in that case pour its blood out and cover it with dust" (Leviticus 17:13, 14); and "Abstain . . . from fornication and from what is strangled and from blood." (Acts 15:19-21). While these verses are not stated in medical terms, Witnesses view them as ruling out transfusion of whole blood, packed red blood cells, white blood cells, plasma, and platelets. However, Witnesses' religious understanding does not absolutely prohibit the use of minor blood fractions, such as albumin, clotting factors, and immune globulins. -See Immunoglobulins, Vaccines.

Refusing blood does not make Jehovah's Witnesses anti-medicine. There are many effective nonblood medical alternatives to allogeneic blood. For example, nonblood volume expanders are acceptable, and reinfusion of their own blood is permitted by many Witnesses when the blood is not stored and when the equipment is arranged in a circuit that is constantly linked to the patient's circulatory system. (See page 4.)

Burial of a Fetus
The decision is a personal one to be made by the couple or the woman involved.

Child Discipline, Neglect, and Abuse
Child neglect or abuse has no justification. Discipline in the sense of instruction, training, and balanced correction are vital in molding the lives of young children. The Bible speaks approvingly of using the "rod"
of parental authority in correcting children, which may include appropriate but moderate physical chastisement at times. -Proverbs 13:24; 29:15, 17.

**Circumcision**

Under Christian law, whether one is or is not circumcised has no spiritual value. (1 Corinthians 7:19) This is a personal matter for the parents to decide on behalf of their child.

**Decision-Making and Treatment Information**

The patient (or parents/guardians of young children) should be fully informed on diagnosis, prognosis, and treatment recommendations so that informed health care decisions can be made. Parents have the natural and legal right to make such decisions for their children. In a rare emergent situation where doctors may feel the need to get a court order to impose medical care to which the parents have not given consent (such as administering a blood transfusion), the parents should be informed of such intended action as early as possible so that they can also be represented in court.

**Dietary Laws and Beliefs**

Christians are required to abstain from eating blood and meat of animals from which blood has not properly been drained. (Acts 15:28, 29) Aside from this Biblical injunction, there is no restriction on what is to be eaten.

**Dissection and Autopsies**

Unless there is compelling reason, such as when an autopsy is required by a governmental agency, Jehovah's Witnesses generally prefer that the body of a beloved relative not be subjected to a postmortem dissection. The appropriate relative(s) can decide if a limited autopsy is advisable to determine cause of death and the like.

**Drugs**

See "Alcohol, Narcotics, Medications."

**Euthanasia**

See "Prolongation of Life and Right to Die."

**Handicapping Conditions (Birth Defects)**

See comments under "Prolongation of Life and Right to Die."

**Heart Bypass**

Some Witness patients permit the use of a heart-lung machine when the pump is primed with nonblood fluids and blood is not stored in the process.

**Hemodialysis**

Hemodialysis is a matter for each Witness patient to decide conscientiously if a closed circuit is employed, if no blood prime is used, and if there is no blood storage.

**Hemodilution**

Induced hemodilution is a matter for the Witness patient to decide according to his conscience when a closed circuit is used and no blood storage is involved. Jehovah's Witnesses do not accept preoperative collection and storage of blood and its later transfusion.

**Immunoglobulins, Vaccines**

The religious understanding of Jehovah's Witnesses does not absolutely prohibit the use of minor blood fractions such as albumin, immune globulins, and hemophiliac preparations. Each Witness must decide individually whether he/she can accept these. Accepting vaccines from a nonblood source is strictly a medical decision to be made by each patient.
"Living Will"/Substitute Decision-Maker/ Power of Attorney for Medical Decisions
Each patient will decide what is appropriate for him/her according to his/her circumstances and the provisions of the law.-See "Decision-Making and Treatment Information."

Medications
See "Alcohol, Narcotics, Medications."

Narcotics
See "Alcohol, Narcotics, Medications."

Organ Donation and Transplantation
While the Bible specifically forbids consuming blood, no Biblical command pointedly forbids the taking in of tissue or bone from another human. Therefore, whether to accept an organ transplant is a personal, medical decision. The same would be true of organ donation.

Prolongation of Life and Right to Die
Life is sacred and the willful taking of life under any health care circumstance would be wrong. For this reason, reasonable and humane effort should be made to sustain and prolong life. However, the Scriptures do not require that extraordinary, complicated, distressing, and costly measures be taken to sustain a person, if such, in the general consensus of the attending physicians, would merely prolong the dying process and/or leave the patient with no quality of life. Any advance directions by the patient that specifically defined what was or was not wanted should be respected.

Religion and Healing Processes(Faith Healing)
Jehovah's Witnesses have faith in God but do not believe in faith healing today. Miraculous healing was God's arrangement for a limited time.

Religious Sacraments, Ordinances, Rituals, and Customs
Jehovah's Witnesses do not have special rituals that are to be performed for the sick or for those dying. Every reasonable effort should be made to provide medical assistance, comfort, and spiritual care needed by the sick patient.

Serums
Serums are not forbidden; however, an individual Witness may still conscientiously refuse them. The same applies to albumin as a minor component of blood.

Transplants
See "Organ Donation and Transplantation."

Vaccinations
See Immunoglobulins, Vaccines."

Volume Expanders
Nonblood expanders are acceptable to Witness patients.
Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion (QR) PART 2 (Revised Version June 2000)

1. Surgical Devices and Techniques to Locate and Arrest Internal Bleeding

   a. Electrocautery/Electrosurgery

   b. Laser Surgery

   c. Argon Beam Coagulator

   d. Stereotactic Radiosurgery

   e. Microwave Coagulating Scalpel

   f. Ultrasonic Scalpel

   g. Endoscope ("keyhole surgery")

   h. Arterial Embolization

   i. Tissue Adhesives

2. Techniques and Devices to Control External Bleeding and Shock

   a. For Bleeding:
      (1) Direct Pressure
      (2) Ice Packs
      (3) Elevate body part above level of heart
      (4) Hemostatic Agents (see below)
      (5) Prompt surgery
      (6) Tourniquet
      (7) Controlled Hypotension

   b. For Shock:
      (1) Trendelenburg/shock position (patient supine with head lower than legs)
      (2) Medical Antishock Trousers (M.A.S.T.)
      (3) Appropriate volume replacement after bleeding controlled

3. Operative and Anesthetic Techniques to Limit Blood loss During Surgery

   a. Hypotensive Anesthesia

   b. Induced Hypothermia

   c. Intraoperative Hemodilution

Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Hospital Information Services (Canada) for Jehovah's Witnesses
d. Hypovolemic Hemodilution

e. Intraoperative Blood Salvage

f. Mechanical occlusion of bleeding vessel

g. Reduce blood flow to skin

h. Meticulous hemostasis

i. Preoperative planning:
   (1) Enlarged surgical tearn/Minimal time
   (2) Surgical positioning
   (3) Staging of complex procedures


a. Transcutaneous Oximeter

b. Pulse Oximeter

c. Pediatric microsampling equipment

d. Multiple tests per sample

5. Volume Expanders

a. Crystalloids
   (1) Ringer's Lactate
   (2) Normal Saline
   (3) Hypertonic Saline

b. Colloids
   (1) Dextran
   (2) Gelatin
   (3) Pentastarch/Hetastarch

c. Perfluorocarbons

6. Hemostatic Agents for Bleeding/Clotting Problems

a. Topical:
   (1) Avitene
   (2) Gelfoam
   (3) Oxycel
   (4) Surgicel
   (5) Many others

b. Injectable:
   (1) Desmopressin
   (2) e-Aminocaproic Acid
   (3) Tranexamic Acid
   (4) Vitamin K
c. Other Drugs:
   (1) Vasopressin
   (2) Conjugated Estrogens
   (3) Aprotinin
   (4) Vincriistine

7. Therapeutic Agents and Techniques for Managing Anemia

a. Stop any bleeding
b. Oxygen support
c. Maintain intravascular volume
d. Hematinics (iron, folic acid, Vitamin B12)
e. Erythropoietin
f. Nutritional support
g. Immunosuppressive agents if indicated
h. Perfluorocarbons
i. Granulocyte-Colony Stimulating Factor
j. Hyperbaric Oxygen Therapy
k. 10/30 rule has no scientific basis

NOTE: Current references from respected peer-reviewed medical journals are available upon request from Hospital Information Services (Canada) for jehovah's Witnesses.

Hospital Information Services facilitates, at no cost to the physician, access to current and clinically relevant information regarding strategies to avoid allogeneic blood transfusion in medicine and surgery.

Local representatives of the Hospital Liaison Committee Network for jehovah's Witnesses are also available to support physicians and Witness patients, at the patient's request, by arranging consultations with physicians and medical teams experienced in the use of medical alternatives to blood transfusion.

**Hospital Information Services (Canada) for Jehovah's Witnesses**

- Hospital.info@wtbts.ca
- Information/Referral # 1-800-265-0327 #
- 24-Hour Hot Line

In BCT May 2000 Part 9
CLINICAL STRATEGIES for managing HEMORRHAGE and ANEMIA without BLOOD TRANSFUSION in the ICU (QR)

PART 3 (Revised Version June 2000)

GENERAL NONBLOOD MANAGEMENT PRINCIPLES

1. Formulate a comprehensive plan of care for avoiding allogeneic blood, integrating a combination of blood conservation modalities.
2. Anticipate and be prepared to address potential risks.
3. Employ a multispeciality team approach.
4. Maintain frequent, close observation for hemorrhage. Early recognition and prompt intervention to prevent/control abnormal bleeding is the cornerstone of effective care for patients who will not accept allogeneic blood. In general, avoid a "watch and wait" approach to the bleeding patient.
5. Exercising clinical judgment, be prepared to modify routine practice when appropriate.
6. Consult promptly with senior specialists experienced in nonblood management if complications arise.
7. Transfer a stabilized patient, if necessary, to a major centre before the patient's condition deteriorates.
8. Discuss risks (both short- and long-term), benefits and alternatives to proposed interventions with the patient/family.

GENERAL THERAPEUTIC PRINCIPLES 1,2,3,4

1. Control or avoid hemorrhagic and iatrogenic blood loss.
2. Optimize cardiac and respiratory support by maximizing oxygen delivery (volume replacement, oxygenation, vasoactive agents) and minimizing oxygen consumption (analgesia, sedation, mechanical ventilation).
3. Restore/improve blood count by stimulating hematopoiesis.

1. MINIMIZE HEMORRHAGIC BLOOD LOSS5

A. Avoid hypertension and hypervolemia 6,7

1. If active bleeding present, consider tolerating mild hypotension (i.e., reduced systolic blood pressure in the range of 90-100 mm Hg for a normotensive patient) until hemorrhage is promptly controlled, using a combination of blood conservation modalities.8,9,10
2. Hypertension and hypervolemia may inhibit spontaneous hemostasis, accentuate hemorrhage, or disrupt effective thrombus. Excess fluids may also promote hemorrhage by diluting coagulation factors and lowering blood viscosity.
3. Allow a slow, gradual return to normal blood pressure after bleeding is controlled.11
4. In resuscitation from shock state avoid circulatory overload. Fluid administration by protocol without ongoing clinical judgment should be avoided.
5. Use vasodilators to manage hypertension with/without automated control of transient hypotension.12

B. Avoid severe hypotension

1. Use vasoactive drug therapy to control marked hypotension not responding to fluid therapy.
2. In severe head trauma, maintain appropriate level of cerebral perfusion pressure (70-80 mm Hg).13,14 Resuscitation of head-injured, multiply-traumatized patients with lactated Ringer's, hypotonic, or dextrose-containing solutions may be detrimental.15,16

C. Maintain extra vigilance

to detect and treat ongoing bleeding and other complications. 17

Note: Continuous low-level bleeding (e.g., from small vessels and capillaries) could become significant if tolerated for a prolonged period of time.

D. Avoid delay.

Do not defer surgery if active bleeding cannot be controlled nonoperatively.18,19.
(e.g., pharmacologic, endoscopic, angiographic)

E. Blood salvage

20,21,22 (i.e., postoperative)

Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Hospital Information Services (Canada)/for Jehovah's Witnesses
F. Maintain normothermia
unless hypothermia is indicated 23
Notes:
1. External active warming may be superior to passive warming.
2. Coagulation proteins may be less effective at lower temperatures, increasing risk of bloodloss.24
3. Hypothermia is associated with higher infection rates.25
4. Controlled hypothermia may be considered for severe anemia or cerebral protection.26, 27

G. Adequate and appropriate heparin/protamine dosing 28,29

H. Hemostatic agents for bleeding/clotting problems 30,31

1. Tranexamic acid 32,33
2. Epsilon-aminocaproic acid 34
3. Desmopressin 35,36,37 (use trial dose to assess response)38
4. Aprotinin 39,40,41 Note: Aprotinin or Desmopressin may reduce bleeding due to drug-induced platelet dysfunction (e.g., due to ASA, NSAIDs, beta-lactam antibiotics, antithrombotics).42
5. Conjugated estrogens 43,44
6. Vasopressin 41
7. Appropriate drugs to control gynecological hemorrhage (e.g., hormone manipulation) 45
8. Vitamin K 46,47

Notes:
1. Consider prophylactic parenteral administration of vitamin K.
2. Causes of vitamin K deficiency include:
   a. Inadequate dietary intake, limited absorption or synthesis
   b. Antibiotics
   c. Anticoagulants (e.g., warfarin)
   d. Other drugs (e.g., salicylates)

9. Treatment for congenital or acquired hemorrhagic disorders: a. Clotting factor replacement therapy
   b. Cryoprecipitate

I. Prophylaxis of upper gastrointestinal hemorrhage 48,49

1. Cytoprotective agents (e.g., sucralfate) 50
2. Enteral nutrition 51
3. Proton pump inhibitors 52
4. H2 blockers 53 (associated with thrombocytopenia and pancytopenia in some patients; may reduce iron solubility due to increase in gastric pH)

J. Avoid/treat infections promptly

1. Prophylaxis of infection54,55,56
2. Thorough assessments of wounds; avoid secondary contamination (e.g., colon or rectal)

2. REDUCE IATROGENIC BLOOD LOSS

A. Restrict Phlebotomy 57,58

1. Perform only essential tests
2. Eliminate duplication; perform multiple tests per sample 59
3. Pediatric phlebotomy tubes 60
4. Point-of-care whole blood microsampling 61,62,63,64
5. Pulse oximetry
6. Transcutaneous oximetry
7. End-tidal CO2 monitoring
8. In-line blood reservoirs; eliminate purge discard volume 61,66
9. In-line arterial blood gas monitors 67

B. Review adverse effects of current medications (NSAIDs, e.g., Ketorolac; Antibiotics, e.g., cephalosporins, penicillins) and drug reactions and interactions that may increase risk of iatrogenic anemia, hypoprothrombinemia, bleeding or suppress erythropoiesis

1. Consider dosage reduction, discontinuation, or substitution with alternative medication. Continue monitoring for adverse reactions.
2. Judicious prophylaxis of thromboembolism. Closely monitor patients treated with anticoagulants/antiplatelet drugs. Risk of hemorrhage is related to dosage, duration of therapy, and predisposing conditions where risk of hemorrhage is present.
3. MAXIMIZE OXYGEN DELIVERY

A. Maintain intravascular volume

68 (stop any bleeding-see 1. A.-1.)

1. Judicious use of asanguineous fluids:
   i. Crystalloids
      a. Ringer’s lactate
      b. Normal saline
      c. Hypertonic saline
   ii. Colloids
      a. Pentastarch
      b. Hetastarch (may adversely affect coagulation-see note 3 below)
      c. Gelatin
      d. Dextran (may adversely affect coagulation-see note 3 below)
   iii. Perfluorochemicals (oxygen-carrying blood substitutes)

Notes:
1. Normovolemic anemia can be tolerated in hemodynamically stable patients.
2. Avoid circulatory overload, especially in profoundly anemic patients. Closely monitor fluid balance and vital signs.
3. The clinician should judiciously choose the solution(s) for volume expansion. (See also 1. A.)
4. If indicated (clinical examination and non-invasive investigation provide inadequate data), use invasive monitoring (e.g., pulmonary artery catheter, central venous line, arterial catheter, antiseptic-impregnated catheters) to guide the management of patients.
5. Bleeding should be suspected and diagnosis sought when a patient shows evidence of hypovolemia despite reasonable hydration. Avoid aggressive fluid replacement to normalize blood pressure. Adequate perfusion can be obtained at lower pressure. Simple measurement of vital signs is a poor indicator of blood volume.
6. Albumin therapy may be detrimental to the shocked patient.

B. Maintain cardiovascular support

1. Closely monitor and assess oxygen utilization/hypoxia (e.g., clinical signs, pH and lactate, urine output), hemodynamics (e.g., cardiac output, pulmonary artery wedge pressure)
2. Maintain/improve tissue perfusion and cardiac output (inotropes)
3. Maintain blood pressure (vasopressors)

C. Maintain Ventilation and Oxygenation

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1. Appropriate and adequate ventilatory support for optimal oxygenation and CO2 elimination (e.g., PEEP, IPPV, CPAP)

Note: Nitric oxide and hypercapnia may increase risk of bleeding.

2. Ongoing monitoring and assessment of the adequacy of ventilation and oxygenation (clinical assessment, arterial blood gas analysis and/or pulse oximetry, capnometry, oximetric pulmonary artery catheter) to allow for early and appropriate intervention
3. Hyperbaric Oxygen Therapy (HBO)

   a. Indications for HBO therapy:
      i. Adequate oxygen transport and metabolism (arterial and mixed venous blood gas analysis) cannot be achieved using conventional mechanical ventilation
      ii. Tissue hypoxia (e.g., mental obtundation, abnormal vital signs, decreased urine output, metabolic acidosis) in the presence of adequate fluid resuscitation and perfusion
   b. Use HBO therapy with i.v. r-HuEPO, and iron, folate, and nutrition to support hematopoiesis
   c. Use intermittent HBO therapy and antioxidants to minimize oxygen toxicity or barotrauma
   d. Provide concomitant therapy with i.v. r-HuEPO, and iron, folate, and nutrition to support hematopoiesis

4. MINIMIZE OXYGEN CONSUMPTION

A. Adequate and appropriate analgesia

B. Sedation;
   consider neuromuscular blockade (i.e., to prevent muscle shivering, agitation, anxiety)

   1. To minimize adverse effects, use lowest dose and shortest duration of analgesia and sedation necessary
   2. Closely monitor degree of blockade (e.g., peripheral nerve stimulation) and adjust drug doses to determine minimum appropriate dosage to allow faster recovery of neuromuscular function and spontaneous ventilation; avoid standard dosing

C. Mechanical ventilation

D. Maintain/restore normothermia

   unless hypothermia is indicated. Actively rewarm postoperative patients. Cool febrile patients

5. IMPROVE BLOOD COUNT

A. Therapy for Hematinic Deficiencies:

   1. i.v. iron
   2. Folic acid
   3. Vitamin B12

Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Hospital Information Services (Canada) for Jehovah’s Witnesses
B. Prophylactic hematonic therapy to maximize stores and optimize response to erythropoietin

C. Recombinant Erythropoietin (r-HuEPO) Therapy

1. Subcutaneous injection or intravenous administration

2. Factors that may delay or attenuate response to r-HuEPO include: 113, 114
   a. Iron deficiency 115, 116, 117
   b. Chronic infection, inflammation, or malignant process
   c. Occult blood loss
   d. Bone marrow disease
   e. Vitamin deficiencies (folate, B12)
   f. Poor subcutaneous absorption of r-HuEPO
   g. Hemolysis
   h. Aluminum intoxication (e.g., medications, dialysate fluid)
   i. Osteitis fibrosa cystica (hyperparathyroidism)

Notes:

1. Endogenous EPO production is proportional to degree of anemia. For severe anemia, r-HuEPO should be used for rapid restoration of red cell mass.

2. A high endogenous EPO level does not preclude response to r-HuEPO. 118

3. Rate of response to r-HuEPO is dose dependent and varies among patients. Therapy may need to be individualized. Monitor and escalate dosage or change route of administration to improve response. 119, 120, 121, 122

4. Consider pretreatment investigation to identify and correct, if possible, any factor that could mediate erythropoietin resistance. If not correctable, use higher dose. 123

5. Hyperoxic ventilation (a high PaO2) or critical illness may blunt endogenous EPO production in response to acute anemia.

6. r-HuEPO administration up to 2,000 U/kg/day in divided doses has been reported to be well tolerated. 124

7. Monitor for hypertension, which may induce bleeding, and consider initiation or increases in antihypertensive therapy.

8. r-HuEPO may procure a moderate dose-dependent rise in the platelet count, within the normal range, during treatment. 125, 126

D. Other Hematopoietic Growth Factors (e.g., G-CSF, GM-CSF, IL-11)

E. Nutritional Support

6. PREOPERATIVE WORKUP / CLINICAL EVALUATION

Thorough patient assessment is essential to formulating a comprehensive risk factor-based plan of care incorporating multiple blood conservation measures in an optimal manner. 128

A. Medical History and Physical Examination

1. History of anemia
2. Congenital/acquired bleeding disorders 131 (known from birth, circumcision, frequent nose bleeds, easy bruising without trauma, tonsillitis, dental extraction, menorrhagia, prolonged bleeding after minor skin lesion, previous surgery, pregnancy, etc.)
   a. Personal history
   b. Family history
3. End-organ disease/injury (esp. renal or hepatic)
4. Previous surgery (blood loss may be increased with repeat surgery)
5. Identify medications that may adversely affect hemostasis 132 (e.g., ASA, NSAIDs, anticoagulants, platelet aggregation inhibitors, antibiotics, dietary supplements). Also ensure that additional prescription and nonprescription drugs containing ASA or NSAIDs are not inadvertently taken by patients. 133, 134
6. Physical examination
   (e.g., purpuric lesions, petechiae, ecchymosis, hepatomegaly, splenomegaly)

B. Laboratory Assessment/Screening

1. Establish baseline parameters:
   a. Complete blood count (including red blood cell and platelet counts)
   b. Serum ferritin
   c. Serum folate
   d. Serum vitamin B12
   e. PT, PTT, template bleeding time (as indicated)
2. Additional investigation as indicated by history and degree of hemostatic challenge:
   a. Coagulation tests
   i. Platelet function
   ii. Fibrinogen concentration
   iii. Fibrin degradation products (FDP)
   iv. Specific coagulation factor assays
   v. Assay for ristocetin cofactor activity (von Willebrand disease, Bernard-Soulier syndrome)
   b. Liver function
   c. Renal function (creatinine)
   d. Point-of-care coagulation monitoring (e.g., thrombelastogram, Sonoclot) 138

Note: Minimize iatrogenic blood loss. (See 2. A.)
C. Management of bleeding risk/therapy for coexisting disease [9,140]

1. Consider discontinuing medications associated with increased postoperative bleeding complications (from 3 to 14 days preoperatively) and temporary substitution with alternate therapy:
   - ASA (at least 7 days before surgery)
   - NSAIDs (10 days or more for NSAIDs with long half-lives)
   - Anticoagulants, platelet inhibitors (e.g., warfarin, ticlopidine)
   - Antibiotics (e.g., ticaricillin)
2. Treatment for congenital and induced hemorrhagic disorders [142]
3. Consider preoperative prophylactic optimization of tissue perfusion by augmentation of cardiac output [143,144] (patients with coexisting pathology and poor cardiac function)

D. Correct anemia and optimize preoperative hemoglobin level (See 5. A-C.)

Note: Consider preoperative use of r-HuEPO in surgical patients where there is risk of significant blood loss, even if not anemic. [145,146,147,148]

7. SURGICAL/ANESTHETIC BLOOD CONSERVATION TECHNIQUES [149,150,151,152,153]

A. Surgical procedure(s) to specifically avoid and prevent bloodloss [154,155]
   1. Minimally invasive techniques (endoscopic/laparoscopic surgery)
   2. Enlarged surgical team minimal time [156]
   3. Surgical positioning to minimize bleeding [157,158]
   4. Staged surgery for complex procedures [159]

B. Arterial Embolization [160,161,162] (including preoperative) [163,164]

C. Meticulous Hemostasis [165, 166, 167]

D. Mechanical occlusion of bleeding vessel [168]

E. Electrocautery

F. Ultrasonic Scalpel [169]

G. Argon beam coagulator [170,171]

H. Tissue Adhesives

I. Intraoperative Blood Salvage [174, 175]

J. Hemodilution [176, 177]

K. Platelet-rich plasma sequestration [178, 179]

L. Induced hypothermia

M. Hypotensive anesthesia [180]

Note: Regardless of the choice of anesthesia (regional, narcotic, etc.) the anesthetic technique must be well-planned and executed so as to minimize blood loss (e.g., positioning, ventilation, deliberate hypotension). Avoid increases in arterial or venous pressure [181]

This table reflects current clinical and scientific knowledge and is subject to change. The strategies do not indicate an exclusive course of treatment. Clinical judgment may suggest modification, depending on the specific circumstances and patient wishes.
References

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76. Tuman K.I. Tissue oxygen delivery: the physiology of anemia.


83. third European Consensus Conference in Intensive Care Medicine. Thrombus hypoxia: How to detect, how to correct, how to prevent. Société de r´eanimation de langue francaise.


89. Cost J. Alternative management procedures should be used. *BMJ* 1998; 316:246.

90. Rudis MI, Sikora CA, Angus E, et al. A prospective, randomized, controlled evaluation of peripheral nerve stimulation versus standard clinical dosing of neuromuscular

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**Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology**

**Hospital Information Services (Canada) for Jehovah’s Witnesses**
Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Information Services/Canada for Jehovah’s Witnesses.


Clinical Strategies for Avoiding and controlling Hemorrhage and Anemia without Blood Transfusion in Obstetrics and Gynecology

(QR) PART 4 (Revised June 2000)

General Principles of Nonblood OB/GYN Management

1. Prepare an individualized management plan to facilitate rapid decision making. Be prepared to utilize a combination of interventions to minimize blood loss.
2. Ensure availability of experienced personnel, appropriate drugs, and equipment to prevent and promptly manage hemorrhage without blood transfusion.
3. Communicate plan to involved medical and nursing personnel to avoid treatment delays.
4. Maintain close observation for hemorrhage. The clinical urgency of unspectacular low-level persistent bleeding may not be recognized until compensatory mechanisms fail and blood pressure falls. Early recognition and prompt intervention to prevent/control abnormal bleeding is the cornerstone of effective care for patients who will not accept allogenic blood. In general, avoid a "watch and wait" approach to the bleeding patient.
5. Adopt a multidisciplinary team approach to patient care. Involve other specialists in planning, if necessary.
6. Transfer a stabilized patient, if necessary, to a major centre before the patient's condition deteriorates.
7. Obtain informed consent to nonblood management. Discuss the options and the risks and benefits (both short- and long-term) of proposed interventions with the patient / family.

General Therapeutic Principles

1. Optimize red blood cell count preoperatively and during pregnancy.
2. Timely recognition and expeditious control of hemorrhage must be the first objective of treatment in the hemorrhaging patient who refuses blood transfusion. In the face of severe hemorrhage, definitive measures are required.
3. Maintain appropriate fluid resuscitation. Until hemorrhage is controlled, avoid attempts to normalize blood pressure; permit mild hypotension.
4. Prevent or treat coagulation disorders promptly.
5. Minimize the amount of blood drawn for laboratory testing.

1.Clinical Evaluation/Preoperative Planning1,2

A. Medical history and physical examination3
1. History of anemia
2. Hereditary or acquired bleeding disorders4,5
   a. Personal history
      (1) easy bruising
      (2) frequent nose bleeds or unexplained bleeding from the gums
      (3) bleeding after tooth extractions
      (4) postoperative bleeding (e.g., after tonsillectomy, adenoidectomy)
      (5) menstrual history, especially of menorrhagia
   b. Family history
      (1) easy bruising
      (2) frequent nose bleeds or unexplained bleeding from the gums
   c. Other end-organ disease or injury (esp. renal or hepatic)
3. Determine drug allergies. Take an inventory of medications used by the patient. Identify current prescription or nonprescription drugs that may adversely affect hemostasis (e.g., anticoagulants, platelet aggregation inhibitors, preparations containing ASA or NSAIDs, or antibiotics)6

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6. Physical exam (e.g., purpuric lesions, petechiae, ecchymosis, hepatomegaly, splenomegaly)

**Note:** Clinicians should have a high index of suspicion of a bleeding disorder in women with persistent menorrhagia sufficient to cause iron deficiency or a history of bleeding after hemostatic challenge.

**B. Laboratory assessment/screening**

1. Complete blood count (including red cell and platelet counts)
2. Additional investigation as indicated by history and degree of hemostatic challenge:
   a. Template bleeding time (to detect platelet dysfunction)
   b. PT, PTT
   c. Serum ferritin level
   d. More detailed coagulation studies to identify clotting disorders, including specific coagulation factor assays, e.g., for von Willebrand disease
   e. Liver function
   f. Renal function (creatinine)

**Note:**

1. Thorough history taking and judicious laboratory testing improve the estimation of risks and help guide clinical decision making.
2. Women with mild coagulation abnormalities in early labour may need special attention regarding the risk of postpartum hemorrhage.
3. Minimize the volume of blood drawn for laboratory analysis throughout the perinatal or perioperative period. Combine laboratory blood tests. Use pediatric-sized blood collection tubes, point-of-care blood testing and microsampling.
4. In preparation for obstetric emergencies, the obstetrician should seek early collaboration with the anesthetist, anticipate which parturients are at higher risk, and develop a plan of care to facilitate decisive intervention.

**C. Optimize blood count**

1. Hematinics (maximize store)
   a. Oral13 or parenteral14-16 iron
   b. Folic acid17 (oral/parenteral)
   c. Vitamin B1217,18 (parenteral/oral)

**Note:**

1. Bioavailability of oral iron may be improved with concomitant administration of ascorbic acid.19
2. Iron absorption may be decreased by concurrent use of milk products, egg yolks, coffee, tea, antacids, fiber, and soy protein.
3. Administration of H2 blockers (cimetidine, ranitidine), proton pump inhibitors (omeprazole), and other drugs may decrease the absorption of iron.
4. Parenteral iron should be considered for patients with low iron stores, intolerance to oral iron, inadequate absorption, noncompliance, or patients with chronic or severe blood loss.20 It is reported that intravenous iron as a total dose infusion is able to replenish iron stores more efficiently and faster than oral iron therapy.21,22

2. Recombinant Erythropoietin (r-HuEPO)23,24,25
   a. Provide supplemental iron, folate, and B12 to support erythropoiesis.
   b. Consider use of r-HuEPO during pregnancy and preoperatively for anemic patients and also preoperatively for non-anemic surgical patients where there is risk of significant blood loss.
   c. Rate of response to r-HuEPO is dose dependent and varies among patients. Monitor and escalate dosage or change route of administration to improve response.26,27,28
   d. Consider factors that may diminish or delay response to r-HuEPO therapy.29,30
   e. Monitor for hypertension and consider initiation of antihypertensive therapy.
3. Anabolic Androgenic Hormones23,24,25 (to stimulate erythropoiesis if r-HuEPO unavailable)
4. Protein Nutrition26 (oral/subc[parenteral)

**D Management of Menorrhagia and Bleeding Risk**

1. Emergency treatment for menorrhagia26
   a. L.V. Conjugated Estrogens
   b. High dose Oral Contraceptive preparation q.6.h. for 24 to 48 hours
   c. Emergency Hysterectomy and Curettage, or Hysterectomy27

2. Preoperative preparation for elective surgery or for chronic bleeding28
   a. Tranexamic acid29,30
   b. Prostaglandin inhibitors (may cause GI bleeding
   c. Combined Oral Contraceptives
   d. Progesterone (e.g., levonorgestrel29)
   e. Danazol (reported to be more effective in patients over 45)
   f. GnRH analogue31

3. Discontinue/substitute medications that can affect platelet aggregation or are associated with bleeding complications
   a. Anticoagulants, platelet inhibitors (If a patient is at high risk or a diagnosis of thromboembolism is established, monitor anticoagulants closely or substitute with low molecular weight heparin)
   b. Aspirin or NSAID-containing preparations
   c. Antibiotics

4. Consider discontinuation of oral contraceptive at least one month before major elective surgery due to risk of thromboembolic complications.

**Note:** In addition to gynecologic disorders, menorrhagia may reflect an underlying defect in hemostasis.
2. SURGICAL AND ANESTHETIC BLOOD CONSERVATION TECHNIQUES\textsuperscript{43,44,45}

A. Insert two large-bore intravenous catheters prior to major surgery; warming of fluids and the patient will avoid hypothermia and coagulopathy

B. Enlarged surgical team/minimal time

C. Meticulous hemostasis
   1. Electrosurgery/Electrocautery
   2. Laser surgery
   3. Microwave coagulating scalpel\textsuperscript{46}
   4. Ultrasonic scalpel\textsuperscript{17,49,50}
   5. Mechanical occlusion of bleeding vessels\textsuperscript{39}
   6. Arterial embolization\textsuperscript{1,32,33} (including preoperative) (See also 2.K.4.)

D. Uterine Thermal Balloon Ablation Therapy\textsuperscript{54,55}

E. Transcervical or hysteroscopic endometrial ablation\textsuperscript{56,57}

F. Spinal/epidural/general anesthesia\textsuperscript{58,59}

G. Normovolemic hemodilution\textsuperscript{60,61,62}

H. Controlled hypotension\textsuperscript{63}

I. Intraoperative blood salvage\textsuperscript{64,65,66,67}

J. Considerations for cesarean section:
   1. Intraccesarean blood salvage/recovery with precautions\textsuperscript{68,69,70}
   2. Spontaneous placental delivery at cesarean section\textsuperscript{71}

K. Management of surgical Hemorrhage/shock
   1. Hemorrhage should be immediately controlled
   2. Elevate legs/apply blood pressure cuffs
   3. Appropriate volume replacement after bleeding controlled. Avoid aggressive intravenous fluid replacement and uncontrolled hemorrhage\textsuperscript{72}
   4. Angiographic arterial embolization\textsuperscript{73,74} including prophylactic\textsuperscript{75}
   5. Prompt laparoscopy/surgery/uterine or internal iliac artery ligation
   6. Medical Antishock Trousers (M.A.S.T.)\textsuperscript{76}

Notes:
1. Involve anesthetists and operating room staff in preoperative planning.
2. Regardless of the choice of anesthesia drug (general, regional) the anesthetic technique must be well planned and executed so as to minimize blood loss. Avoid increases in arterial or venous pressure.

3. NONBLOOD VOLUME EXPANDERS

A. Crystalloids
   1. Ringer's lactate
   2. Normal saline
   3. Hypertonic saline\textsuperscript{77}

B. Colloids
   1. Gelatin
   2. Pentastarch\textsuperscript{79}/Hetastarch\textsuperscript{79,80} (preferable low molecular weight)
   3. Dextran (anticoagulant effect opposable with desmopressin)\textsuperscript{81}

Notes:
1. In active bleeding or oozing, permit mild hypotension (systolic blood pressure of 90-100 mm Hg in a normotensive patient) while taking prompt measures to control the hemorrhage.\textsuperscript{82,83}
2. Appropriate volume replacement, judiciously choosing the solution(s) for volume expansion.\textsuperscript{39,85} Adequate perfusion can be obtained with deliberate underresuscitation and mild hypotension.
3. Avoid hypertension. Aggressive fluid resuscitation may inhibit spontaneous hemostasis, accentuate hemorrhage, or disrupt clots. Excess fluids may also promote hemorrhage by diluting coagulation factors and lowering blood viscosity.
4. Allow a slow, gradual return to normal blood pressure after bleeding is controlled. Permit mild hypotension during the early postoperative hours.\textsuperscript{79}
5. Avoid circulatory overload, especially in severely anemic patients. Closely monitor fluid balance and vital signs. Use pulmonary artery catheter or CVP line, if indicated.
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4. HEMOSTATIC AGENTS FOR BLEEDING/CLOTTING PROBLEMS

A. Topical

1. Collagen Avitene
2. Gelatin Gelfoam
3. Oxidized cellulose (Oxycel, Surgicel)
4. Tissue adhesives
5. Uterine packing
6. Vaginal/abdominal/pelvic packing
7. Vasopressin (infiltration or soaked uterine packing)
8. Thrombin

Notes:
1. If packing is used, care must be taken to ensure it does not conceal substantial hemorrhage. It may be used as a temporary measure before surgical intervention to repair major vascular injuries.
2. Consider combining hemostatic methods (e.g., vasopressin and tourniquet for myomectomy).

B. Injectable

1. Vitamin K
2. Tranexamic acid
3. Epsilon-aminocaproic acid
4. Desmopressin (in elective case, use trial dose to assess response)
5. Aprotinin

Note: Aprotinin or desmopressin may be used for control of bleeding due to drug-induced platelet dysfunction (e.g., due to ASA, NSAIDs, beta-lactam antibiotics, and antithrombotics).

6. Conjugated estrogens
7. Replacement therapy for congenital/induced hemorrhage disorders (with specific patient consent)

5. OBSTETRIC HEMORRHAGE

A. Antepartum

1. Prompt evacuation of uterus (if indicated)
2. Timely, appropriate drug therapy (See 4.B.)
3. Anticipate postpartum hemorrhage

B. Postpartum

1. Anticipation and prevention; Postpartum Hemorrhage Risk Factors

a. Previous history of postpartum hemorrhage, manual removal of the placenta, or retained products
b. Nulliparity
c. Maternal age, obesity, and/or grand multiparity
d. Abruptio placenta or Placenta previa
e. Multiple pregnancy
f. Intrauterine death
g. Prolonged labour with/without induction
h. Mid-forceps extraction or forceps rotation
i. Breach presentation
j. Cesarean section/prior cesarean delivery
k. Birthweight of 4 kg or more

2. Active management of third stage of labour

a. Thirty seconds to deliver anterior shoulder
b. Immediate prophylactic synthetic oxytocin – I.V. or I.M.
c. Thirty seconds to deliver posterior shoulder
d. Deliver body slowly/head down
e. Deliver placenta by controlled cord traction/displace uterus upwards by suprapubic pressure
f. Prompt extraction or manual removal of placenta if hemorrhage occurs. Consider i.v. nitroglycerine to aid manual extraction of retained placenta.
g. Consider prophylactic ergometrine administration – 1.M.
h. Monitor vital signs and observe for hemorrhage one hour post delivery
i. Never leave bleeding postpartum patient

3. Control of postpartum hemorrhage

a. Uterine massage
b. Transabdominal aortic compression

4. Prevention and Management of Disseminated Intravascular Coagulation (DIC)\textsuperscript{143,144,145}

- Identify and treat the underlying pathologic process without delay. Consult promptly with a hematologist or internist.
- Causes: gram-negative infections, anoxic fluid embolism, abruptio placenta

7. MANAGEMENT OF PROFOUND ANEMIA\textsuperscript{146,147,148,149}

A. Stop any bleeding

1. Avoid hypertension and excessive fluid administration
2. Do not defer surgery if active bleeding cannot be controlled nonoperatively
3. Maintain normothermia (hypothermia is associated with increased blood loss)

B. Restrict laboratory blood testing

C. Maximize oxygen delivery

1. Maintain intravascular volume
2. Mechanical ventilation/hyperbaric oxygen therapy\textsuperscript{150,151}

D. Minimize oxygen consumption

1. Adequate and appropriate analgesia and sedation

E. Improve blood count\textsuperscript{152,153,154} (See I.C.)

This table reflects current clinical and scientific knowledge and is subject to change. Clinical judgement, taking into account individual circumstances and patient wishes, may require adjustments.

References


**Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Hospital Information Services(Canada)for Jehovah’s Witnesses**
114. Alperin JB. Estrogens and surgery in women with von Willebrand’s disease.


111. Ward JP. Trasylol in hyperfibrinolytic haemorrhage.

109. Taylor KM. Aprotinin therapy and blood conservation: extending the indications.


120. Norris TC. Management of postpartum hemorrhage.


94. Wax JR. Channell JC, Vandersloot JA. Packing of the lower uterine segment—new approach to an old technique.


Clinical Strategies for Avoiding Blood Transfusion in Obstetrics and Gynecology Hospital Information Services(Canada)for Jehovah’s Witnesses


149. Thomas JM, Wong CJ, Scheuermann KW, et al. Clinical strategies for managing hemorrhage and anemia without blood transfusion in the ICU. Poster presented at the 7th World Congress of Intensive and Critical Care Medicine; 1997 Jun 29-Jul 3; Ottawa, Canada. Reprint requests: Hospital information Services (Canada), P.O. Box 4100, Georgetown, Ontario, Canada L7G 4Y4; E-mail: hospital.info@wtbts.ca.


