Let's Talk About...

Monitoring the nervous system (IONM) during surgery

Intraoperative neurophysiological (in-tra-OP-er-uh-tive NOO-row-fizz-ee-oh-LOJ-ih-cal) monitoring, or IONM, is testing and monitoring the nervous system—brain, spinal cord, and nerves—during surgery.

IONM helps your child's medical team understand how the nervous system is working during surgery. This can make the surgery safer and lower the chance of problems like movement, feeling, or hearing loss.

You can decide whether healthcare providers use IONM during your child's surgery. The surgeon will discuss the potential benefits, risks, and alternatives to IONM and your child's specific surgery.

How does IONM work?

A specially trained technician or doctor does IONM. They will set up the equipment, connect it to your child, and monitor the IONM readings (sometimes called waveforms) throughout the surgery. The provider tells with the surgeon about any nervous system changes.

A physiatrist or neurologist will also watch the waveform data from IONM, either in the operating room or from another location.

Why does my child need IONM?

Your child's doctor may recommend IONM to lower the chance that surgery could harm part of your child's nervous system. IONM is often used for surgeries to:

- Remove tumors in or near the nervous system
- Repair the bones of the spine
- Release part of the spinal cord from the tissue around it (tethered cord)

In these surgeries, IONM can give the medical team important information. It may:

- Help the surgeon tell the difference between a nerve and the tumor
- Find specific nerves
- Show whether there's enough blood going to the spine
- Tell the doctor if hardware placed during surgery is affecting the nervous system

What are some IONM tests?

Healthcare providers may do several IONM tests, depending on your child and the type of surgery. These may include:

- **SSEPs (somatosensory evoked potential):** SSEPs provide information about the sensory nerves (nerves that communicate feeling or touch). Healthcare providers put sticky electrode pads connected to wires over specific nerves at the wrist or ankle. Small bursts of electricity activate the nerves and send a signal through the spine to the brain.

Small recording electrodes in the skin of the scalp then pick up this brain activity. This signal is displayed on the computer screen.

- **MEP (motor evoked potential):** MEPs provide information about the part of the nervous system that controls movement. Healthcare providers put electrodes in the skin of the scalp, over the part of the brain that controls movement. When this area is stimulated, it causes nerve activity to run from the brain, through the spine, and out to the nerves that makes muscles contract. Electrodes in or near the muscles record the nerve activity, which is displayed on the computer screen.

- **ABR (auditory brainstem response):** An ABR allows the team to test your child's hearing while they're asleep. It measures the hearing nerve's response to sound. For the test, a small in-the-ear earphone makes a sound, and the ear then turns it into an electrical response. This response travels from the ear through the brainstem and into the brain. Nerve activity is recorded from the electrodes in the scalp.

- **Free-running EMG (electromyography):** EMGs represent muscle activity that could be caused by damage or irritation to the nervous system. This activity is recorded by electrodes in or close to a muscle. EMGs help the surgical team know when they're getting close to a nerve.

- **Triggered EMG:** The surgeon uses a hand-held stimulator to create an electrical impulse in a nerve. The impulse from the nerve causes the muscle to contract, and electrodes on the muscles record the nerve activity. This type of EMG helps surgeons find specific nerves and make sure there are no nerves around where they are cutting.

- **BCR (bulbocavernosus reflex):** This test monitors the sacral portion (connected to the pelvis) of the spinal cord's function. BCR is important for monitoring the nerves that control bowel, bladder, and sexual function. Healthcare providers put stimulating electrodes over the skin of the penis or clitoris (a group of nerves in girls above where urine comes out). They also put recording electrodes in the muscle around the anus.

How does my child prepare for IONM?

To prepare for IONM, your child should take a bath or shower and gently scrub their skin, especially the wrists and just behind the inside ankles. They shouldn't use lotion or makeup afterward. If your child has long hair, they should braid it or put it in a ponytail.

What happens before my child's surgery?

The IONM provider or supervising IONM doctor will examine your child and ask questions about their symptoms and medical history. You and your child can ask any questions about IONM at this time.

What happens during my child's surgery?

After your child is asleep, the IONM will place the electrodes so they don't feel them. They'll get reference values called baselines once all the equipment is in place and your child is ready for surgery. The IONM provider will take another set of baseline values after the surgeon has opened the surgery site. The second baselines will give the providers a reference for the rest of the surgery.

The IONM provider will tell the surgeon immediately if they notice any changes to your child's nervous system.

What happens after my child's surgery?

Once the surgeon has finished your child's surgery, the IONM will remove all the electrodes before they wake up. You may notice a small amount of bleeding at the electrode sites. This is normal.

What are the risks of IONM?

The risks of IONM are rare but may include:

- Lip or tongue injury
- Burns at the electrode site (caused by the energy of the device the surgeon uses to cut skin and stop bleeding)
- Infection at the IONM electrodes sites
- Bruising, bleeding, or damage at the underlying tissue when placing or removing electrodes
- Pain at the electrode sites
- Heart arrhythmias
- Jaw fracture
- Seizures
- Damage to a cardiac pacemaker or nerve stimulator
- Injury from muscle movement caused by nerve stimulation

Notes

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