Rhode Island Hospital
Hasbro Children's Hospital
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Transfusion-Free Medicine & Surgery

Restoring Quality of Life for Patients

Adult and Pediatric Neurosurgery and Orthopedic Surgery

About This Publication

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Program Manager
Editor

Welcome to the Transfusion-Free Medicine & Surgery publication! For some 18 years, patients have been successfully treated without blood product transfusion at Lifespan hospitals. There have been thousands of successful surgeries for patients all throughout New England, the eastern region states and extending as far as the west coast of the United States.

Transfusion-free protocols involve a multimodality and multidisciplinary approach to patient care—all members of the surgical team work collaboratively. Physicians strive to accommodate patient preferences, altering their techniques for certain procedures, achieving consistently favorable outcomes. Additionally, patients are identified prior to surgery and we continually receive appreciative comments on the benefits of this early consultation. There is coordination of patient care from preadmission status to discharge and follow up. It is noteworthy that blood product usage and associated costs have been reduced. William G. Cioffi, MD, surgeon-in-chief at the Miriam and Rhode Island Hospitals commented: “Our patients deserve the best, including novel approaches and increased options.”

In this publication, the focus is on neurosurgery and orthopedic surgery. Highlights include an op-ed by Francois Luks, MD, pediatric surgeon-in-chief at Hasbro Children’s Hospital. He discusses the progress of medical science which has resulted in a decline for the need of blood transfusion. Then read firsthand accounts from patients, as they relate in their own words their surgical course and favorable outcomes. Thereafter, I invite you to carefully read the conversations with three of our leading surgeons: Craig Eberson, MD, Curtis Doberstein, MD, and Petra Klinge, MD. Each physician has a specific expertise, yet each achieves successful surgical outcomes without the use of blood products. They reflect the high standard of care that all of our physicians and surgeons provide. Finally, learn about Covid-19 strategies and appropriate management of iron deficiency anemia.

It is my hope that this information can help to address some of the questions you may have regarding the various surgical options and the benefits of each. If you have specific questions about a recommended procedure, and/or you’re in need of a physician referral, please send an email or call so that we may assist you.

Warm regards,

Kevin T. Wright

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To Our Patients

Rhode Island Hospital upholds a patient’s right to considerate care that safeguards personal dignity and privacy and respects individual differences and values. We provide care based on the principle of personal autonomy, and a patient’s right to accept or reject recommended elective or emergent treatment, including the administration of blood and blood products. Patient safety is, of course, an important consideration.

Physicians endeavor to explain to the patient, in terms the patient can understand: (1) the risks and benefits associated with refusing blood or blood products in the proposed procedure, and (2) the risks, benefits and anticipated outcomes of treatments, if any, which do not require the administration of blood or blood products.

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Opinion | Decreasing Dependence on Blood Transfusion

Francois I. Luks, MD, PhD
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Division Chief, Pediatric Surgery

There is little doubt that the discovery of blood types by Karl Landsteiner, a century ago, and the subsequent development of the fields of transfusion medicine and blood banking, have revolutionized surgery, trauma care, hematology, obstetrics and many other medical fields. Without the availability to replace blood loss, open heart surgery and organ transplantation, to name a few, would not be possible today. Blood typing also opened the door to the science of immunology, which allowed us to better fight infections, organ rejection after transplantation and auto-immune disorders (when a person's organs are being attacked by their own immune cells).

Just like these scientific discoveries, there have been many other advances in medicine, and some have had an impact on the need for blood transfusion. A century ago, surgeons had very few tools at their disposal to prevent bleeding during an operation. Today, electrocautery and other devices allow bloodless incisions. Trauma care used to rely heavily on replacing blood loss with banked blood. Today, moderate blood volume loss is often restored without the need for transfusion, and drugs like epinephrine or devices like tourniquets can produce a bloodless operating field. As a result, certain operations, like complex orthopedic or neurosurgical procedures, are now associated with minimal blood loss.

When blood loss is inevitable, other methods are often used, as described elsewhere in this publication: autotransfusion or "cell savers" that collect blood during an operation and return it to the patient. Preoperative conditioning that allows a patient to tolerate lower levels of hemoglobin or red blood cells, so that any intraoperative blood loss will be less detrimental. At the same time, studies have clearly demonstrated that the human body can tolerate much lower levels of red blood cells than previously thought. The threshold to transfuse has been raised significantly: in otherwise healthy individuals (children and young adults in particular), a very low level of red blood cells is tolerated, in the knowledge that healthy bone marrow will restore normal blood levels over time.

Blood loss has been an obvious concern for surgeons and other physicians for centuries, of course. Blood is the elixir of life, and we are hardwired to fear bleeding. If blood is shed, a natural reflex would be to replace it, milliliter per milliliter, but that is in fact not necessary. Here, too, scientific progress has made us more sophisticated health care professionals. The main function of blood is its capacity to transport oxygen to all the organs and tissues in our body. Without oxygen, cells cannot survive. Because oxygen is not water-soluble, it has to be transported by hemoglobin molecules within red blood cells, which make up the largest cellular component of blood.

Each hemoglobin molecule can carry four molecules of oxygen; the higher the hemoglobin concentration in the blood, the more oxygen can be transported at any given time. If our hemoglobin or red blood cell concentration drops (for example, when there is actual blood loss, or if we suffer from anemia from other causes), oxygen demand by our tissues can still be met, but our body has ways to compensate for this lower oxygen-carrying capacity. If our body's oxygen requirement remains unchanged, but the amount of oxygen that each milliliter of blood can carry drops, our heart needs to pump faster. Patients who are anemic or suffer moderate bleeding see their heart rate increase (tachycardia): the net result is that the same amount of oxygen gets delivered to the organs. As long as we have a healthy heart, and as long as the blood loss is controlled in time, our body is very much able to tolerate this change.

"Electrocautery and other devices allow for bloodless incisions. Moderate blood volume loss is often restored without the need for transfusion, and drugs like epinephrine or devices like tourniquets can produce a bloodless operating field. Complex orthopedic or neurosurgical procedures are now associated with minimal blood loss."

Our body requires more oxygen when we are active, as when running, jumping, and exercising. Thus, a body at rest requires less oxygen, and avoiding exertion is another way we can compensate for temporary blood loss. Patients who recover from major surgery or trauma are typically at rest; they also receive adequate oxygen (supplemented via a mask or nasal cannula, if necessary). This ensures that each red blood cell is exposed to as much oxygen as possible, so that even in the presence of anemia, oxygen transport and delivery is optimized. In fact, anemia itself triggers the bone marrow to make new red blood cells—the road to recovery. Finally, getting blood to all the organs requires adequate pump pressure: blood vessels must be sufficiently filled as to allow adequate flow from the heart to the rest of the body. Replacing lost blood with saline was found decades ago to be quite effective in maintaining blood pressure, and ensuring that blood flows effectively throughout our body; for

a variety of reasons, each mL of blood must be replaced by roughly 3 mL of electrolyte solution.

> *"Optimizing oxygen availability, minimizing stress and maximizing rest, and ensuring adequate hydration, allows patients, and otherwise healthy children in particular, to tolerate even substantial blood loss without ill effects."*

This all means that a specific threshold in hemoglobin or red blood cell concentration, below which transfusion is required, is impossible to define. Whereas a few decades ago, recommendations were based on an actual number, we have become more sophisticated in managing patients with surgical or other blood loss. Looking at the entire picture, optimizing oxygen availability, minimizing stress and maximizing rest, and ensuring adequate hydration, allows patients, and otherwise healthy children in particular, to tolerate even substantial blood loss without ill effects. Scientific evidence bears this out as Jacques Lacroix, MD, pediatric critical care specialist, states in a landmark article in the New England Journal of Medicine: "In stable, critically ill children, a restrictive strategy [that tolerates much lower hemoglobin concentrations than accepted historically] results in a 96% reduction in total transfusion exposure … without increasing adverse outcomes." (Lacroix 2007; 356:1609-1619).

A common concern is the risk of transmitting diseases through blood transfusion. In reality, blood transfusion has never been safer: testing pathogens is more sophisticated than ever, and severe allergic reactions can be treated, and even prevented in most cases. Still, there is always a risk associated with blood transfusion, and these should be weighed against any benefits of administering blood products. At Hasbro Children's Hospital, we are very conscious of the need to avoid blood transfusion whenever possible, and we are very successful at it. Most children under our surgical care have an otherwise healthy metabolism and a strong heart, and we can go to great lengths to avoid transfusion without any risk of harm. This does not prevent us from offering some of the most sophisticated and complex operations to our young patients, including advanced orthopedic and neurosurgical procedures, organ transplantation, major tumor resections and even fetal surgery.

How successful are we at transfusion-free surgery? Less than 0.5% of all operations performed annually at Hasbro Children's Hospital require a blood transfusion—in those that do, we are able to autotransfuse (giving back a patient's own blood) more than three-quarters of the time.

Dr. Luks is professor of surgery, pediatrics, obstetrics and gynecology at The Warren Alpert Medical School of Brown University. His research interests include fetal development and fetal surgery, and in particular the etiology of twin-to-twin transfusion syndrome. To read more, see Francois I. Luks, MD, PhD | Lifespan.

GENERAL SURGICAL STRATEGIES

Preoperative Planning

For anemia, one or more of the following therapies is recommended:

- Vitamin B12, folic acid, vitamin C
- Oral or IV Iron
- Erythropoietin (stimulates red blood cell production)

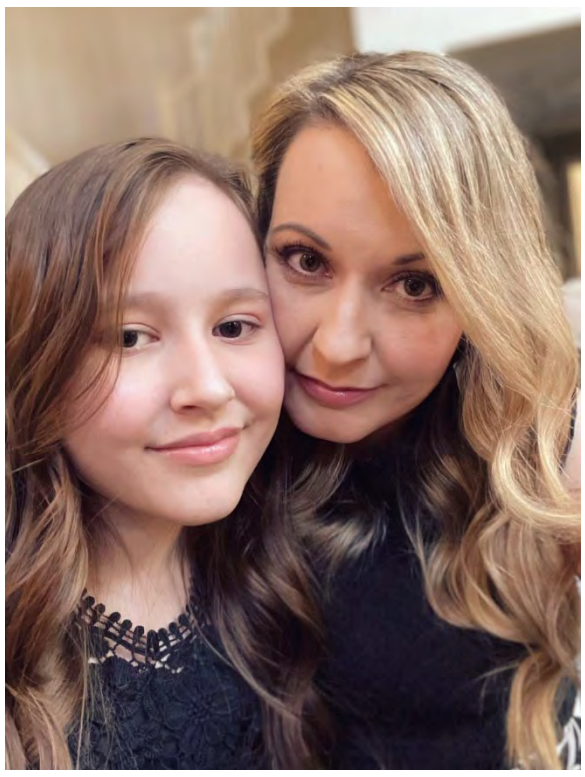
During Surgery

- Hemodilution – whole blood is diverted and replaced with a volume expander; the diverted blood is later returned.
- Intraoperative blood salvage (cell saver or autotransfusion) – blood recovered from the surgical field is washed or filtered and returned.
- Volume expanders – intravenous fluid solutions that contain water, salts (electrolytes), starches and/or sugars.
- Hemostatic agents – to control bleeding from the surgical site.
- Electrocautery – to seal blood vessels to reduce or stop bleeding.

Postoperative Care

- Erythropoietin and/or iron therapy
- Minimal blood draws
- Vitamin and nutritional support

Sofia’s Story



Sofia and Alyson Ritz

As told by Alyson Ritz

We live in Las Vegas, Nevada, and Sofia's first seven years of life were what we call the before, meaning before her life was filled with hospitals, endless doctors, pain, and surgeries. Sofia was a healthy girl with so much energy. She was a dancer, it was her favorite creative outlet, and twice a week she soaked up her lessons.

At almost eight years old, Sofia started spraining her ankles and knees continuously. Next came unexplained shoulder and neck pain. The fatigue of just walking too far became so overwhelming that we found ourselves needing a stroller again for her. Then she began experiencing extreme stomach pain with chronic nausea, which meant that we’re in and out of the emergency department, seeing specialists for months until we learned that her gallbladder was diseased—Sofia had her first surgery to remove it at just eight years old. Six months later she had an appendectomy. It was at this time I knew something deeper was going on and I was determined to figure it out. We waited nine months for a consultation with a geneticist and the discovery—Ehlers-Danlos syndrome. We generally think of this as someone who is double-jointed or extremely flexible but sadly so much more is involved. The faulty connective tissue affects every joint and organ in her body. Sofia lives her daily life on a pain scale of 7 on a good day and a lot of days at a 10. She was also diagnosed with postural orthostatic tachycardia syndrome, mast cell activation syndrome (MCAS), Chiari malformation, and a tethered spinal cord.

Sofia had her first Chiari decompression surgery in New York in November of 2019. That was an extremely stressful experience, as being one of Jehovah's Witnesses, we encountered a lack of understanding and support at that hospital when needing bloodless surgery. Our love of life runs deep, so being treated so disrespectfully at the hospital made an already stressful situation almost unbearable; Sofia still has traumatizing memories from that experience. Sofia completely stopped walking from extreme pain in her legs and lower back in August of 2020. It was a heartbreaking and very scary time.

My experience at Hasbro Children’s Hospital was entirely different. After not getting any answers in Las Vegas, I discovered one of Dr. Klinge's medical conferences online and knew she could help us. We flew to Rhode Island a few months later for Sofia to be examined. There are not enough words to explain the amount of compassion and care Dr. Klinge showed us. She let us know that Sofia needed to have surgery to “release” the tailbone tethering of her spinal cord. After my last experience with her prior neurosurgeon, I was nervous when discussing the need for bloodless surgery. Yet, when I discussed this with Dr. Klinge, her support and respect was priceless to our family; she is a rare gift to anyone and we feel honored to have her as Sofia's surgeon.

Dr. Klinge informed me that Hasbro has a transfusion-free department. What a blessing this proved to be! My first interaction with the team was actually during preadmission, assisting with Sofia's admission process; Kevin Wright ensured that everything was in proper order before Sofia went into surgery. Thereafter, he would visit postoperatively to check on us and also look after other hospital matters related to Sofia's care during her stay. Sadly, Sofia needed two additional surgeries, one of them being another Chiari decompression surgery. Through all three surgeries, the care, compassion and support that we received at Hasbro from both Dr. Klinge and Kevin Wright was simply a gift. The peace of mind that this transfusion-free department brings to a parent's heart is invaluable. We appreciate all the hard work they do in keeping a close eye on everything to make things as seamless as possible. Our family is forever grateful to Hasbro Children’s Hospital for supporting the values and beliefs of families like ours.

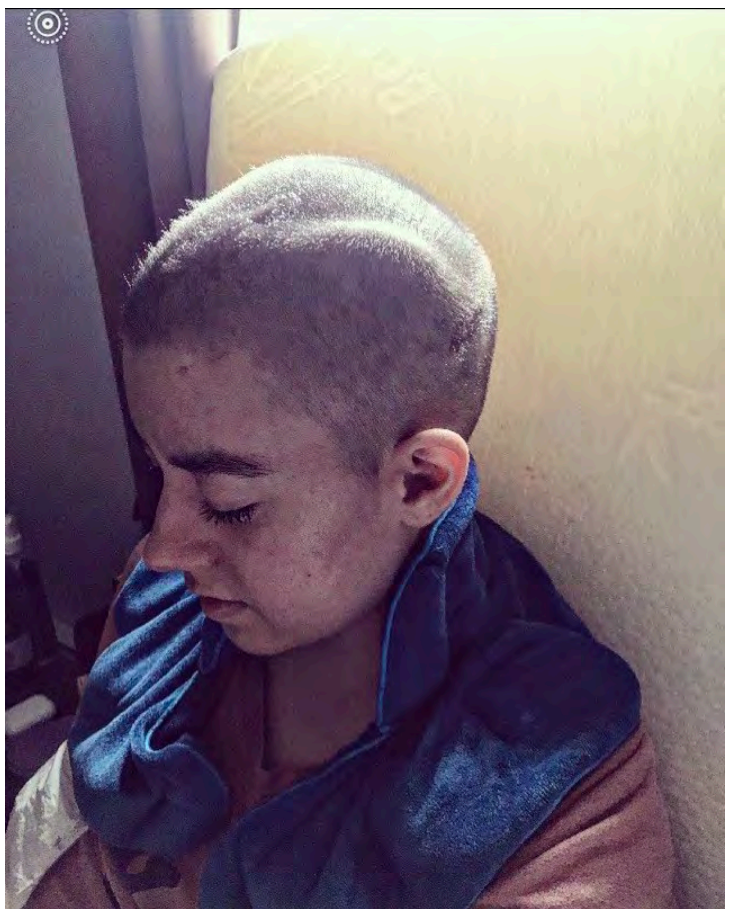
Sofia and Dr. Klinge

I Survived—My Brain Tumor

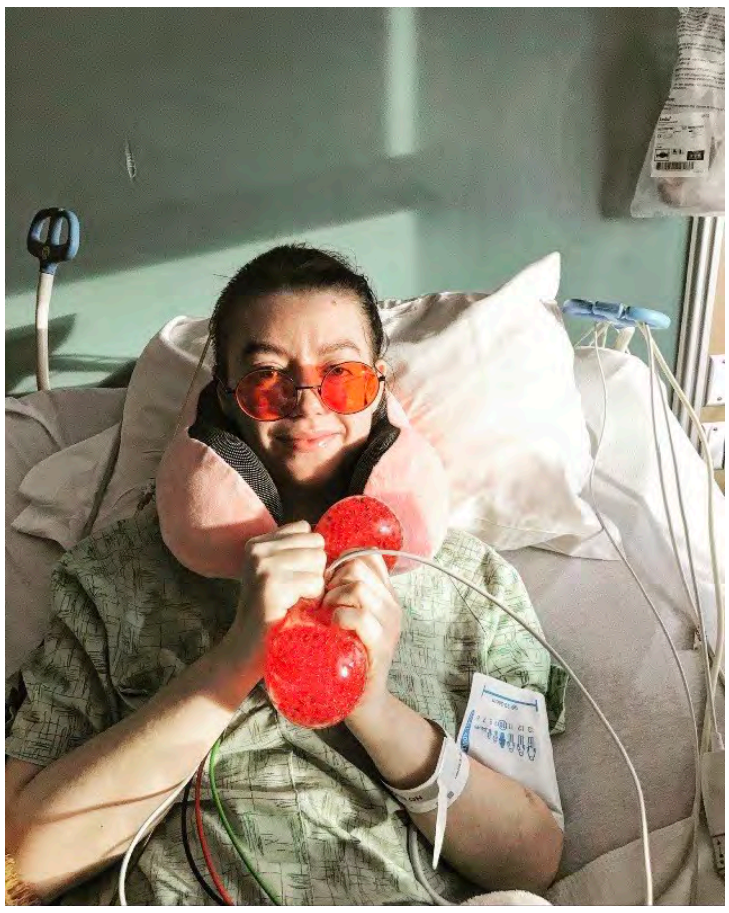
As told by Briana Weaver

I've had chronic headaches since I was a young teen as well as tinnitus and some hearing loss in my right ear. In my early 20s I started to have very noticeable issues with my balance and gait. Last spring, during a routine eye exam, my eye doctor observed that my optical nerves were swollen/enlarged and therefore I needed to have an MRI. It took a month before they were able to get me in for one, and the very next morning my primary care doctor called to tell me I had a 4 cm large schwannoma tumor on the right side of my brain with hydrocephalus; this necessitated an immediate trip to the emergency department, a call to the neurosurgery unit and the need for neurosurgery.

I was just about to turn 24, and you can imagine that this was very surreal and overwhelming. That same day I went to the hospital, and by that night, a tube was inserted into my head to drain the cerebrospinal fluid resulting from hydrocephalus. I lived with the tube for three weeks, it was my constant ever-annoying companion which required frequent adjustments with an extra-long construction level; this was my "juice bag" as I so lovingly referred to it when conversing with my nurses!



The doctors were very good at keeping me informed and explaining everything at both pre and post-op: they listened to my concerns and made decisions during my surgery with those concerns in mind. The decision was to leave a small portion of the tumor on the facial nerve so as to avoid paralysis of the right side of my face, and thereafter a Gamma Knife procedure several months later to prevent it from growing again.



As one of Jehovah's Witnesses, I would not accept a blood transfusion and I thankfully had my Medical Directive that outlined my prior expressed decisions. In cases of an emergency and admitted to the hospital, the directive sets forth the options that I personally feel comfortable with should complications arise, even if during surgery.

Rhode Island Hospital is progressive in its bloodless procedures and I felt in good hands with the knowledgeable doctors and the transfusion-free service that specifically handles these surgeries. The doctors, residents, and nurses were all incredibly respectful and supportive which made the terrifying experience a bit easier to endure. And when control is completely out of your hands, it's comforting to know that the people whose hands have that control have your best interest at heart, physically as well as spiritually.

My Scoliosis Journey

As told by Jade Didie

I was diagnosed with severe scoliosis in the year 2020 during the pandemic. I was referred to Dr. Craig Eberson by Dr. Alvin Marcovici, (Southcoast Brain & Spine Center, North Dartmouth, MA) who is well known to my family and understood our concern for a bloodless surgery; he helped us choose the right surgeon. Additionally, the Hospital Liaison Committee put my family in contact with Kevin Wright, and thereafter a consultation was arranged with Dr. Eberson.

Dr. Eberson helped me to feel very comfortable, as he had a lot of experience performing surgeries without the use of blood transfusion. Kevin Wright discussed with me and my family all of the options that were available to me, so that I had a thorough understanding. We then met with an oncologist who recommended an iron infusion to help improve my hemoglobin levels prior to my procedure. Because of the severity of my scoliosis, there was much discussion and I was presented with the option of having halo-gravity traction (halo) to lessen the length of time needed for anesthesia. I was first admitted for three weeks with the halo traction, to reduce the degree of curvature in my spine. The halo actually became such a part of me that at a point I forgot it was there; I was able to attend and participate in school and my congregation meetings virtually. I was even able to hook myself up to a walker and wheelchair for my halo treatment; this process enabled me to reach a certain goal every day.

The day before surgery I found out that my grandmother had the sickle cell trait. My parents requested additional blood work to determine if I had it too, which in fact I did. Dr. Eberson discussed his concerns about proceeding with my surgery, due to possible sickle cell related complications. The surgical team wanted to be cautious because I had the trait. Therefore, we had a long conversation with Kevin Wright, who had been helping every step of the way throughout all of our obstacles. We prayed as a family that night and were able to assure Dr. Eberson that we trusted him and the team, and were willing to proceed with surgery. Dr. Eberson consulted with his colleagues, here and elsewhere, for added observations on my case and thereafter set a new date for surgery. During my procedure, the surgical team kept the room at a high temperature so as to avoid a sickle cell crisis—the team was prepared to take on the challenge. After six hours, my halo traction was off and I came out with a new spine of course with many screws and rods attached.

I felt very comfortable and confident going into surgery knowing that I wasn't alone. A Bible verse that really helped me is Isaiah 41:10. That verse reminded me that God is and always will be there to help me with whatever trial I'm going through. I also have many friends in my area who were kind, and received many cards, flowers and gifts from friends that I didn't even know. I really appreciate Dr. Eberson and the whole surgical team—thank you so much everyone!

I Found Relief!

For several months, Brandon experienced pain and increasing numbness in his right arm, along with a constant tingling traveling down to his right hand. This affected his daily life, interrupted his sleeping patterns, and there was also the pain that he described as a "burning sensation" with occasional weakness in his right hand. The symptoms persisted despite multiple modalities of conservative treatment. In seeking relief, Brandon was referred to Deus Cielo, MD, who determined that he was a candidate for a right ulnar nerve decompression and transposition procedure. The ulnar nerve is part of a network of nerves essential for arm movement. Brandon was relieved to learn that from a surgery standpoint, this procedure was generally straightforward. Brandon says: "Dr. Cielo was fantastic! From the initial appointment to his personally calling me after surgery, I knew I was in good hands. I would without question have another surgery here and recommend friends and family to do the same." To read more, see Deus J. C. Cielo, MD | Lifespan.

Brandon Greenfield

A Conversation with Craig P. Eberson, MD

Craig P. Eberson, MD
Chief, Pediatric Orthopedics
Hasbro Children's Hospital

Dr. Eberson specializes in the treatment of orthopedic disorders in children. His main clinical interests are the treatment of scoliosis and other spine disorders, congenital or acquired problems of the lower extremities in children, and pediatric fracture care.

Dr. Eberson, please tell us about your background.

I grew up in Fair Lawn, NJ, a small town 20 minutes outside of New York City. After high school, where I was active as a pole vaulter and in student government, I went to University of Pennsylvania for college, and I returned to my home state of New Jersey to attend Rutgers for medical school. The orthopedic department at Brown was known as one of the top training programs in the country for orthopedic residency, and I was fortunate to match here where I completed my residency and an orthopedic trauma fellowship. My experience in residency solidified my desire to care for children, so I pursued an additional fellowship in Pediatric Orthopedic surgery and scoliosis surgery at the renowned Texas Scottish Rite Hospital for Children in Dallas, Texas.

How did you become interested in transfusion-free medicine?

Given the risks associated with blood transfusion in children, I became interested in transfusion-free medicine. Having taken care of several Jehovah's Witness patients over the years has solidified my approach.

What are some of the challenges with this approach in pediatric patients?

In children, a transfusion-free approach is attractive, since they usually can tolerate more blood loss than adults who might have underlying medical problems. On the other hand, given their small size, a relatively small apparent blood loss can actually represent a large percentage of their total blood volume. In patients undergoing extensive surgery, such as spinal fusion or hip reconstruction, blood loss is significant and can represent a challenge to get the child safely through the surgery and accomplish all of our surgical goals while at the same time avoiding the need for transfusion.

Patients are familiar with some of the options such as the cell salvage machine; what else do you utilize?

First of all, I use a patient-centered approach. Tools such as cell saver, tranexamic acid (TXA), hemodilution, and others have allowed me to safely perform the majority of our surgeries without transfusion. In some patients, their underlying medical conditions and potential clotting abnormalities make blood loss more difficult to control. In situations where our team feels that blood loss is representing a significant risk to their overall health, we have a decision to make. As a last resort, we will use transfusion as a treatment option. For patients who have an objection to blood transfusion, before the surgery we already have set agreed upon stopping points, where we can conclude the surgery and return in a staged fashion to complete the procedure rather than suffer continued blood loss which may be detrimental to the patient.

When patients have no objection to blood transfusion?

Even in patients who accept blood products, the risk of infection, allergic reaction, and other potential complications of blood products make it advantageous to avoid unnecessary transfusions in all patients.

What are the specific challenges with scoliosis procedures?

There are several challenges with scoliosis surgery. It is typically a rather large surgery, and given the amount of muscle which must be moved away from the spine, there usually is significant blood loss. Preparation of the spine bones for fusion also leads to bleeding. These cases usually take several hours, and in long cases the effects of surgery and anesthesia can lead to a decrease in the body's ability to clot effectively. This can lead to even more blood loss toward the end of the procedure.

Were there challenges with Jade's procedure?

In Jade's surgery there were some other variables which affected our decision making. When we put our patients to sleep, we then use neurological monitoring to make sure that we protect the spinal cord during the spine surgery. For unexplained reasons, when Jade's blood pressure was brought to regular levels to begin the surgery, our neurological monitoring told us that her spinal cord was not getting enough blood and she might lose the function of her legs. Raising her blood pressure to high levels relieved this problem, but operating on her spine with her blood pressure that elevated would certainly lead to a dramatic increase in blood loss. We chose to delay the surgery to perform a more in-depth workup of her spinal cord. This was negative. We

then chose to use a halo traction, where a halo ring was attached to her skull and we used gradual traction to stretch out her spine and correct her scoliosis. This would make it easier to perform her definitive surgical procedure. On top of that, it was revealed that a family member was found to have sickle cell trait, and our hematology team tested Jade and found that as well. By working with the hematology team, as well as our transfusion-free team, we were able to develop a protocol for surgery that would not risk Jade having a problem from her sickle cell trait.

Would you walk us through Jade's procedure?

After she had been in traction for a couple of weeks, we had obtained a good correction of her scoliosis. We then proceeded to the operating room. Our neuromonitoring team and anesthesia team had worked together to develop an anesthesia protocol which maximized our ability to use neural monitoring and keep her surgery safe. We took great care during the exposure of her spine and dramatically limited the amount of bleeding. Constant communication with our anesthesia team allowed us to monitor her blood loss, and noting that it was very low, we were able to complete her entire procedure. I placed screws in the bones for the spine and then connected the screws to two metal rods which allowed me to straighten her scoliosis. After scratching the surface of her spine bones, we added bone graft to facilitate the spine fusing and make the surgery permanent. We then carefully sewed her incision closed in multiple layers in order to provide excellent healing and minimize bleeding in the postoperative period. After a few days in the hospital, Jade was able to go up and down the stairs and resume a normal diet, so we sent her home.

Dr. Eberson concludes: Over the past two years since her surgery, Jade has done very well. It is important to note that the success of this procedure was only possible through intense teamwork. The orthopedic, anesthesia, hematology, neuromonitoring, blood bank, and transfusion-free medicine divisions all played a part in Jade undergoing this surgical treatment for her severe scoliosis. A great part of the success was also due to Jade and her family. They partnered with the remainder of her treatment team to design a protocol which met their spiritual needs and allowed her treatment to proceed in a successful manner. It was fortunate that Jade's mother happened to work with a neurosurgeon in Massachusetts who was an experienced spine surgeon. He recognized that spinal surgery in a young girl was best performed at a hospital with great experience in treating these complex patients. Our Pediatric Orthopedic Service has tremendous experience both with spinal deformity surgery as well as with working with the Jehovah's Witness community.

Dr. Eberson is a professor of orthopedics at The Warren Alpert Medical School of Brown University, the director of the orthopedic residency program and the pediatric orthopedic fellowship. His current research interests include enhancing the education of the next generation of orthopedic surgeons, improving spine care for children and the treatment of pediatric musculoskeletal injuries. To read more, see Craig P. Eberson, MD | Lifespan.

EQUIPMENT AND STRATEGIES FOR TRANSFUSION-FREE SURGERY

- Individualized Surgical Plan
- Interdisciplinary and Collaborative Team Approach
- Meticulous Techniques
- Minimally Invasive Surgery
- Blood Recovery/Salvage Devices
- Hemostatic Surgical Instruments
- Hemostatic Agents
- Recombinant (synthetic) Growth Factors to Stimulate Blood Cell Growth

A Conversation with Curtis E. Doberstein, MD

Curtis E. Doberstein, MD
Director, Cerebrovascular and Skull-Base Surgery
Rhode Island Hospital

Dr. Doberstein specializes in surgery on the blood vessels of the brain, neck and spinal column. He sees many patients with circulatory problems such as aneurysms, arteriovenous malformations and carotid artery disease. He also treats patients with nervous system tumors, including those of the brain and the skull base. Patients with degenerative spine disorders comprise another large part of his practice. At present, he is investigating clinical outcomes following the removal of plaque from a carotid artery. He has performed over 500 of these surgeries. Specifically, he is exploring the feasibility of same-day discharge after carotid endarterectomy.

Dr. Doberstein, please tell us about your background.

I attended Haverford College and received my BS degree in biology and subsequently completed medical school at McGill University in 1988. I completed my neurosurgical residency training at the UCLA School of Medicine and have been teaching and practicing neurosurgery here at Brown for the past 27 years. My neurosurgical practice focuses on the care of patients with blood vessel diseases of the brain and spinal cord, tumors involving the pituitary gland and skull base regions, and degenerative spine conditions.

How did you become interested in transfusion-free medicine?

I have always been aware of the issues regarding transfusion of blood products in surgical patients with diverse cultural and religious backgrounds. I have learned a great deal about these issues directly from patients, families, and other professionals and this experience has solidified the importance of communication and individualization. The development of a dedicated transfusion-free service, under the guidance of Kevin Wright, here at Lifespan has been a great partnership. I have continued to learn and evolve my practice to help patients develop a safe, individualized, and respectful plan regarding their hospital care and treatment.

What options do you utilize?

A plan is developed in concert with patients, their families, and the transfusion-free medicine service. Because each case may be different, there is no “one size fits all” situation. The key, I believe, is a comprehensive 2-way communication between the patient and his/her/their providers. We utilize an intraoperative cell salvage (cell saver) in cases where high blood loss is expected and the patient is agreeable to receiving their own blood in return. We also try to optimize volume expanding products, not derived from primary blood components, if necessary and if acceptable to the patient. We also educate patients and their families about some of the difficulties which could arise and how we all agree to handle these scenarios. For example, surgery may be staged or discontinued if significant blood loss arises.

What are the challenges with neurosurgery procedures?

The brain and spinal regions are highly vascular and many of our surgical interventions involve, or are closely related to, arteries and veins. A potential for blood loss is always a challenge but having a plan on how to handle this potential situation is critical.

Please describe how you handled Briana’s procedure.

Briana had a large brain tumor arising from the nerve controlling hearing at the base of the back of her brain which required surgery. She, her parents, and Kevin Wright communicated very effectively on how to handle her specific situation with respect to any potential transfusions. Her surgery involved removing some of the skull behind her ear and using a high-powered microscope to remove most of the tumor and decompress the surrounding critical brain structures. Her surgery went well and the majority of her tumor was removed. It was determined to be benign and not cancerous, and Briana continues to make an excellent recovery.

Dr. Doberstein concludes: Be aware of blood loss—prior to any surgical procedure, patients are evaluated and an appropriate strategy is formed. If patients are found to be anemic, the goal is to build up their red blood cell volume prior to surgery. Early communication to address patient expectations is the key to a successful perioperative experience, and the incorporation of various strategies to limit blood loss and avert the need for blood transfusion.

Dr. Doberstein is a professor of neurosurgery at The Warren Alpert Medical School of Brown University, and the director of the neurosurgery residency program. He is executive vice-chair of clinical operations. He specializes in surgery on the blood vessels of the brain, neck and spinal column. He sees many patients with circulatory problems such as aneurysms, arteriovenous malformations and carotid artery disease. He also treats patients with nervous system tumors, including those of the brain and the skull base. To read more, see Curtis E. Doberstein, MD | Lifespan.

A Conversation with Petra M. Klinge, MD, PhD

Petra M. Klinge, MD, PhD
Director, Pediatric Neurosurgery, Hasbro Children's Hospital
Director, CSF Disorders of the Brain and Spine, Rhode Island Hospital

Dr. Klinge is internationally renowned for the diagnosing and neurosurgical treatment of patients with cerebrospinal fluid (CSF) disorders. Her practice also includes patients with associated developmental CSF disorders, such as spina bifida, Chiari malformation, tethered cord, patients with connective tissue disorders and associated spinal fluid disorders including syringomyelia and occult tethered cord syndrome.

Dr. Klinge, please tell us about your background.

Very little of my professional career beginning with studying medicine or even going into neurosurgery was planned out, it always just happened. In my first year of residency at the neurosurgery department at the Hannover Medical School in Germany, I thought about becoming involved in a research project. An attending physician asked me if I would be open to take over studying brain blood flow in elderly patients with normal pressure hydrocephalus, a project that no one was really interested in doing. Normal pressure hydrocephalus is to the aging population, the excess cerebrospinal fluid in the brain that is associated with gait disorder and dementia. Neurosurgeons are involved in the treatment of this condition, as some patients need surgery to install a brain shunt. That is a permanent drainage system implanted into the body that reduces the excess fluid and allows patients to function again.

As I continued with my studies, I had the opportunity to present at national and international conferences, and to publish in international peer-reviewed neurosurgical journals. At an international conference around 2005, Dr. Curtis Doberstein invited me to join the neurosurgical faculty at Brown University to continue my clinical and research endeavors in hydrocephalus and related disorders of the cerebrospinal fluid.

The focus on the pediatric population started here in Rhode Island Hospital and The Warren Alpert Medical School. This led me to further specialize in pediatric patients with congenital and genetic conditions that also affect the cerebrospinal fluid and its circulation, such as Chiari malformation, a condition where the cerebellum obstructs the base of the skull and minimizes the CSF circulation, and tethered cord, a condition that pathologically fixates the spinal cord to the tailbone and alters the CSF circulation in the spine. Both conditions can also affect the elderly and may present with a myriad of symptoms.

How did you become interested in transfusion-free medicine, and what does this involve?

As a pediatric neurosurgeon, also performing neurosurgery on children in their first years of life, prevention of blood loss is vital to the safety and outcome of the surgery. In this population, meticulous control and prevention of blood loss, preoperative control of anemia, coagulation stabilizing and blood cell "boosting" measures, if possible, are crucial. This requires an interdisciplinary teamwork at Hasbro between the pediatricians, the pediatric and neonatal critical care team, hematology-oncology, transfusion-free medicine, general surgery and neurosurgery. Another incentive is that my practice includes patients with co-morbidities that mandate avoidance of transfusion. A large portion of my patients suffer from connective tissue disorders that harbor allergies and significant sensitivities to not only a wide spectrum of blood and related products but also other "allergens." These substances certainly should not have a home at all in elective surgical procedures, where we are striving for best functional outcomes.

What options do you utilize and what are the challenges with your neurosurgical procedures?

The procedures of my practice are all elective intervention, meaning non-emergent, and to their nature, additional morbidity must be minimized. This, of course, foremost addresses prevention of any blood loss as well as an adverse reaction to any blood-related products. Therefore, meticulous surgical dissection using cautery, taking time to control the surgical bed and using cotton patties and surgical foams to control venous bleeding, paralytics and deep anesthesia to avoid venous pooling and increases in arterial and venous pressure, etc., are a major part of the surgery enabling success. Another very important reason why procedures in and around the cerebrospinal fluid system should be as bloodless as possible, is related to the surgical goal. Any blood contamination of CSF during the procedure can potentially cause an immune-inflammatory reaction within the CSF leading to the formation of scar tissue within the arachnoid tissues (this is the "tissue" of the cerebrospinal fluid). These are so-called arachnoid adhesions or arachnoiditis and may itself obstruct the CSF circulation defeating the purpose of the entire surgery.

A Conversation with Petra M. Klinge, MD, PhD

Were there challenges with Sofia's procedure?

Sofia was diagnosed with a connective tissue disorder and mast cell activation syndrome (MCAS) was a major issue. After the first procedure in her lower back to fix and "release" the tailbone tethering of her spinal cord, she had a reaction to the suture material due to her multiple sensitivities causing a painful scar at the lumbar back, and she needed a wound revision with the assistance of pediatric plastic surgeon, Albert Woo, MD. The second neurosurgical intervention to address her rapid neurological decline and debilitating seizure-like episodes a year later necessitated an urgent intervention at the base of the skull to address a problem of her congenital Chiari malformation causing obstruction of the CSF circulation between the skull and the spine. In anticipation of moderate blood loss but needing to avoid blood transfusion, careful dissection of the neck muscle tissues and meticulous cauterization as well as the use of diamond drill bits to perform bloodless bone drilling of the base of the skull was performed. While suturing in the "tissue patch" that allows room for the CSF to circulate, bleeding from the wound was controlled with cotton patties, saline irrigation and gentle suction. Those measures may prolong the duration of the surgical procedure, however that was minor compared to the enormous benefit.

Dr. Klinge concludes: My goal when caring for patients is that they understand me as a partner; I'm here to help in making their decision and I want them to completely understand, not only their specific problem, but to see the bigger picture, that they're not alone and that we have measures to help.

Dr. Klinge is a professor of neurosurgery at The Warren Alpert Medical School of Brown University. Her research has focused on the failure of "myodural bridges" and defunct collagen that supports the aspects of CSF circulatory failure at the base of the skull in various conditions including Chiari associated with connective tissue disease, and she works on the novel concept of a spinal cord motion disorder that might explain and support occult neurosurgical pathologies associated with impaired CSF regulation and tethering of the spinal cord and brain stem.

In collaboration with neuroradiology in her practice at Rhode Island Hospital, the Carney Institute for Brain Science at Brown University, and the Department of Biomedical Engineering at The Warren Alpert Medical School of Brown University, she develops pioneering and novel clinical and in-vivo diagnostics and pathological studies to improve the management and validation of those conditions. To read more, see Petra M. Klinge, MD, PhD | Lifespan.

Staying Safe: Covid-19 Strategies to Reduce Risk of Exposure

Leonard A. Mermel, DO
Medical Director, Department of Epidemiology and Infection Prevention
Lifespan

Children and young adults were in school spending more time together indoors. However, now, as summer is upon us, the weather has warmed up and outside activities are becoming more prevalent. This is welcome news since it lowers risk of transmission of respiratory viruses compared to indoor settings. Although COVID-19 cases are much lower now than in the recent past, cases are still reported daily to the RI and MA health departments. To protect yourself, family, and friends, it is important that you are up to date with COVID-19 vaccinations. This means you should get a bivalent COVID-19 vaccine if 6 months of age or older.

Vaccines are highly effective in preventing life-threatening illness, hospitalization, and death, as well as reducing transmission of respiratory viruses to others. However, no vaccine is 100% effective. As such, minimize exposure to indoor, crowded settings whenever possible if you are at risk of severe disease (e.g., oldest age groups, multiple underlying illnesses, etc.). Wearing a mask that fits well to your face remains an important strategy to reduce risk for such patients in these settings. Increasing the number of air exchanges in your workplace or home is also helpful if it can be done, as well as increasing the number of fresh air exchanges in the air handling system. Improving Ventilation in Buildings | CDC. Lastly, don't forget to clean your hands frequently and minimize touching your eyes/mouth. These basic strategies will reduce your risk and risk of those around you.

Dr. Mermel is a professor of medicine, The Warren Alpert Medical School of Brown University, and adjunct clinical professor, University of Rhode Island, College of Pharmacy.

Management of Iron Deficiency Anemia: More Than Just Taking a Pill

Eridania Teixeira, PharmD
Rhode Island Hospital

The diagnosis and management of iron deficiency anemia (IDA) is an important public health issue. Oral iron is used as first line therapy in most patients due to the ease of administration and because it is generally effective, readily available, inexpensive, and safe. However, in a large percentage of patients for whom oral iron is prescribed (especially ferrous sulfate), it may be ineffective due to high rates of intolerance and nonadherence.

Therefore, appropriately counseling patients as highlighted in the boxes below may help to increase adherence, improve iron absorption, decrease side effects, and resolve anemia.

ORAL IRON ADMINISTRATION

On an empty stomach

- Iron generally should not be taken with food as certain foods can decrease absorption of iron by 50%.
- Iron should especially be taken separately from calcium containing foods and beverages such as cereals, eggs, milk, coffee, tea, also dietary fiber and calcium supplements.
- Patients should not drink coffee and tea within one hour of taking iron.

With vitamin C

- Patients should not drink coffee and tea within one hour of taking iron.
- Vitamin C (ascorbic acid) supplements and citrus juices may increase iron absorption.
- Iron may be taken with orange juice or with a 250 to 500 mg ascorbic acid tablet.

ORAL IRON ADMINISTRATION (cont)

Avoid certain medications

- Iron is best absorbed in a mildly acidic medium, therefore medications that reduce gastric acid (i.e., antacids, histamine receptor blockers, proton pump inhibitors) may impair iron absorption.
- Iron should be taken two hours before, or four hours after, ingestion of antacids.

Alternate-day dosing

- Evidence suggests that excessive oral iron dosing is potentially counterproductive. Higher or more frequent doses of oral iron can lead to reduced fractional iron absorption, increased side effects, without improving iron levels or anemia.
- Alternate-day dosing (every other day) appears to result in equivalent or increased iron absorption rather than daily dosing, usually with fewer adverse effects.
- A recommended schedule is Monday, Wednesday, and Friday.

AWARENESS AND MANAGEMENT OF SIDE EFFECTS

- Oral iron can cause gastrointestinal disturbances which are generally a result of undigested iron and is therefore dose dependent.
- Symptoms can include nausea, vomiting, diarrhea, constipation, epigastric pain, bloating, metallic taste, dark stools.
- Strategies to reduce these effects include reducing the frequency to every other day, dietary modifications, and switching to a liquid formulation which allows for dose titration.

IRON PREPARATION CONSIDERATIONS

- Not all preparations are the same and may contain varying amounts of elemental iron and other ingredients.
- It has been estimated that the maximum amount of elemental iron that can be absorbed with an oral iron preparation is 25 mg per day.
- Consider dosing one tablet (containing at least 25 mg elemental iron) once a day on Monday, Wednesday, and Friday.

Management of Iron Deficiency Anemia: More Than Just Taking a Pill

ADDITIONAL SUPPLEMENTS

- Oral supplements and foods containing vitamin B12 and folic acid improve red blood cell formation and maturation.
- Iron should be taken with vitamin B12 and folic acid supplementation.

IMPORTANCE OF DIET

Foods rich in iron, vitamin B12 and folic acid can help improve and prevent IDA. All meals should be consumed with foods containing vitamin C to improve iron absorption.

- Heme iron sources include: beef, calf and beef liver, chicken, chicken liver, pork, turkey, lamb, veal, clams, mackerel, oysters, salmon, sardines, scallops, shrimp, tuna. (Heme iron is the most easily absorbable form)
- Non-heme iron sources include: beets, lima beans, baked beans, lentils, peas, soybeans; chard, collard, mustard and turnip greens, spinach; apricots, prunes, raisins, peaches, dates; eggs; whole and enriched grains; blackstrap molasses.
- Vitamin C sources include: lemons, limes, oranges, grapefruit, tangerines, and 100% juices of these fruits; mango, papaya, honeydew, cantaloupe, strawberries, kiwi; tomatoes, spinach, greens, broccoli, green peppers, chili peppers, brussels sprouts.
- Vitamin B12 sources include all meat, liver and dairy products.
- Folic acid sources include: liver, asparagus, leafy green vegetables, spinach, dried beans, whole wheat, wheat bran, wheat germ, yeast, oranges, broccoli, and cabbage.

INTRAVENOUS (IV) IRON MAY BE PREFERABLE TO ORAL IRON

- If lack of response to, intolerance of, or inability to adhere to oral iron
- If to replete iron stores in one or two visits rather than over the course of several months (i.e., planned surgery within the next two months)
- Ongoing blood loss that exceeds the capacity of oral iron to meet needs (i.e., heavy uterine bleeding)
- Anatomic or physiologic conditions that interfere with oral iron absorption (i.e., gastrectomy or bariatric surgery)
- Coexisting inflammatory conditions that interfere with iron homeostasis (i.e., inflammatory bowel disease)
- Dialysis-dependent kidney disease
- Transfusion-free medicine patients

According to the World Health Organization (WHO), iron deficiency is the top nutritional disorder in the world, with research estimating that as many as 80 percent of people worldwide don't have enough iron in their bodies. This is of particular concern for pregnant women and children, especially in developing countries, yet is also significantly prevalent in industrialized countries.

Disclaimer

This information is only intended to be general summary information for public use and does not replace professional medical advice, diagnosis, or treatment. If you have questions about a medical condition, always seek the advice of your doctor or other qualified clinician.