

The Joseph E. Robert, Jr., Center for Surgical Care
Division of Orthopaedic Surgery



Your **Guide** to
Idiopathic Scoliosis:
Posterior Spinal Fusion



Children's National™



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This educational booklet was provided for in part by funding from the Board of Visitors.



INTRODUCTION

What is Idiopathic Scoliosis?

Idiopathic scoliosis is a condition of a child's spine. The spine has an abnormal side-to-side shaped curve that measures 10 degrees or greater. Along with the curve, the spine also rotates or twists, pulling the ribs along with it.

Signs and Symptoms

Idiopathic scoliosis generally does not cause pain; however, a child with idiopathic scoliosis may complain of some occasional pain in the lower back area. This is typically due to poor core abdominal strength and tightness of the hamstring muscles. Parents also may notice the following signs in their child:

- Shoulders are uneven
- Head is not centered with the rest of the body
- Hips are uneven
- Shoulder blade heights are uneven or in different positions
- One shoulder blade is more prominent than the other
- Back is asymmetric when bending forward

Diagnosis

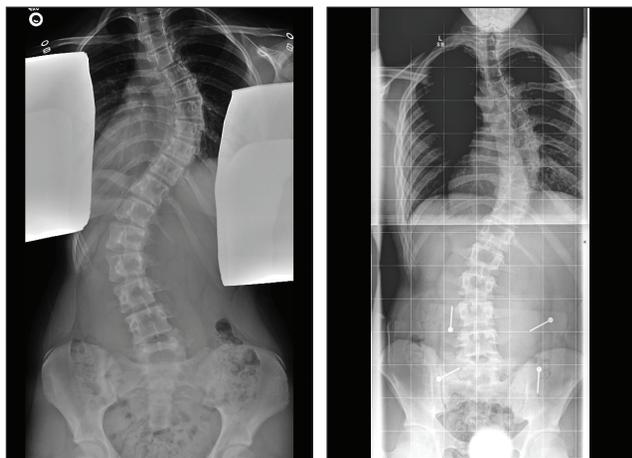
A child's parent(s) or pediatrician is usually the first to detect an issue with the spine. If there is a concern for scoliosis, a child's pediatrician may initially order X-rays or refer the



patient to an orthopaedic surgeon for further evaluation. To determine the presence and severity of your child's scoliosis, we will initially start with an X-ray. Obtaining an X-ray of the entire spine on a single film is best practice for evaluating a child with a concern for scoliosis.

Types of Curves

There are two types of curves associated with idiopathic scoliosis – C-shaped (one curve) and S-shaped curvature (two curves).



Radiographs showing typical curve patterns of idiopathic scoliosis. Scans provided by Dr. Oetgen.

Progression

The progression of a child's curve can be predicted by looking at the level of skeletal maturity as well as by assessing the magnitude of the existing curve.

A child's curve is most at risk for progressing during rapid phases of growth. In females, this time period is right before they begin their menses (period), which is between the ages of 10 and 12. In males, this time period is between the ages of 12 and 14. It also is noted that even after skeletal maturity, a child with a curve greater than 50 degrees can progress one to two degrees a year for the rest of their life.

Causes

At this time there is no known cause for idiopathic scoliosis. There is thought to be a genetic component, as 30 percent of adolescent idiopathic scoliosis patients have some family history of scoliosis.

Who does it affect?

Idiopathic scoliosis most commonly affects females. In fact, idiopathic scoliosis is 10 times more common in females than males.

Monitoring

Curves that range from 10 degrees to 25 degrees are monitored. X-rays are generally obtained every four to six months during periods of rapid growth then radiographs every six to nine months as a child's growth slows down.

Treatments

Treating idiopathic scoliosis is based on skeletal maturity of the patient, the size of the curve, and the curve progression.

Bracing

Bracing for idiopathic scoliosis is indicated in curves measuring from 25 degrees to 45 degrees. The goal of bracing for idiopathic scoliosis is to stop the progression of the curve, not to correct the deformity. There are four types of braces: Milwaukee brace, TLSO brace, Boston-style brace, and Nighttime Bending brace. Your child's physician will choose the appropriate brace for your child based on the type of curve. The Milwaukee brace, TLSO brace, and Boston-style brace are worn on an average of 18 hours a day. The Nighttime Bending brace is worn only at night. A brace is worn until the physician deems it is appropriate to stop. The decision to stop bracing is based on multiple factors, when the child reaches skeletal maturity (which is measured on X-ray) and when no more growth is noted on the exam or when the child is two years post-menarchal (in females).

Surgery

Surgery is recommended for children with curves greater than 50 degrees. The best practice for treating idiopathic scoliosis with curves greater than 45 degrees is posterior instrumentation and spinal fusion. The goal of surgery is to prevent the curve from getting worse, while also keeping the patient well balanced.



POSTERIOR SPINAL FUSION



Once in the operating room, a series of steps are taken to maximize safety. The first step is to give anesthesia either using gas that is breathed in or medicine through an IV. Once the child is asleep, a breathing tube is inserted, an IV is placed, a special IV is inserted into an artery at the wrist to monitor blood pressure, and a urinary catheter is placed to monitor urine production. Leads are then placed on the child's head, arms, and legs. This allows us to check the spinal cord during the operation. We can stimulate the brain and pick up the signals in the arms and legs (motor-evoked potentials). We also can stimulate the legs and pick up the signal in the brain (somatosensory-evoked potentials). Then the child is turned facedown to allow us to operate on the back. We are careful to pad all boney areas to decrease the risk of pressure sores. The back is then cleaned to decrease the risk of infection. The time to get a patient safely prepared takes approximately 35 to 45 minutes.

Once the incision is made, parents will be notified. The surgeon will then expose the bones of the back, place the metal implants, and correct the curvature. To obtain a completely straight spine is not necessary and sometimes not possible. The metal implants are used to help correct the curve and hold that position until the bones fuse together. To encourage the bones to fuse together, donor bone is placed along the spine. The "bone graft" serves as a scaffold for the bone to grow onto.

We will continue to update parents every few hours and when we start to close the incision. Once the incision is completely closed and covered with a clean dressing, the child is rolled onto his or her back. As soon as the child is able to move his or her legs and the breathing tube is removed, the surgeon will talk about how the procedure went. The child will then be brought to the recovery room.



MEET THE TEAM



We are proud to have one of the most experienced pediatric orthopaedic practices in the nation. Our dedicated team has extensive experience in pediatric orthopaedic care, combining our technical expertise with compassion. We place an emphasis on communication by meeting regularly with patients and their families to explain all stages of treatment and answer questions. We collaborate with other experts and departments to offer your child comprehensive services and ensure your child is receiving the full spectrum of care.

The Children's National Idiopathic Scoliosis team includes:

- Surgeons
- Anesthesiologists
- Pediatric Nurse Practitioners
- Physician Assistants
- Physical Therapists
- Occupational Therapists
- Nurses

Orthopaedic Spine Surgeons

Matthew Oetgen, MD, MBA



Dr. Oetgen graduated from Georgetown University School of Medicine. He completed his orthopaedic residency at Yale-New Haven Hospital and his fellowship program at the Texas Scottish Rite Hospital for Children. He is board-certified by the American Board of Orthopaedic Surgery. He specializes in all forms of pediatric spinal deformity including idiopathic scoliosis; kyphosis; spondylolisthesis; and neuromuscular, neurofibromatosis associated, and congenital spine deformities. Additionally, he is experienced in the treatment of early onset scoliosis using a variety of treatments including Mehta casting, growing rods, the VEPTR (Vertical Expandible Titanium Rib) device, the MAGEC magnetic controlled growing rod, and intra-operative navigation of spinal instrumentation. Dr. Oetgen was the recipient of the 2014 Scoliosis Research Society Edgar Dawson Traveling Fellowship. He is the Chief of the Division of Orthopaedic Surgery and Sports Medicine at Children's National. He also is an active member of the Scoliosis Research Society.

Shannon Kelly, MD



Dr. Kelly graduated from University of California San Diego School of Medicine. She completed her orthopaedic residency at the Mayo Clinic and her fellowship program at the Texas Scottish Rite Hospital for Children. She is board-certified by the American Board of Orthopaedic Surgery. She specializes in the operative and non-operative treatment of pediatric spine pathology including adolescent idiopathic scoliosis, early onset scoliosis, neuromuscular scoliosis, kyphosis, spondylolisthesis, and spine trauma. She follows modern technological advances and, when indicated, uses such techniques as magnetically controlled growing rods (MAGEC) and intraoperative navigation. Dr. Kelly also is head of the Pediatric Orthopaedic Residency program at Children's National and the Director of the Pediatric Orthopaedic Fellowship program.

Jeffrey Hanway, MD



Dr. Hanway graduated from Harvard Medical School. He completed his orthopaedic residency at Hospital for Special Surgery (Cornell) in New York City and his fellowship program at Texas Scottish Rite Hospital for Children in Dallas. He is board-certified by the American Board of Orthopaedic Surgery. He specializes in the operative and non-operative treatment of all types of pediatric spinal deformity including idiopathic scoliosis, kyphosis, early onset scoliosis, congenital scoliosis, and spondylolisthesis. He has vast experience with both posterior and anterior surgical techniques for spinal deformity treatment and also employs newer techniques for the treatment of early onset scoliosis such as Mehta casting and magnetically controlled growing rods (MAGEC). Dr. Hanway has practiced in the Washington, DC, metro area for over 20 years and has been named one of the Washingtonian Magazine's "Top Doctors" for the last decade. He is the Vice-Chair of Orthopaedics and Sports Medicine at Children's National Health System and Chief Surgical Officer at Pediatric Specialists of Virginia, LLC. He is a member of the Pediatric Orthopaedic Society of North America (POSNA) and the American Academy of Orthopaedic Surgeons (AAOS).

Benjamin Martin, MD



Dr. Martin graduated from Georgetown University School of Medicine. He completed his orthopaedic residency at Georgetown University Hospital and his fellowship program at the Texas Scottish Rite Hospital for Children. He is board-certified by the American Board of Orthopaedic Surgery. He specializes in all types of pediatric spinal deformity including infantile scoliosis, juvenile and adolescent idiopathic scoliosis, congenital scoliosis, neuromuscular scoliosis, spondylolysis, and spondylolisthesis. Dr. Martin also is experienced in the treatment for early onset scoliosis such as Mehta casting as well as modern technological advances such as intra-operative navigation of spinal instrumentation. Dr. Martin fully embraces the Jesuit tradition "Cura Personalis", care of the whole person, with every patient he interacts. He was recently recognized as a "Top Doctor" in Washingtonian Magazine. He also is an active member of the Pediatric Orthopaedic Society of North America (POSNA), the American Academy of Pediatrics (AAP), and the American Academy of Orthopaedic Surgeons (AAOS).

Anesthesiologists

Children’s anesthesiologists provide surgical anesthesia and post-operative pain management for all young patients undergoing surgery at Children’s National. All of our anesthesiologists are fellowship-trained in pediatrics. They are specialized in caring for the particular psychological, physical, and physiological needs of infants, children, and teens. At Children’s National, ensuring patient and parent comfort is an important part of the care we provide. Our anesthesiologists work through the Perioperative Care Clinic to create a specialized care plan for each patient having major surgery at Children’s National. During surgery, we have a special team of anesthesiologists who routinely provide anesthesia for spinal fusions. Our pain team is another special team of anesthesia providers who are available 24 hours a day. They provide pain control after posterior spinal fusion until the pain is controlled only by oral medications.

Pediatric Nurse Practitioners

Our pediatric nurse practitioners specialize in orthopaedics and acute post-operative management of pediatric patients. They will assist in managing the post-operative hospital course. They provide continuity of care and education, and they collaborate with other services to give the best care possible until the first follow-up appointment with the surgeon.

Physician Assistants

Our physician assistants specialize in orthopaedics. They are responsible for delivering compassionate care in the outpatient setting. In conjunction with surgeons, our physician assistants will help manage pre-operative, post-operative (after the first follow-up appointment), and long-term care. Our physician assistants are able to answer any questions or concerns before or after surgery.

Physical Therapists (PT)

Physical therapists are professionals who are licensed in the examination, evaluation, and treatment of physical impairments through the use of special exercise, safe mobility techniques, and other physical modalities. The goal is to assist persons who have just had surgery or are physically challenged to maximize independence and improve mobility, self-care, and other functional skills necessary for daily living.

Occupational Therapists (OT)

Occupational therapists are professionals who use purposeful activity and interventions to maximize the independence and health of any person who is limited by physical injury or illness, cognitive impairment, psychosocial dysfunction, mental illness, or a developmental or learning disability. Services include the assessment, treatment, and education of the patient or family; interventions directed toward developing daily living skills; and facilitation of the development of sensory-motor, perceptual, or neuromuscular functioning or range of motion.

Nurses

Nurses at Children’s National specialize in pediatric nursing, ensuring that all patients have a skilled expert to provide care. They work closely with other healthcare professionals, bringing skill and compassion to every patient they treat and always putting the needs of children first.



PREPARING FOR SURGERY



Scheduling



Once a decision is made to proceed with surgery, the surgeon will submit a surgical plan of care to the surgery scheduler. The surgery scheduler will seek approval for the surgery with your child's insurance company. Once the insurance company has given approval to proceed with the surgery, you will be contacted by the surgery scheduler to pick a date that is convenient for you and your surgeon. The approval for the surgery generally takes one week to obtain.

Perioperative Complex Care Preoperative Screen



Prior to surgery, all individuals scheduled for a posterior spinal fusion meet with our perioperative complex care (POCC) team. The POCC team is led by perioperative nursing and our Anesthesiology department. The POCC team is responsible for reviewing

your child's entire medical history and devising a specific care plan for him or her. The POCC team also is responsible for coordinating with other division specialists to make sure that your child is safe to proceed with surgery.

Pre-Surgical Tour



A pre-surgical tour is available to all families at the Sheikh Zayed Campus for Advanced Children's Medicine every Sunday at 2 p.m. The tour includes a visit to the Main Atrium, surgery waiting/registration areas, pre-operative areas (including induction rooms), recovery rooms, and inpatient unit. Prior registration is required to attend the pre-surgical tour. It is recommended that you attend the tour the Sunday prior to your child's surgery. The online registration form can be found on Children's National's main website, under pre-surgical tour. If you cannot attend a pre-surgical tour, a virtual one also is available on our website. For more information you can also contact 202-476-3812.

Labs



Your child will need to complete blood work prior to meeting with the POCC team so that they can determine if your child has any signs of anemia or a higher risk of bleeding with surgery. A lab slip will be included in your pre-operative packet.

Donating Blood



Children who have a posterior spinal fusion may require a blood transfusion during their operation or soon after. We recommend that your family consider autologous blood donation. This is where your child can donate a unit of his or her own blood that can be used during the surgery. Typically the blood donation would be scheduled three to four weeks before surgery in order for the body to replenish the blood that was donated. Information about donating blood will be provided to you in the surgical packet, which is mailed to you by our surgical schedulers. Discuss blood donation with your surgeon. If you have any questions about blood donation, please contact our surgery schedulers at 202-476-2108.

Iron Supplements



One month before your child's surgery, iron supplements are recommended to minimize blood loss after surgery. If your child is doing autologous blood donation, then he or she should begin the iron supplements one month before the blood donation (approximately two months prior to surgery). Iron supplements can be found in any vitamin aisle. The recommended dose of iron is 325mg once a day.

Bowel Regimen



Three days before your child's surgery, we recommend beginning a course of MiraLAX® (17g) once daily. This is to help prevent constipation, a known side effect of anesthesia and opioid pain medication as well as moving around less after surgery.

What to Eat Before Surgery



It is very important to follow all guidelines about eating and drinking before surgery. If your child does not follow the guidelines, the surgery may be delayed or canceled. These guidelines are in place for your child's safety to prevent complications associated with vomiting during surgery.

Beginning midnight the evening before surgery, do not give your child any solid food. This includes:

- Juice with pulp
- Hot or cold cereal
- Chewing gum
- Milk or milk products
- Pudding
- Candy or mints

Your child may have clear liquids until four hours before surgery. Clear liquids include:

- Apple juice
- JELL-O®
- Sports drinks
- Water
- Popsicles
- Pedialyte®

What to Bring to the Hospital



On the day of surgery, make sure you bring the following information to check in and register:

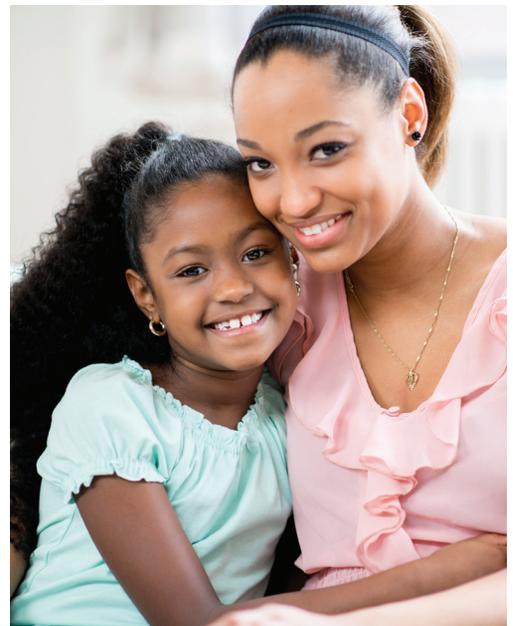
- Picture ID card (for parents and patients over 18)
- Child's insurance card
- Proof of guardianship (foster parent papers/court orders) if you are not the parent
- Referral/authorization, if covered by an HMO
- Statement of non-availability, if covered by TriCare
- Your child's medications; parent/caregiver medications

When packing for your child's stay in the hospital, please bring items to make your stay more comfortable. Items to bring may include:

- Comfortable clothing and a change of clothes
- Containers for glasses, contact lenses, or any assistive devices such as hearing aids
- Your child's favorite toy, blanket, or comfort item
- Something to occupy your time while you are waiting, such as magazines, knitting, or your laptop computer; a free wireless network is available to our guests



DAY OF SURGERY



You will receive a call two business days prior to surgery telling you when you should be there. In general, please plan to report to the center for surgical care two hours before the scheduled surgery time.

When you arrive at Children's, park in the visitor parking garage and go to the first floor. Personalized directions from your home are available on the Children's web site. All visitors are required to sign in at the Welcome Desk. From there, take the elevators to the second floor, and follow the signs to surgery. Please bring a photo I.D. to receive a visitor's badge. Patients age 18 or older must also have a photo I.D.

Once you check in, you will meet the team that will be caring for your child throughout surgery and recovery. You

will have an opportunity to ask any last minute questions that you have. Expect the surgery to last approximately six to eight hours. Parents will be given a pager that will alert them when the surgeon has an update. Families are free to wait in the surgical waiting area or visit the cafeteria on the second floor or Dr. Bear's Café on the seventh floor of the East Inpatient Tower to get food and drinks.

When the surgery is complete, your child will be transferred from the OR to the Post Anesthesia Care Unit (PACU) or Pediatric Intensive Care Unit (PICU) dependent upon his or her needs for post-operative care during the first night after surgery. You will be reunited with your child once he or she is settled in the PACU or PICU.



WHAT TO EXPECT DURING YOUR HOSPITAL STAY



Each individual is unique

in the post-operative (after surgery) recovery period. However, after a posterior spinal fusion, we typically expect patients to be in the hospital for three days post-surgery. By post-operative day three, most children have met general discharge goals for home, which include:

- Transition all pain control from intravenous (IV) to pain medication by mouth
- Drink and eat enough to stay hydrated off of intravenous fluids
- Work with physical therapy until the child is able to move without help while in bed, walk around the unit, and use stairs with just parents assisting
- Have a bowel movement

Pain control

Pain control is a priority for all patients who have a posterior spinal fusion. Due to the extent of the operation, it is very difficult to eliminate pain completely. Therefore, the goal for pain control is for your child to have a tolerable level of pain. In the immediate post-operative period, the pain medicine team will be available and consulted to manage your child's pain until it is mostly managed by pain medications by mouth.

The following medications are typically used for pain control:

Morphine or Hydromorphone PCA Pump: This is an electronically controlled infusion pump that delivers an amount of IV pain medication by pressing a button. It

is programmed with a patient's information, including weight, so that pain medication can be delivered quickly and safely. The PCA pump is used in the immediate post-operative period to control severe pain.

Ketorolac : This non-steroidal anti-inflammatory drug (NSAID) works similarly to Motrin or Ibuprofen but is given in an IV. It is effective in treating post-operative pain caused by inflammation or swelling in the tissues surrounding the surgical site.

Oxycodone: This oral opioid to treat severe pain is typically started on the first day after surgery when a patient is able to drink liquids and perhaps tolerate a small amount of solid food. It is used to help patients transition off of the PCA pump in preparation for pain control at home.

Diazepam: This medication is used to treat muscle spasms that are common after surgery due to manipulation of muscles connected to the spine. It can be taken through an IV or by mouth.

Acetaminophen : This non-opioid analgesic helps control mild to moderate pain as an adjunct therapy to opioid main medication. It helps the opioids work better and last longer. It also helps control fever.

Ibuprofen: This non-steroidal anti-inflammatory drug works similarly to Ketorolac in helping reduce pain caused by swelling and inflammation in the tissues surrounding the surgical site. Patients are typically transitioned from Ketorolac to Ibuprofen once they are able to drink liquids.

Side Effects of Pain Medications (Analgesics)

Analgesics or pain medications could have side effects that may affect a patient while taking them.

NSAIDs, such as Ketorolac or Ibuprofen, can cause bleeding due to interruption in platelet function. Most patients are not affected by this at all; however, if a patient has a pre-existing bleeding disorder, it is important to communicate this information, as NSAIDs may not be safe to use to control pain.

Opioid pain medications such as morphine, hydromorphone , or oxycodone may have multiple side effects that can be expected while taking them. These include dizziness, confusion, hallucinations, drowsiness, decreased appetite, nausea, vomiting, constipation,

and decreased respiratory rate or effort. The majority of patients will not experience all of these side effects. However, it is important to be aware that some may occur.



Customizing Your Child's Pain Regimen

The pain medicine team will customize your child's pain regimen to ensure the most effective pain control post-operatively. As mentioned previously, our post-operative goal is for your child to have a tolerable level of pain; complete elimination of pain is unlikely due to the extent of the surgical procedure.

Pain Medicine Goals

POST-OPERATIVE DAY ONE: **Begin transition to oral pain medication if able to tolerate fluids.** Your child will continue these oral medications in conjunction with the PCA pump to decrease need for morphine or hydromorphone.

POST-OPERATIVE DAY TWO: **Transition off of the PCA pump. Continue pain medications by mouth.** Your child will continue to have IV morphine or hydromorphone available should they have breakthrough pain. Adjustment of doses and schedules may be necessary to determine the best pain regimen for your child.

POST-OPERATIVE DAY THREE: **Post-operative Day Three: All pain medications are taken by mouth.** You will be given prescriptions for these same medications and doses for home use.



What to Expect: Lines, Tubes, and Drains



Arterial Line: A small, flexible catheter placed directly into an artery during surgery to monitor blood pressure continuously. It will remain in place until the transfer to the surgical care unit on post-operative day one.



Peripheral (IV) Line: A small, flexible catheter that is placed directly into a vein used to administer fluids, pain medications, and other medications. More than one peripheral line may be placed during your child's hospital admission. This line will remain until you go home.



Nasal Cannula or Face Mask: These are used to administer oxygen through the nose or mouth to the lungs to help treat hypoxia. The nasal cannula is a small clear tube with two nasal prongs on the end that fit into the nose. A face mask is a clear plastic mask that fits over the nose and mouth to administer oxygen. These will only be used if your child is requiring oxygen after surgery.



Foley Catheter: A small, flexible tube that is placed into the urethra to collect urine from the bladder. It is placed in the operating room while the patient is asleep. Nursing staff will clean the catheter at least twice a day. It will remain in place until post-operative day two. Once removed, patients will begin to urinate regularly.



Hemovac Drain: A flexible tube that is placed beneath the skin during surgery before the incision is closed to collect fluid draining from the surgical site. The drainage may be bright red, pink, or clear. The drain is removed at the bedside usually when the dressing is changed. Your child will be awake for this process. Removing the drain may hurt briefly but once it is removed most patients report an overall improvement in their level of pain.



MEDICAL MANAGEMENT

Post-operative Atelectasis

Atelectasis is defined as the collapse of alveoli (air sacs in the lungs) or loss of lung volume. It is a very common complication following surgery, especially in children. Post-operative atelectasis may be due to decreased lung compliance or ventilation and/or pain that hinders deep breathing and coughing. In most cases, atelectasis will have no obvious signs or symptoms. However, depending on severity, some children will experience decreased oxygen levels in tissues (otherwise known as hypoxia) as well as increased respiratory rate and work of breathing. Hypoxia also may occur as a side effect of anesthetic or narcotic medications due to decreased respiratory rate and work of breathing. If patients experience hypoxia, a nasal cannula or face mask will provide supplemental oxygen. In some cases, atelectasis may progress to pneumonia, an infection of the lungs.

To help prevent and resolve pulmonary complications following surgery, it is extremely important to practice deep breathing exercises and use an incentive spirometer, a device that encourages deep breaths in order to increase capacity and improve atelectasis. Mobilizing by getting out of bed frequently, sitting up in a chair, and walking also helps combat the effects of atelectasis. We will work with your child by providing support and adequate pain control so that he or she is comfortable enough to perform these very important tasks.

Systemic Inflammatory Response Syndrome (SIRS)

As a result of surgery and the insult to tissues, the body may develop systemic inflammation characterized by fever, increased heart rate, increased respiratory rate, or an elevated white blood cell count. This is an expected response to major surgery, and in general, these symptoms

will go away on their own in two to three days after surgery. However, if your child continues to have fevers after the first few days, then he or she may be further evaluated for other possible causes, such as surgical site infection, urinary tract infection, pneumonia, and deep vein thrombosis. Fevers may also result in reaction to certain medications and a blood transfusion.

Anemia

Anemia due to acute blood loss is an expected post-operative complication of surgery. Anemia is a drop in red blood cell mass, defined by either hematocrit or hemoglobin level, below the average amount for a person's age and gender. We will frequently monitor hematocrit and hemoglobin levels to assess the severity of anemia. Signs and symptoms of anemia may include dizziness, fatigue, an increased heart rate, pale skin, lips, gums and nail beds, and cool skin. In some instances, patients may require oxygen or a blood transfusion if red blood cell levels drop too low. Therefore, it is important to take iron supplements as prescribed before surgery to optimize red blood cell levels prior to surgery.

Nausea, Vomiting and Dehydration

Nausea and vomiting are a frequent side effect of anesthesia and medications that help control pain. Patients also may experience nausea and vomiting due to constipation. Not everyone will experience this side effect. However, if patients do, we try our best to limit discomfort with medications or switching to another pain medication. It is especially important to keep hydrated and continue to drink fluids to prevent dehydration. In some instances, extra fluids may need to be delivered intravenously.

Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE)

A DVT or PE is a very rare occurrence in which a blood clot manifests either in the legs (DVT) or in the lungs (PE). A DVT will often present as pain or tenderness in the affected leg, warmth, swelling, and skin discoloration. A PE may present with more vague symptoms but will usually have a sudden onset and may include increased respiratory rate, work of breathing, chest pain, cough, hypoxia and difficulty breathing. Risk factors for a DVT or PE include recent surgery, obesity, age (older children), gender (female), race (African American), and other inherited or acquired disorders. It is very important that patients wear sequential compression devices (SCDs) and mobilize early after surgery to prevent these life threatening complications. SCDs are devices that wrap around the lower legs and inflate with air periodically, squeezing the legs. They do not cause pain.

Constipation

There is high risk for constipation after surgery. This is due to a number of factors that slow down the motility of bowels, including anesthesia and narcotic pain medication, poor mobility, and dehydration. Constipation can be very uncomfortable after surgery and may progress to a post-operative ileus. An ileus is a delayed return of bowel function characterized by lack of passing of gas, discomfort, nausea and vomiting, and poor oral intake.

Preventing constipation is a joint effort between patients and care providers. Taking MiraLAX® preoperatively for three

days prior to surgery will help to lessen post-operative constipation. Getting out of bed, sitting up in a chair, and walking, as well as drinking plenty of fluids and eating high fiber foods, are the best ways to prevent constipation after surgery. Patients also will be given medications, including MiraLAX® and Docusate-Senna, to help stimulate bowels on a daily basis. We will wean patients off of narcotic pain medication as soon as it is comfortable to do so, to limit the adverse effects of these medications. If patients are unable to have a bowel movement or are unable to pass gas, we will give additional medications to help stimulate this process. This includes milk of magnesia, suppositories, and enemas. A suppository is a small, pill-like medication that is inserted into the rectum. An enema is about 4oz. of fluid that is inserted into the rectum to stimulate a bowel movement. Most children will need a suppository or enema following their spinal fusion.

Urinary Retention

Your child may notice that it is difficult to urinate the first time after the foley catheter is removed. This is normal. If your child is unable to urinate within 8 hours after removal of the catheter, they may be experiencing urinary retention or the inability to fully empty the bladder. Urinary retention may be due to a number of different causes. However, after surgery, it is usually a side effect of narcotic pain medication and in rare instances, a urinary tract infection. Another catheter will be placed into the bladder to relieve pressure and prevent distension or over-stretching. Weaning off of pain medication, mobilizing, and drinking plenty of fluids will help relieve this complication.



REHABILITATION: PHYSICAL AND OCCUPATIONAL THERAPY IN THE HOSPITAL

The rehabilitation team

is composed of both physical and occupational therapists who will work with your child and the orthopedic team to help your child move on their own and care for his or herself after surgery.

Your child will be seen two to three times per day by members of the therapy team for a 20- to 30-minute session. We encourage a normal schedule during your hospital stay to help your child return to a normal routine.

Movement after Surgery:

Spinal precautions:

- **No bending** - Do not bend hips past 90 degrees

- **No lifting** - Do not lift anything greater than 50 pounds
- **No twisting** - Do not twist the back; keep shoulders and hips aligned

Movement will begin the morning after surgery. It is never easy to get up the first time after surgery; however, the sooner your child begins to move, the quicker he or she will get better. A physical therapist will help your child get out of bed, sit in a chair, walk, and educate your family on safe ways to assist your child's movement after surgery. It is important to keep the back in alignment within the spinal restrictions previously mentioned. Moving after surgery is important to decrease stiffness and pain, improve strength, and make sure your child's lungs stay healthy. Your child will pass physical therapy and no longer need our services in the hospital when he or she is getting in and out of bed, walking, and climbing stairs with the help of only family.

Helping Your Child After Surgery

GETTING OUT OF BED:

1. When helping your child roll, make sure that his or her shoulders and hips stay in alignment.



2. To help your child come from the side to a sitting position, place one hand on the hip and the other under the shoulder.



3. Once in a sitting position, to help your child stand up, place your hands under the bottom and help guide him or her. Encourage your child to help as much as possible.



WALKING:

Your child may need help with walking as he or she may be off balance after surgery. We recommend someone be at your child's side to keep him or her safe, while allowing him or her to do as much as possible. Your child should be getting out of bed to the bedside chair for every meal and walking outside of the room three times a day by the second day after surgery.



STAIRS:

Ascending — When helping your child go up the stairs, stand behind to help him or her safely climb the stairs.

Descending — When helping your child go down the stairs, stay in front to help safely descend the stairs.



Other exercises used while in the hospital to keep your child healthy, improve endurance, and decrease stiffness include:

Incentive spirometry: Perform 10 times every waking hour during the day.

Perform neck movements two times every hour:

- Rotation
- Side bend
- Flexion/extension

Helping Your Child When You Leave the Hospital

Most activities can be adapted so that your child can perform them independently at home. Your child may need help initially when moving in and out of bed, but independence will improve with practice and time. When dressing the lower body, your child must bend at the knee and raise the foot to put on pants, shoes, and socks. Button-up shirts will be the easiest to wear on the upper body, but your child must not twist at the waist to put them on.

Going to the bathroom: Your child needs to bend at the knees, not through the waist, to sit down and stand up from the toilet. Ensure your child faces forward to clean, no twisting or bending through the waist.

Getting around the house: Place everyday items your child will need within easy reach around the house. Think about your home set up, and practice strategies with the therapists to get around the bedroom, bathroom, and home. Remind him or her to avoid low and/or soft chairs and sofas to prevent bending too much through the waist.

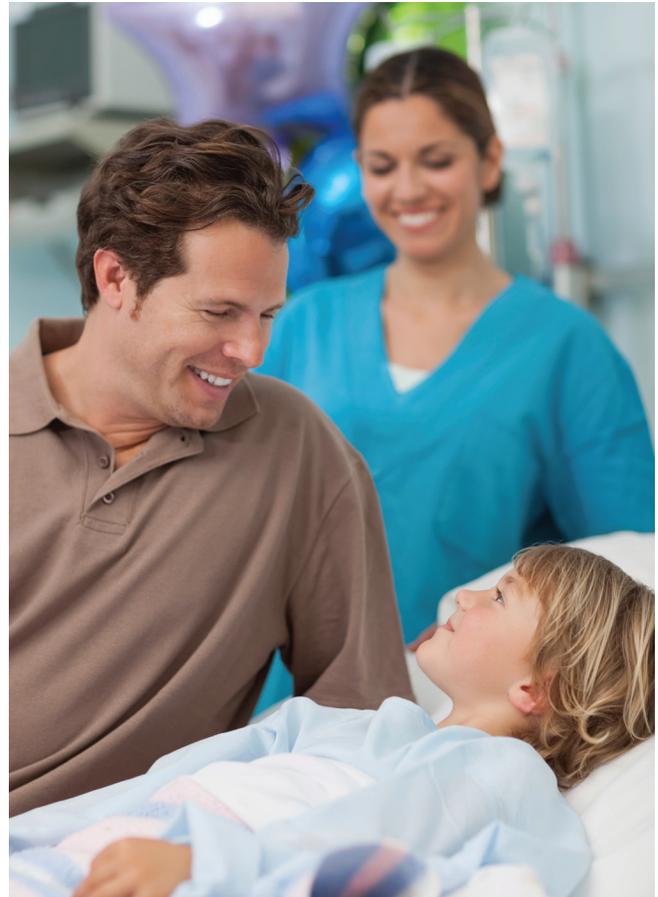


GOING HOME

As discussed, each child is unique in the post-operative recovery period. However, after a posterior spinal fusion, we typically expect children to be in the hospital for three days after surgery. We have gathered some important instructions and contact information for your reference once you go home.

By Post-Operative Day 3 most patients have met general discharge goals for home which include:

1. Transitioning all pain control from IV to pain medication by mouth
2. Drinking and eating enough to stay hydrated off of IV fluids
3. Working with physical therapy until they are able to perform independent bed mobility, walk around the unit, and use stairs with just parents assisting
4. Having a bowel movement





LIFE AFTER POSTERIOR SPINAL FUSION



Spinal Fusion Post-operative Instructions

Dressing changes: Patients will leave the hospital with a dressing over the incision. Remove this dressing on post-operative day seven. When the dressing is removed, wash the incision and steri-strips/dermabond with soap and water, then pat dry. Do not attempt to remove any steri-strips or dermabond; allow these to peel off on their own. You may trim the edges of the steri-strips or dermabond as they curl off on the skin. Do not apply any lotions, ointments, or creams to the incision. Keep it clean and dry.



Showers: Showering is permitted after dressing is removed on post-operative day seven as long as the wound is dry. No soaking in a tub or swimming pool until after the first post-operative appointment.



Stitches: Occasionally stitches may be visible around the incision. Do not do anything about these as they will dissolve or fall off on their own. If your child experiences itching, you may provide a dose of Benadryl®. Please follow the dosage instructions on the medication's package.



Exercise: Take three to four walks each day at home. Start small, maybe a walk to the mailbox, down the driveway and back, or to the end of the block and back. Gradually increase the distance as tolerable. No gym class, physical therapy, spinal manipulation, running, jumping, bending at the waist, lifting, sit-ups, or stomach crunches until these activities are cleared by the doctor.



Stairs: Once home, your child may go up and down stairs, usually slowly at first, but this will improve with strengthening.



Dental appointments: Avoid all dental procedures, including routine teeth cleaning, for at least the first three months following surgery. Please discuss with your surgeon beginning dental procedures and any antibiotic requirement at the follow-up appointment.



Muscle spasms: Muscle spasms and stiffness are common following surgery. This is normal and will typically resolve within a few weeks after surgery.



Prominent hardware: Rarely following this type of surgery there may be reddening of the skin or skin breakdown in the area of the incision. If you notice any changes in the skin around the incision such as redness, drainage or opening of the incision, please call your surgeon/PA team immediately. You may be able to feel some of the spine implants under the surface of the skin, however they should not be poking out of the skin or causing severe pain.



Medication: Your doctor will prescribe pain medicine for your child. This should gradually lessen as discomfort improves. Your child should not continue to take narcotics once returning to school. As pain decreases, you may prefer to give regular Tylenol as needed for mild pain during the day, Motrin/Ibuprofen for



up to one month after surgery, and use the narcotics only at bedtime. Within two to three weeks after surgery, most patients do not need to continue on any pain medicine. Narcotics do cause constipation, so stop narcotic pain medicine as soon as possible. Your child may take Colace/Senna and MiraLAX® for constipation as needed. Narcotics commonly cause nausea and vomiting, so this medication should be taken with food.



Diet: Your child should resume a normal diet once you return home from the hospital. Make sure to include lots of fruits and vegetables that contain fiber, as this will also help with constipation. Your child also should drink sufficient fluids at home.



Driving: Your child should not drive a motor vehicle for at least six weeks after surgery and only after discontinuing all narcotic medicine. Please continue to wear a seatbelt.



School: Most children feel like going back to school between three and six weeks after surgery. At your first post-operative visit, the surgeon will discuss when he or she will allow your child to return to school. If your child feels ready to go back to school before the first post-operative visit, contact your surgeon/PA team to discuss this with them.



Backpacks/heavy lifting: No lifting anything heavier than 5 lbs., including school backpacks and book bags, for the first three months after surgery. We will discuss increasing weight limits at each appointment.



Sports/PE Class: We will not allow your child to return to PE class or sports for several months after surgery. At each post-operative appointment, the surgeon will say what activities your child may begin participating in after that visit. We will provide a note for PE class, school restrictions, and school activities at each visit if you request one.



Long-term scar care: Once the incision is well-healed and your child has been cleared by the surgeon at a follow-up appointment, you may begin applying sunscreen (30 spf or greater) to the incisional scar to help protect it from sun discoloration during sun exposure. Wearing a dark t-shirt during prolonged sun exposure also will help prevent discoloration.

Once the incision is completely healed and your child has been cleared by the surgeon, over-the-counter scar reduction medication such as Mederma or liquid vitamin E can be used. However, they are not necessarily effective for all patients, and therefore, not routinely recommended.



Post-operative appointment: Typically your child's first post-operative appointment will be pre-scheduled by your surgeon. We do not need to see your child sooner unless there is a complication. We will assess the incision at that first appointment and take X-rays at a subsequent appointment to check the hardware. This first post-operative date is listed in the preoperative surgery packet you receive in the mail and in your discharge summary.



IMPORTANT DISCHARGE INFORMATION

Contacting Your Surgeon

You can email your surgeon and include his/her PA or NP or leave a phone message for the PA or NP. That contact information was provided on the business card given to you in clinic.

Non-emergency Concerns

Call the Orthopaedic Clinic Nurse Line at 202-476-5562 or orthopaedic nurse practitioners at 202-476-3399 if you have non-emergent questions or concerns. If you have to leave a message, someone will return your call within 24 hours during regular business hours (Monday through Friday, 8 am-4 pm). Please leave a detailed message including your child's name, date of birth, surgeon, procedure, question, and the best way to contact you.

Emergencies or Urgent Concerns

Call the Children's National hospital operator at 202-476-5000 and ask to speak with the orthopaedic resident on-call during off hours (nights, weekends, holidays) if you have an emergency or urgent concern.

Once you have been to your first follow-up appointment, please resume contacting your surgeon's outpatient PA for any further questions or concerns.

Appointment Scheduling Line

To schedule or reschedule an appointment with the orthopaedic clinic, please call 202-476-2112.

Call immediately if you think the wound is infected.

Signs of infection include:

- Unusual redness or swelling around the incision
- Increasing pain and tenderness not relieved by pain medication
- Pus drainage
- Edges of incision separating
- Red streaks going away from the incision
- Fever greater than 101.5 Fahrenheit



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