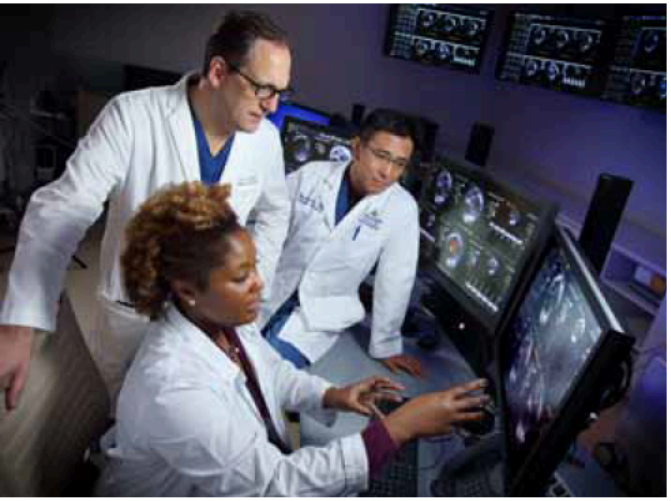
A Bloodless Tetralogy Repair

More than half of cardiac surgeries require blood transfusion—a lifesaving measure, but one that nevertheless could fuel short- and long-term complications ranging from temporary immune suppression to graft-versus-host disease.



Shetarra Walker, Luca Vricella and Narutoshi Hibino say teamwork is key in preparing patients for a transfusion-free heart operation.

For several years, use of blood conservation techniques in cardiac surgery has been gaining momentum, and Johns Hopkins is among the hospitals that have launched protocols to reduce the use of blood products. Even so, totally bloodless heart operations in infants remain rare.

Recently, Johns Hopkins cardiac surgeons performed a totally blood-free tetralogy of Fallot repair in a 2-month-old, 6-kilogram infant—the youngest and smallest in the institution's history to undergo heart surgery without a single drop of foreign blood. The baby was discharged home on day six following the operation and has had a smooth, complication-free recovery.

"It's a conditioned assumption that blood transfusions are unavoidable," says **Luca Vricella**, director of pediatric cardiac surgery. "In small babies, it's medically, clinically and logistically challenging, but it can be done."

Identifying and treating anemia preoperatively is vital, says pediatric cardiologist **Shetarra Walker**. Patients get erythropoietin injections for several weeks leading up to surgery to enhance their hematocrit. Blood conservation is also done intraoperatively. Collecting blood from the patient before the surgery to fend off any blood loss is a common approach that can be modified for use in Jehovah's Witnesses patients by using a closed circuit technique that allows the blood to be recirculated directly back into the body. Any spilled blood during surgery is siphoned and reintroduced into the circulation, says pediatric cardiac surgeon **Narutoshi Hibino**, who operated on the infant with Vricella.

During surgery, triggers are established that signal the need for transfusion. For example, if brain oximetry starts trending downward, a transfusion is initiated promptly to prevent tissue hypoxia. The transfusion threshold must be individualized because it's predicated on factors such as age and comorbidities, including overall cardiopulmonary reserve.

"The question we ask is, what is the lowest level of hemoglobin a patient can withstand without compromising tissue oxygenation?" Hibino says. "That varies from person to person."

Postoperatively, clinicians can further minimize blood loss by reducing the number of phlebotomy draws, Walker says. At 6 kilos, for example, a child's blood volume is less than 500 CCs, so every little draw can quickly add up.

"All pediatric cardiac surgeries are ensemble pieces," Vricella says. "But nothing illustrates the power of teamwork like orchestrating bloodless surgery in a little infant." ■