All children with pacing needs are different. Our goal for all children with pacemakers is for them to have the most normal and active childhood possible. We hope this handout is helpful to you and your family as we partner to meet this goal.

What is a pacemaker?

A pacing system has two parts: the pacemaker and wires (leads). The pacemaker has electronic circuitry and a battery. The pacemaker can be programmed (like a computer) to watch for slow heart rates. It can send signals to the heart to cause it to beat. The leads carry the signals to and from the heart. Pacing systems can use 1 or 2 leads, based on your child’s needs.

Why do children need pacemakers?

There are a few conditions for which children need pacemakers. Your doctor will discuss your child’s condition and why your child’s heart needs pacing. Some common reasons a child may need pacing are:

- **Heart block**: The electrical system in the heart (see picture on page 2) is “blocked.” This blockage stops signals from traveling through the heart to make it beat properly. This causes a very slow heart rate, which can prevent children from doing normal activities and can sometimes be dangerous. This condition can be present at birth, after some illnesses, or be caused by some types of open-heart surgery.

- **Sinus node dysfunction**: The sinus node is the area of the heart’s electrical system that keeps the heart beating at a regular rate. In some children, this area does not work properly. Sometimes it beats very slow, and sometimes very fast. When the node is too slow it can not keep up a good heart rate when children are active. This makes them tire quickly or become faint. This condition can be caused by some heart medicines and after some types of open-heart surgery.

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**The Heart’s Normal Electrical System**

- Sinus node
- Atria
- AV node
- Ventricles
- Child’s left side
- Child’s right side
How is the pacemaker implanted?

The pacing system can be placed (implanted) in 1 of 2 ways, called “epicardial” or “transvenous.” Your doctor will explain what method will be used for your child.

With both methods, an incision is made and the pacemaker is buried beneath tissue in a “pocket.” The pocket will protect and cover it. The pacemakers are small and can be seen usually as a slight bulge under your child’s skin.

Epicardial means that the leads are connected to the outside of the heart and the pacemaker is implanted in your child’s abdomen near the stomach. This method is used in children with some types of structural heart disease and in infants and small children. The hospital stay is usually 1 to 2 days.

Transvenous means that the leads are threaded through vessels in the shoulder area of your child’s chest into the inside of the heart. The pacemaker is implanted in the upper chest area. This method is used in larger children and teenagers. The hospital stay is usually 1 to 2 days.

Your child will be under general anesthesia while the pacemaker is implanted. This means your child will be given medicine to make them sleep without pain. They will also get pain medicine after the surgery.

How do I care for my child after the surgery?

Most of the care after the surgery is taking care of the incision where the doctor made the pocket for the pacemaker. After the surgery:

• Your child may be prescribed pain medicine. As your child is able to handle it, you can offer Tylenol (acetaminophen) or ibuprofen to help with pain and to slowly stop taking the prescribed pain medicine.
• You can also reduce pain by placing a pillow under your child’s affected arm.
• **Call your child’s doctor if your child shows any signs of infection.** This includes if the incision area opens up at all, if fluid is coming out of the incision area (a small amount of clear fluid is OK), if you see redness or unusual swelling around the site or if your child has a temperature over 101 degrees F in the week after the surgery.
• Don’t let your child play with the tape strips (steri-strips) that are over the incision. They keep the incision line neat so it heals evenly. Let the steri-strips fall off by themselves, even if it takes a few weeks.
• Keep the incision area and steri-tapes dry. Do not put ointment, cream or lotion on the area around the incision for 2 weeks. As long as the incision site has not opened at all, your child may shower after 2 days and gently pat the incision area dry. If the incision site opens up at all, keep it dry until it is fully closed (has a scab over it).
• If your child had a catheter placed in the groin, do not let them soak in a tub or take a bath until the scab where the catheter went in falls off.
• Protect the incision area from sunlight. Apply sun block with a high SPF (SPF 15 or higher) or cover the area with a Band-Aid if your child is out in the sun. Keep the area covered when your child is outside until the scar is no longer pink.
• The stitches are absorbed by the body over time and do not need to be removed. Do not touch, pull or cut the stitches, as this can cause infection. Sometimes the doctor can remove a knot in the stitches if it does not fall off by itself.

• Ask your doctor about when your child can return to school and when your child may return to full activity. This will depend on the type of implant your child had (epicardial or transvenous).

• If your child had a transvenous implant (in the shoulder), make sure your child does not move the affected arm higher than the level of their shoulder for 4 to 6 weeks. This helps the pacemaker leads heal into the tissue. Your child may be given a sling to wear to help remind them not to lift their arm above their shoulder.

What should children with pacemakers avoid?

Follow these guidelines, and teach them to your child, to prevent injury to the connection between the pacemaker and its lead(s). These guidelines will prevent other (electromagnetic) signals from causing problems with your child’s pacemaker.

• Keep at least 6 feet away from arc welding or ham or CB radios.

• Keep mobile (cellular) phones 6 inches away from your child’s pacemaker. Have them hold the phone to the ear opposite to the pacemaker or use the speakerphone function.

• Keep iPads, Bluetooth devices, stereo speakers, video game controllers, MP3 players, iPod players at least 6 inches away from the pacemaker.

• Do not go near dams that have large magnets.

• Do not let your child go to the top of radio-transmitting towers.

• Avoid sports (such as football, rugby or kick boxing) and any activities that may involve a hard hit to your child’s pacemaker. Ask your doctor if you have a question about a specific activity or sport.

• Your child cannot have MRI tests. X-rays and CT scans are OK.

• Microwaves are OK. Modern pacemakers are sealed tightly against microwave signals. Other household appliances do not interfere with the pacemaker.

• Airport security systems, including airport body scanners, should not affect the pacemaker, but it might set off the alarm. You might need to show your child’s pacemaker identification (ID) card if the alarm goes off.

• Anti-theft devices are generally OK, but do not let your child be near them when possible.

• Your child should not ride bumper cars or roller coasters that have shoulder harnesses.

• Do not let your child use monkey bars or other playground structures where they swing by their arms. They also should not jump on trampolines.
• Call your child’s pacemaker nurse or doctor if they are scheduled for any medical or surgical procedure. Your child’s pacemaker team will decide if the other procedure is safe for your child’s pacemaker.

**How long do pacemakers last?**

On average, pacemakers last anywhere from 5 to 10 years. Exactly how long they last depends on the usage. Children wear out the batteries faster than adults because they have higher heart rates.

This is why the Pacemaker Clinic check and telephone checks are so important (see below). At these checks, the pacing system is tested for the amount of energy it needs for your child. Only the needed, safe amount is programmed. This extends how long the pacemaker lasts.

**How is the pacemaker tested?**

The pacemaker is tested in 2 ways: the pacemaker clinic check done in the Heart Center and the remote pacemaker check (by mobile phone, home phone or internet). Your doctor will provide you with a schedule for testing based on your child’s needs. These tests make sure your child is healthy and that the pacing system is working right. It may help to mark the testing days on a calendar at home.

**Pacemaker Clinic check**

The Pacemaker Clinic check is done using a pacemaker programmer, or computer, which can send and receive messages to and from your child’s pacemaker. We will place a small device that looks like a computer mouse over your child’s pacemaker. The pacing system is tested to make sure that it is working in the best way for your child’s needs. Pacemaker settings such as heart rate and energy outputs can be changed using the programmer. This is how we prevent battery waste and extend the life of the pacemaker.

**Remote pacemaker check**

A remote pacemaker check is done every 1 to 3 months (depending upon your child’s needs) using a small monitor. The remote check shows us:

• If the pacemaker is working normally
• If the energy settings are right
• How the battery is doing

This is a way of catching problems with the pacing system before they become a problem for your child.
How is the battery changed?

When the battery is changed, the entire pacemaker is replaced. This is because the battery is sealed within the pacemaker. Sometimes it is possible to remove the old pacemaker and place a new one using the same leads. If the original leads aren’t working right or are stretched, 1 or 2 leads may need replacement or repositioning. Your doctor will discuss the plan for replacement when that time comes.

What if I have questions or concerns?

Please feel free to contact the Pacemaker nurses with any questions or concerns you might have, as well as, with your comments and suggestions.

For more information on your child’s specific pacemaker and safety guidelines for your child, try these websites:

- Medtronic [www.medtronic.com](http://www.medtronic.com)
- Boston Scientific [www.bostonscientific.com](http://www.bostonscientific.com)
- St. Jude Medical/Abbott [www.stjudemedical.com](http://www.stjudemedical.com)

Seattle Children's offers interpreter services for Deaf, hard of hearing or non-English speaking patients, family members and legal representatives free of charge. Seattle Children’s will make this information available in alternate formats upon request. Call the Family Resource Center at 206-987-2201.

This handout has been reviewed by clinical staff at Seattle Children’s. However, your child’s needs are unique. Before you act or rely upon this information, please talk with your child’s healthcare provider.

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