Vagus Nerve Stimulator

The vagus nerve is one of the main communication pathways between the body and the brain. The vagus nerve stimulator (VNS) is a device that gives periodic mild electrical stimulation to the left vagus nerve to help stop or lessen your child's seizures. The stimulation happens automatically at set intervals, while your child is awake or asleep. The neurologist sets how often the stimulations are given. The device is usually set to stimulate the vagus nerve for 30 seconds every 5 minutes.

VNS is used **in addition** to medicine in individuals with drug-resistant epilepsy.

How does the VNS work?

We don't know exactly how the VNS works but we do know that stimulating the vagus nerve changes the level of neurotransmitters in the brain.

- 50% of people with a VNS have 50% fewer seizures.
- 75% of people have better seizure control and alertness.
- Other benefits may include improved memory, better mood, and improved thinking ability.

How long does the VNS battery last?

The life of the battery varies depending on the settings and the type of VNS placed. Most batteries last 5 - 10 years depending on the settings. Your child's neurology care team checks the battery at each routine clinic appointment. When the battery is near the end of its life, the VNS is replaced in surgery. Don't let the VNS generator stop working, this can cause an increase in your child's seizures.

Are there different kinds of VNS devices?

There are several VNS devices, but the 2 most recent are Model 106 and 1000. Your neurologist and neurosurgeon will decide which one is best for your child depending on their seizure types.

Model 1000 is the newest VNS. This one can monitor your child's heart rate all the time and activates when their heart starts beating faster, which happens during certain types of seizures. If the heart rate monitor is on, the battery life will be shorter than if it's off. Your neurologist can monitor the activations and decide if your child needs to use this function. When the heart rate activation is turned off, the battery life is the same as the 106 Model. This model can be pre-programmed at your first clinic appointment to ramp up at home over a 2-month time frame.

Model 106 VNS is bigger and has a larger battery. This VNS can be set on a rapid cycle for seizure types that may respond better to being stimulated more often. If your child needs to have a rapid cycle setting, the battery won't last as long. Your child needs to come to clinic every week for 5 weeks to have it ramped up to the correct setting.

What are potential side effects of VNS?

Common side effects:

- Coughing (usually mild)
- Hoarseness, change in tone of voice (report constant hoarseness)
- Throat pain
- Feeling of gagging, tightness of throat

Less common side effects

- Trouble swallowing
- Having a warm, red face
- Shortness of breath when moving around or exercising
- Throwing up

How is the VNS placed?

The VNS generator and lead are implanted in the chest and neck. The generator is put under the skin on the left side of the chest, below the collarbone. The lead is wrapped around the left vagus nerve in the neck.

Your child will have 2 cuts that are 2-3 inches long, in front of the left armpit and above the left collar bone. The surgery takes about 2 hours and is usually done as an outpatient visit to the hospital. Most children can go home the same day. Very rarely, some children need to stay in the hospital overnight.

The device is turned on at the lowest dose during surgery. It will be ramped up or preprogrammed 1 week after surgery during a regular neurology clinic visit. Preprogramming a standard titration schedule for the VNS doesn't hurt and it takes a few minutes.

After surgery, watch the site for any signs of infection including:

- Fever
- Skin irritation, swelling, increased redness
- Drainage from the cuts
- Increased pain at the site

Your child cannot take a bath or swim until after the incision is fully healed (at least 3 weeks). Showers are fine.

How does the magnet work?

The day of surgery you will get 2 high-power magnets surrounded by a plastic casing in the shape of a watch. As the VNS is ramped up over the next few months the magnet will work better.

The magnet activates the VNS making it send stimulations between set intervals. You'll "sweep" the magnet over the VNS from the center of the body to the armpit for 1-2 seconds. **The magnet only works once every 1 minute, no matter how many times you swipe it during that time frame.** You can swipe the magnet again 1 minute after your first swipe to activate the VNS again.

When should I use the magnet?

- When your child is having an aura - to try to stop or lessen the severity of the seizure
- During a seizure to shorten the length or intensity of a seizure
- During a seizure to shorten the aftereffects of a seizure
- To **stop** the stimulator or to cause the VNS to stop working for a short period of time. You can do this if the VNS stimulation is too uncomfortable or if your child needs time without activation like public speaking or singing. To stop the VNS, tape the magnet over the device. Once the magnet is removed, the device will go back to its previous settings.
- **You can use the magnet as often as you want, but not longer than 4 hours in a row**. Using the magnet a lot or all the time will drain the VNS battery and could hurt your child's left vagus nerve. If you need to use the magnet a lot, you should talk to your child's neurologist about changing the normal settings.

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Your child needs to have the magnet with them all the time. It can be attached to their wrist, ankle or belt or carried in a backpack. Teach other family members, friends, and teachers on how to use the magnet when they are caring for your child.

Can I use any magnet?

Only the LivaNova VNS Magnet should be used with your VNS Therapy System. In an emergency, you can try other strong magnets. Using non-LivaNova magnets won't hurt the VNS Therapy System, but there's no way to know if it will work.

If you lose your magnet or need extra magnets, our neurology clinic can give you an extra set of magnets. You can call your neurologist and let them know you need another magnet. We can either mail it to you or you can come to the clinic to pick one up.

Can my child go through airport security?

Yes. Going through airport security won't hurt the VNS or your child and won't change the device settings. The device/magnet doesn't usually set off the metal detectors at the airport, but some airport metal detectors are more sensitive than others. If the metal detector does go off, tell the airport security about the device and show them your child's medical device card that comes with your care kit after surgery.

Can my child go swimming?

Yes. The magnet is waterproof and can be carried with you in the water.

When would the device need to be turned off?

- The device may need to be turned off for medical procedures like an MRI or some surgeries. If your child needs any of these tests, call your neurologist to have the device turned off before the procedure and turned back on when the procedure is done.
- Tell anyone treating your child that they **cannot** have any short-wave diathermy, microwave diathermy, or therapeutic ultrasound diathermy anywhere on their body because they have an implanted VNS. Diathermy is done to promote healing or relieve pain.
- Most routine diagnostic procedures, such as diagnostic ultrasound and radiography (x-rays), should not affect the VNS Therapy System.

What are some environmental concerns?

- Talk to your doctor before going into places with Pacemaker Warning signs.
- Microwave ovens and other small electrical appliances, such as toasters, hair dryers, and electric shavers, shouldn't affect the VNS.
- Refrigerator magnets don't affect the VNS.
- The VNS magnet is powerful and can demagnetize credit cards or erase information stored on computers, so keep wallets and other electronic devices away from the magnet.
- Keep the magnet away from televisions or other sensitive electronic equipment.

How quickly will I see results in my child's seizure activity?

You may not see the benefits of VNS Therapy right away. It can take up to 2 years of treatment to see improvement. Studies show that the results are good and last for a long time. Remember that VNS Therapy is a treatment, not a cure for epilepsy.

When does my child need to follow up after surgery?

- 7-14 days after surgery: visit with the Neurosurgery clinic to make sure your child's incision is healing.
- 7-14 days after surgery: visit in Neurology clinic for VNS ramp up and preprogramming
- 1 month after surgery: visit with the Neurosurgery clinic
- 3-6 months after surgery: visit with your primary Neurologist in the Neurology clinic

Our team is here to support you and your child. Please let us know if you have any questions or concerns.

For any questions about your child's **incisions**, please call Neurosurgery at 720-777-6100.
For concerns with **seizures**, please call your primary neurologist at 720-777-6895.

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