

## Patient safety

# Safety, cost savings, simplicity back broader use of bloodless surgery

**M**ore than 120 centers throughout the US have bloodless surgery programs to serve patients who refuse blood transfusions for religious and other reasons. The practice, which began more than 50 years ago, has evolved through research on blood conservation and new techniques to minimize the need for transfusions.



The Joint Commission is taking a serious look at reducing transfusions, which could spur the growth of blood management and bloodless surgery programs across the country, says Mark Zawadsky, MD, medical director of the Bloodless Medicine and Surgery program at Georgetown University Hospital in Washington, DC.

Blood management has also attracted the attention of the AABB (formerly the American Association of Blood Banks) and the Department of Health and Human Services (HHS).

### Many transfusions unnecessary, costly

The HHS Advisory Committee on Blood Safety and Availability issued findings and recommendations in June 2011.

Among the findings was that too many patients are receiving blood transfusions that they don't need, putting them at risk, wasting limited blood resources, and raising costs.

More than 15 million units of whole blood and red blood cells are transfused annually in the US according to HHS, and as many as 30% of transfusions may be unnecessary.

In 2011, the Implementation Guide for The Joint Commission Patient Blood Management Performance Measures was developed to target indications and screening for blood transfusions ([http://www.jointcommission.org/patient\\_blood\\_management\\_performance\\_measures\\_project/](http://www.jointcommission.org/patient_blood_management_performance_measures_project/)).

Though use of the measures is not an accreditation requirement, participants at a national summit on overuse of blood transfusions, held in 2012 by the American Medical Association and the Joint Commission, called for implementation of the measures at the local and national levels.

### 'Build it and they will come'

Several hospitals have been pioneers in bloodless surgery.

Three years ago, Georgetown University Hospital responded to the needs of the Jehovah's Witness community, which lacked a bloodless center in the DC area.

The Witness community provided organizational support for the program as it was being established, which includes a medical director, nurse coordinator, secretary, and an administrative coordinator.

"We put together hospital protocols and policies to help streamline the process, so when patients who want to avoid blood transfusions come to us, we can immediately tell them the procedures we offer," says Dr Zawadsky.

More than 200 patients a year undergo bloodless surgery at Georgetown, and

about 10% come from outside the Witness community. In the past year, Dr Zawadsky, an orthopedic surgeon, performed some 25 hip and knee replacements in patients in the bloodless program.

“A lot of what we are doing is simply basic good medicine, and it doesn’t have to be just for patients who are bloodless surgery patients. All patients can benefit from these techniques,” he says.

When starting a program, Dr Zawadsky recommends involving the anesthesia department. Anesthesiologists evaluate patients preoperatively, manage them during surgery, and follow up with them in the postanesthesia care unit (PACU). He believes that if you have an anesthesia champion to push the benefits of giving less blood, surgeons may be encouraged to operate this way.

### **Major strategies**

Bloodless surgery at Georgetown and other hospitals consists of 3 strategies (sidebar):

- Preoperative anemia management—administering IV iron or Procrit (epoetin alfa, a synthetic form of the protein human erythropoietin that stimulates bone marrow to make more red blood cells) and discontinuing antiplatelet medications and supplements.
- Intraoperative techniques to minimize loss of red blood cells—normovolemic hemodilution and cell salvage.
- Postoperative conservation of patients’ blood and anemia management—restriction of blood draws for lab tests and administration of IV iron or Procrit if necessary.

“The strategies we use to prepare patients for bloodless surgery are low-tech and common sense,” says Patricia Ford, MD, an oncologist/hematologist and medical director of the Center for Bloodless Medicine and Surgery at Pennsylvania Hospital, Philadelphia.

Every year, Dr Ford guides some 700 patients through procedures from heart surgery to hysterectomies without transfusions.

About 95% of Dr Ford’s patients decline a transfusion based on religious convictions, but an additional 5% decline for other reasons, such as fear of bloodborne infections.

### **Blood management cost-effective**

“Blood is expensive—costing about \$1,100 to acquire and administer 1 unit,” says Sherri Ozawa, RN, clinical director of the Institute for Patient Blood Management at Englewood Hospital and Medical Center in Englewood, New Jersey.

“If a hospital’s blood budget is \$5 million a year, and they decrease it by 10% to 20%, that is a significant savings,” she says.

Research by Ozawa and colleagues (Shander et al, 2010), found annual expenditures for blood and transfusion-related activities for surgical patients ranged from \$1.62 million to \$6.03 million per hospital.

Englewood Hospital started its bloodless surgery program in 1994, and 2 years later, blood use had dropped by 40%.

### **Transfusion poses risks**

Evidence is growing that blood transfusions are associated with increased postoperative morbidity and mortality (sidebar).

According to the most recent National Blood Collection and Utilization Survey, funded by HHS and conducted by the AABB, the annual number of adverse effects

## **Perioperative strategies for bloodless surgery patients**

### **Preoperative**

- Do a history and physical to identify prior transfusions, anemia, or bleeding problems.
- Tell patients to avoid unnecessary medications, supplements, and alcohol.

"Many patients don't know that supplements such as St John's Wort and alcohol can cause them to bleed more," says Patricia Ford, MD, an oncologist/hematologist and medical director of the Center for Bloodless Medicine and Surgery at Pennsylvania Hospital, Philadelphia.

"Many patients are on agents for platelets and anti-inflammatories," says Sherri Ozawa, RN, clinical director of the Institute for Patient Blood Management at Englewood Hospital and Medical Center in Englewood, New Jersey.

"Dealing with those potential coagulation issues before surgery requires an organized system to optimize patients preoperatively both from a coagulation standpoint and an anemia standpoint."

- Check hemoglobin level. Normal levels are 12 g/dL for women and 13-14 g/dL for men.

"If the hemoglobin is normal, we tell them they don't need anything further and can move on to their surgical procedure," says Dr Ford. "But we temper that with how much blood loss we think they will have during surgery." If the procedure is a biopsy, they won't lose a lot of blood, but if they are having an orthopedic, GYN, or cardiac procedure, they can lose a significant amount.

Depending on the procedure, a higher than normal hemoglobin may be warranted. In such a case, Dr Ford administers IV iron in the office until the target is met. Knowing the hemoglobin will rise 1 g per week with this treatment, the surgeon can set a tentative date for the surgery.

Procrit (epoetin alfa, a synthetic form of the protein human erythropoietin that stimulates bone marrow to make more red blood cells) is also administered to some patients if needed.

Ozawa says they follow an algorithm as to when to give iron or Procrit.

"Statistics show that 40% to 50% of patients coming to the OR for elective surgery are anemic, and anemic patients are more likely to be transfused," says Ozawa. The literature also shows a similar rate of postoperative complications among patients who are anemic and those with pneumonia.

- Discuss which blood products and procedures a patient will accept.

Most Jehovah's Witness patients will accept albumin and fluid expanders that have some element of a plasma product, notes orthopedic surgeon Mark Zawadsky, MD, medical director of the Bloodless Medicine and Surgery program at Georgetown University Hospital in Washington, DC.

Most also will accept intraoperative normovolemic hemodilution and cell salvage as long as there's a continuous loop from the patient to the blood bag to the patient.

### **Intraoperative**

Intraoperatively, normovolemic hemodilution is used to minimize the loss of red cells during surgery. For the technique:

- The anesthesiologist collects the patient's blood in a blood bag via IV tubing that stays connected to the patient at all times.
- The anesthesiologist replaces the blood volume with crystalloids such as normal saline or lactated Ringer's solution or with a colloid such as albumin.
- The patient's blood becomes more dilute, so fewer red cells are bled out into the surgical field.
- At the end of the case, the anesthesiologist simply hangs the bag of blood on an IV pole and returns it to the patient intravenously.

Intraoperative cell salvage also is used to clean and return blood from the surgical field. Blood from the surgical wound runs through suction tubing to the Cell Saver. The blood is cleaned and run through IV tubing to a blood bag, which is returned to the patient intravenously in a continuous loop.

### **Postoperative**

- Reduce the amount of blood drawn for lab tests.

"Many patients become anemic postoperatively because of excessive and unnecessary phlebotomies," says Ozawa.

It is routine to draw blood for lab tests every morning whether patients need it or not. Those draws can add up to a unit of blood in just a few days, says Dr Ford.

In addition to limiting the number of blood tests drawn, Dr Zawadsky says he uses pediatric specimen tubes, which can be filled with less blood.

- Either IV iron or Procrit is administered when a patient experiences a sharp drop in hemoglobin.

from transfusions that required any diagnostic or therapeutic intervention was 60,110, or 1 in 394 transfusions.

In 2012, the health alliance Premier found that use of blood products beyond a level deemed medically necessary can increase complication rates and length of hospitalization. Premier recommends industry-wide standardization of blood utilization practices.

Ozawa notes that, conceptually, blood is “really a liquid organ transplant that’s treated as a medicine used to manage anemia. It is the only transplant that can be administered by nurses.”

### **Autologous blood not used**

Preoperative autologous blood donation is not used for patients in bloodless surgery programs.

“All it does is make the patient anemic,” says Dr Ford.

Many patients mistakenly believe that their own blood is 100% safe because it’s theirs, she says. However, human error can make any transfusion risky. The lab can confuse the blood samples, the blood bank can issue the wrong unit of blood, or the nurse or physician can administer the blood to the wrong patient. The blood bank may not label the blood correctly, store it correctly, or return it to the correct patient.

A new Johns Hopkins study on shelf life (Frank et al, 2013) found that red blood cells stored longer than 3 weeks begin to lose their capacity to deliver oxygen to tissue, and these changes are not readily reversible after transfusion.

“When blood is stored for a prolonged period of time, the red cells deteriorate,” says Dr Ford. “They lose enzymes, and don’t carry oxygen as well as they should. They also become deformed and don’t travel through small blood vessels as well as they should.”

### **Transfusion restrictions**

In March 2012, the AABB released a clinical practice guideline on red blood cell transfusion that focused on a restrictive transfusion strategy and the use of patient symptoms as well as hemoglobin concentration to trigger transfusions (<http://annals.org/article.aspx?articleid=1103943>).

A hemoglobin transfusion trigger of 10 g/dL had been the standard since the 1940s.

The first study to challenge this standard, the Transfusion Requirements in Critical Care (TRICC) trial, was performed in 1999 by Hebert et al. The study compared outcomes in intensive care patients transfused when hemoglobin concentrations dropped below 7 g/dL (restrictive group) and those transfused when hemoglobin concentrations were below 10 g/dL (liberal group). The restrictive group had lower overall 30-day mortality and lower in-hospital mortality rates.

A 2011 study by Carson et al confirmed these findings and showed the results also apply to elderly surgical patients with cardiovascular risks. More than 2,000 hip fracture patients with a cardiac history were transfused at either a hemoglobin of 10 g/dL or <8 g/dL. Results showed no difference between the 2 groups in morbidity, mortality, or rehabilitation milestones, but wound infection rates were almost twice as high for the more liberal strategy of 10 g/dL.

### **Are triggers necessary?**

“A patient’s hemoglobin can go very low, and the body can still support adequate tissue oxygenation, and the patient can survive without a transfusion,” says Dr Ford.

Pennsylvania Hospital statistics from 2007 showed that in patients with hemoglobins of 4 g/dL, no deaths were directly related to withholding blood products.

Even at hemoglobins of 2 g/dL and 3 g/dL, survival rates were 50% and 70%, respectively, says Dr Ford.

The hospital saw the number of transfusions immediately lowered by 10% when it modified its guideline from 8 g/dL to 7 g/dL about 2 years ago and began requiring the physician ordering the transfusion to cite a reason if the hemoglobin was above 7 g/dL. An additional modification to order 1 unit of blood at a time and reassess the patient before ordering a second unit also helped lower the number of transfusions.

Georgetown's trigger for transfusion is a hemoglobin of 7.5 g/dL, and staff now order and transfuse 1 unit of blood, then check the hemoglobin before ordering a second unit.

Englewood Hospital's policy does not have a hemoglobin level trigger for transfusion, but most physicians use 7 g/dL, says Ozawa.

"We believe the decision to transfuse needs to be a physiological decision, not a numbers-based decision. There are patients who do fine with a hemoglobin of 5 g/dL and others who have problems at 11 g/dL."

### Simple strategies

Strategies for bloodless surgery patients are simple to implement, can decrease unnecessary blood transfusions, and can save on health care costs for all patients, says Dr Ford.

These include:

- Correct anemia preoperatively.
- Eliminate unnecessary blood tests.
- Don't transfuse based solely on a number; use clinical assessment as to whether a unit of blood is necessary.
- Don't automatically order 2 units of blood; give 1 unit and reassess the patient before ordering a second.

Applying these principles across the spectrum of surgical care could dramatically reduce all patients' exposure to donor blood. ❖

—Judith M. Mathias, MA, RN

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## Evidence on transfusions

Mounting evidence supports concerns about blood transfusions.

- Data on more than 48,000 surgical patients at Johns Hopkins found frequent transfusions were given to patients who didn't need them. Transfusions varied 3- to 4-fold among surgeons (Frank S M, Savage W J, Rothschild J A, et al. *Anesthesiology.* 2012;117:99-106).
- In an analysis of nearly 941,500 surgical procedures in the American College of Surgeons National Surgical Quality Improvement Program database, patients who received 1 unit of blood intraoperatively had higher rates of mortality and more serious morbidity. These rates increased further with transfusions of more than 1 unit (Ferraris V A, Davenport D L, Saha S P, et al. *Arch Surg.* 2012;147:49-55).
- A comparison of Jehovah's Witness patients who refused blood transfusions with non-Witness patients who underwent cardiac surgery at the Cleveland Clinic between 1983 and 2011 showed that Witness patients had significantly lower rates of myocardial infarction, additional operations for bleeding, and prolonged ventilation, along with shorter intensive care and hospital stays (Pattakos G, Koch C G, Brizzio M O, et al. *JAMA Intern Med* 2012;172:1154-1160).
- Examining hospital variability in the use of blood transfusions in patients undergoing major noncardiac surgery at academic medical centers between 2006 and 2010, researchers observed dramatic hospital variability. Because of potential complications associated with transfusions, reducing this variability may result in improved surgical outcomes, the authors say (Qian F, Osler T, Eaton M P, et al. *Ann Surg.* 2013;257:266-268).

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