

PECTUS EXCAVATUM REPAIR SURGERY

AT CHILDREN'S HOSPITAL OF PITTSBURGH OF UPMC, we believe parents and guardians can contribute to the success of this surgery and invite you to participate. Please read the following information to learn about the surgery and how you can help.

Fast Facts About Pectus Excavatum Repair Surgery

- The pectus excavatum repair is a surgery to fix the shape of the bone in the middle of the chest, called the sternum or breastbone, so that the lungs and the heart are not squeezed by the inward curve of the chest.
- Your child's surgery will take place at Children's Hospital.
- Your child's surgery will be done under general anesthesia, which means that he or she will be sound asleep during the surgery.
- When general anesthesia is needed, there are special rules for eating and drinking that must be followed in the hours before surgery.
- Your child will be given either intravenous medication, oral medication or an epidural catheter for pain following the surgery.
- The surgery will take between 1 to 6 hours, depending on the method used for the surgery and your child's specific condition.
- Your child will stay in the hospital for about 3 to 7 days.

What Is Pectus Excavatum Repair?

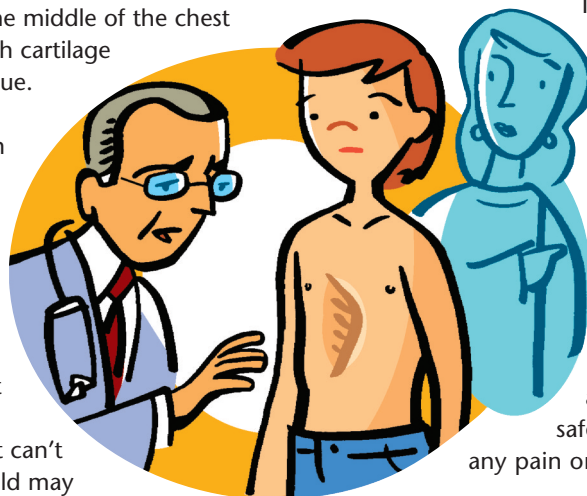
Pectus (*PEK-tuss*) is a Latin word that means "chest," and excavatum (*ek-ska-VAT-um*), also Latin, means "caved in."

The ribs are attached to the bone in the middle of the chest called the sternum (or breastbone) with cartilage (*KART-il-ij*). Cartilage is soft, flexible tissue. Pectus excavatum, also called "funnel chest," is a condition that occurs when this cartilage overgrows onto itself, causing the sternum to curve inward, making the child's chest look as if it has been "pushed in."

When this condition occurs, the heart is pushed from the "midline," or center of the chest, and rotated to the left side of the chest, possibly affecting its ability to pump blood. When the heart can't pump blood the way it should, the child may get tired quickly during exercise. The curve of the sternum also may cause a squeezing effect on the lungs, making it harder to breathe.



- Pectus excavatum is the most common chest wall problem in children.
- Pectus excavatum occurs mostly during the early teenage years in times of rapid growth, and mostly in boys.
- Surgical repair may be done to fix breathing and heart problems, but it may also be done for cosmetic reasons—to make the chest look normal.



The surgery is elective, meaning it can be done when parents want to schedule it. Many choose to have their child's surgery during the summer to allow their child more time to heal without missing school.

The surgery is done under general anesthesia (*an-es-THEEZ-ya*). General anesthesia makes your child's whole body go to sleep and is needed for this surgery so that his or her reflexes will be completely relaxed. General anesthesia makes the surgery easier and safer to do because your child will not feel any pain or have any memory of the surgery.

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Tests Needed Before Surgery

Before your child is admitted to the hospital for surgery, he or she is required to have the following outpatient tests:

- An echocardiogram (or Echo) of the heart, to look for valve problems that can be associated with pectus excavatum.
- A CT scan of the chest to see how successful the repair surgery might be.
- Pulmonary function study, a breathing test that is sometimes necessary to measure the amount of air your child can get into and out of his lungs.

Home Preparation

When general anesthesia is needed, there are important rules for eating and drinking that must be followed in the hours before the surgery. One business day before your child's surgery, you will receive a phone call from a nurse between the hours of 1 and 9 p.m. (Nurses do not make these calls on weekends or holidays.) Please have paper and a pen ready to write down these important instructions.

- The nurse will give you specific eating and drinking instructions for your child based on your child's age. Following are the **usual** instructions given for eating and drinking. No matter what age your child is, you should follow the specific instructions given to you on the phone by the nurse.

For children older than 12 months:

- After midnight the night before the surgery, do not give any solid food or non-clear liquids. That includes milk, formula, juices with pulp, coffee and chewing gum or candy.

For infants under 12 months:

- Up to 6 hours before the **scheduled arrival time**, formula-fed babies may be given formula.
- Up to 4 hours before the **scheduled arrival time**, breastfed babies may nurse.

For all children:

- Up to 2 hours before the **scheduled arrival time**, give only clear liquids. Clear liquids include water, Pedialyte®, Kool-Aid® and juices you can see through, such as apple or white grape juice.
- In the 2 hours before the **scheduled arrival time**, give nothing to eat or drink.

A Parent's/Guardian's Role

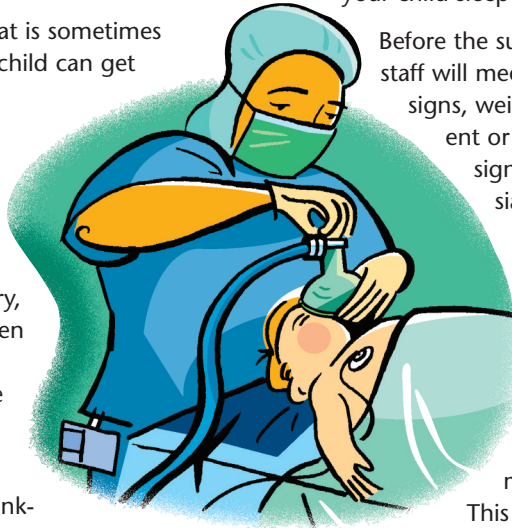
The most important role of a parent or guardian is to help your child stay calm and relaxed before the surgery. The best way to help your child stay calm is for you to stay calm.

- You may bring along a "comfort" item—such as a favorite stuffed animal or "blankie"—for your child to hold before and after the surgery

- During the surgery, at least one parent or guardian should remain in the surgical family waiting area at all times, in case the family needs to be reached.

Going to Sleep

A pediatric anesthesiologist—a doctor who specializes in anesthesia for children—will give the medications that will make your child sleep during the surgery.



Before the surgery, a member of the anesthesia staff will meet with you to take your child's vital signs, weight and medical history. As the parent or legal guardian, you will be asked to sign a consent form before the anesthesia is given.

The anesthesiologist will meet with you and your child to review your child's medical information and decide which kind of sleep medication your child should get.

- If your child is very scared or upset, the doctor may give a special medication to help him or her relax.

This medication is flavored and takes effect in 10 to 15 minutes.

- If you wish, you may go with your child to the room where the surgery will be done and stay as the sleep medication is given.
 - Younger children will get their sleep medication through a "space mask" that will carry air mixed with medication. Your child may choose a favorite scent to flavor the air flowing through the mask. There are no shots or needles used while your child is still awake.
 - Older children may choose between getting their medication through the mask or directly into a vein through an intravenous (IV) line.
 - When your child has fallen asleep, you will be taken to the waiting room. If it has not already been done, an IV will be started so that medication can be given to keep your child sleeping throughout the surgery.

While Asleep

While your child is asleep, his or her heart rate, blood pressure, temperature and blood oxygen level will be checked continuously.

- During the surgery, your child will have a breathing tube placed while he or she is asleep. Your child might have a sore throat after the surgery.
- To keep your child asleep during the surgery, he or she may be given anesthetic medication through the breathing tube, through the IV tube or both. When the surgery is over, the medications will be stopped and your child will begin to wake up.

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The Surgery

Once questions are answered and the operating room is prepared, your child will be taken into the operating room and given an anesthetic to make him or her go to sleep. When your child is asleep, the surgery will begin.

Surgeons have two ways of doing a pectus excavatum repair surgery:

The “Nuss” procedure, named after Dr. Donald Nuss, uses a thoroscope, or small camera, to see inside the chest cavity while the surgeon does the repair. This technique avoids a large incision (cut) and the removal of the cartilage. Instead, the surgery is done through small incisions. A “pectus” bar is inserted into the chest to support the sternum. The bar is made of titanium and comes in various lengths. Your surgeon will select a length based on your child’s chest size. The bar is about 1½ inches wide. It also can be bent during the surgery, using special instruments. This is the most common method used to repair pectus excavatum at Children’s Hospital.

- The surgeon will make two 1½ inch-sized incisions on each side of the chest. A scope, or small camera, inserted through a third incision, is used to place the pectus bar into the chest. The bar is pushed behind the sternum, and rotated forward to raise the sternum to the position where it should be when the child becomes an adult.
- Once the bar is in place, the surgeon will secure it on the chest wall with triangular fasteners to keep it from moving.
- The surgeon then will close the incisions with sutures (stitches) under the skin that will dissolve on their own. This surgery takes about 1 to 2 hours.
- The pectus bar will be removed in approximately 2 to 4 years.

The second, and less common method for pectus excavatum repair, is the traditional “open” procedure, in which the surgeon makes a large incision to give a full view of the areas involved in the repair surgery. The open procedure is done mostly on older teenagers when the breastbone is less mobile.

- The incision is made on the chest and the cartilage attaching the breastbone to the ribs is removed on each side. The breastbone is raised and held in place with another type of bar.
- A variety of bars and “pins” may be used to raise the sternum in the open procedure. The surgeon will decide which bars or pins are needed for your child’s specific condition.
- This method takes about 4 to 6 hours, depending on the amount of cartilage that needs to be removed and the age of the child.
- The bars and pins will be removed in 6 months to a year.

Waking Up

When your child is moved to the recovery room, you will be called so that you can be there as he or she wakes up. While your child is in recovery, your surgeon will talk to you about the surgery. That is a good time to ask questions about pain medications, diet and activity.



- Your child will need to stay in the recovery room to be watched until he or she is alert and his or her vital signs are stable. The length of time your child will spend in the recovery room will vary because some children take longer than others to wake up after anesthesia.
- Children coming out of anesthesia react in different ways. Your child might cry, be fussy or confused, be sick to his or her stomach, or vomit. These reactions are normal and will go away as the anesthesia wears off.

Hospital Stay After Surgery

The Nuss procedure is painful for the first few days after the surgery. Your child will have an epidural (*ep-i-DOOR-ul*) catheter while in the hospital. The epidural catheter will be inserted during surgery to allow the continuous flow of pain medication for a few days after surgery. Your child will continue to be on a mild pain medication by mouth for about 2 weeks after the surgery.

Following an open procedure, your child will be given a strong pain medication prescribed by your surgeon. It will be necessary to take the medication for about 5 to 7 days after surgery. Your child also might have an epidural catheter for a few days after surgery.

If your child had the open procedure, small tubes will be inserted into the incision to drain fluid. A chest tube is almost always needed after the open procedure to remove air from the chest cavity. It is also used in the open procedure to remove blood from the chest cavity. The chest tube is used until there is no more air or blood to come out – usually for about 2 to 4 days.

If your child had the Nuss procedure, these tubes will most likely not be necessary, but there is a possibility that they will be used in certain conditions.

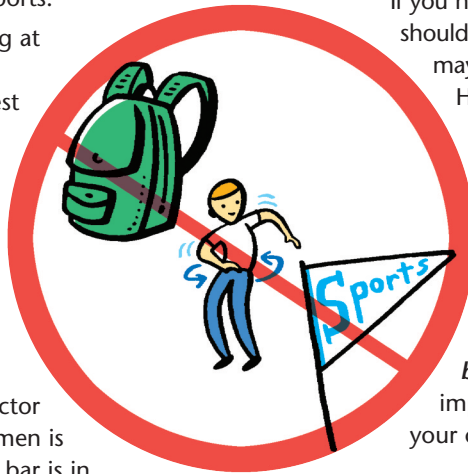
- Your child’s activity will be somewhat limited following either procedure if there is an epidural catheter. Your child’s surgeon will decide how long he or she will have an epidural catheter. It is usually removed within 4 days following surgery.
- After an open procedure, if an epidural catheter is not used, activity will be encouraged as soon as possible. Your child will be encouraged to practice deep breathing, walking and sitting up in a chair.
- Your child’s diet will resume when your child’s surgical team thinks it is appropriate. Usually it will start with liquids on the evening of or the day after surgery, and progress to a regular diet over the next few days.

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At Home

Before leaving the hospital, you will be given a prescription for your child's pain medication and instructions for taking the medication. Your child may resume most normal activities.

- Your child will be able bathe regularly in 5 to 7 days.
- Your child may return to school when he or she is no longer taking pain medication.
- He or she will be excused from gym class for a few months.
- You should discuss with the surgeon the length of time your child needs to avoid contact sports.
- Your child should avoid twisting at the waist or any activity that might cause the bar in the chest to move for about 6 months.
- Your child should not carry a backpack until after the first checkup with your surgeon. If possible, please arrange for a set of your child's school books to be left at home or purchase a backpack with wheels.
- You should alert your child's doctor if an MRI of the chest or abdomen is prescribed while either type of bar is in the chest.



Follow-up Visit

Your child will be scheduled to see the surgeon between 2 to 4 weeks after leaving the hospital.

When to Call the Surgeon

Parents and guardians may call the office any time they have questions or concerns. You should call right away if:

- Your child has pain.
- Your child has an unexplained fever, (i.e., not related to another illness, such as an ear infection.)
- You see "bulging" or swelling at the incision.

Questions

If you have any specific questions about your child's surgery, you should discuss them with the surgeon **before the surgery**. You may call the Division of Pediatric Surgery at Children's Hospital and ask to speak with your child's surgeon, or speak with him or her during the pre-surgical examination on the day of the surgery.

Special Needs

If your child has any special needs or health issues you feel the doctor needs to know about, please call the Division of Pediatric Surgery at Children's Hospital **before** the surgery and ask to speak with a nurse. It is important to notify us **in advance** about any special needs your child might have.

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To see the list of all available patient procedures descriptions, please visit www.chp.edu/procedures.