Tests required before your child’s epilepsy surgery

- EMU
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Electroencephalogram (EEG) before epilepsy surgery

The first step in preparing for epilepsy surgery is for your child to have a routine electroencephalogram (EEG) brain wave recording.

The test takes 60 to 90 minutes. However, if your child needs to take a sedative (see below), please allow up to three hours for your hospital visit. This allows enough time for the EEG and for any medicine to wear off before your child goes home.

Why does my child need an EEG?
Neurons (nerve cells in the brain) use electrical signals to communicate with each other. An EEG measures this electrical activity to help your child’s doctors see more clearly where seizures start.

Your child may have two EEGs: one while they are awake and another while asleep. During the test, electrodes are attached to your child’s scalp to record different patterns of activity in the brain while your child does simple tasks or has a short sleep.

The patterns of electrical activity show up as wavy lines on a computer monitor. Doctors are trained to read these wavy lines to identify what might cause a seizure.

Example of an EEG recording

How do I prepare my child for an EEG?
- Explain what will happen during the EEG in words your child understands.
- Make sure your child’s hair is freshly washed. Check for any signs of head lice and tell the nurse at the hospital if you see anything.
- To help the electrodes stay in place during the test, do not use conditioner or styling products in your child's hair after you wash it.

Will my child need to be sedated for an EEG?
An EEG does not hurt, but some children may need a mild sedative (medicine to keep them calm) to help them lie still for the test. The most common sedatives are chloral hydrate or...
melatonin, a natural substance that helps someone fall asleep.

If your child needs to take a sedative, they must:

- stop eating solid foods eight hours before the test
- stop drinking milk, formula or other liquids six hours before the test
- stop any breastfeeding four hours before the test
- stop drinking water three hours before the test.

**What happens when my child arrives for the EEG?**

1. A technologist will measure your child’s head and mark it with a wax pencil so they know where to place the electrodes.
2. The technologist will clean the marked areas on your child's head with a gel and use a special paste to attach the electrodes to your child’s scalp. They will then cover the electrodes with gauze.
3. The technologist will connect the electrodes to the EEG machine.

**What happens during an EEG?**

The technologist will ask your child to sit or, usually, lie on a bed. They may then ask your child to do different activities, such as:

- breathe deeply for three minutes
- open and close their eyes
- watch flashing bright lights for a few minutes.

While your child does these activities, the EEG machine will continuously record the patterns of electrical activity in their brain as wavy lines on a computer screen.

**May I stay with my child during the EEG?**

Yes, you will be able to stay with your child during the test.

**Does the test have any risks or side effects?**

There are typically no risks or side effects from having an EEG.

**What should I expect after an EEG?**

Once the test is done, the technologist will remove the electrodes from your child’s scalp. You are then free to go home.

If your child took a sedative, they might be sleepy, grumpy and unsteady and will need to be watched carefully until the medicine wears off (usually about six hours after the test). They can return to their usual activities when they are fully alert again.

Your child’s hair may be a little sticky from the paste that attaches the electrodes to their scalp. You can easily wash the paste away with shampoo and water.

**When will I get the test results?**

Your doctor will receive the EEG test results and discuss them with you and your child at a follow-up appointment, usually about four to six weeks after the test.

**Key points**

- An EEG measures electrical activity in your child's brain to help your child's doctors see more clearly where seizures start.
During the test, your child will lie still on a bed and do different activities while electrodes are attached to their scalp to record the activity in the brain.

If your child needs to take a sedative before the test, follow any eating and drinking instructions from your child's team.

You will be able to discuss the EEG results with your child's doctor about four to six weeks after the test.

**At SickKids**

If your doctor has told you that your child needs a sedative for the EEG, a nurse from the neurophysiology department will contact you with instructions on when your child needs to stop eating and drinking before the EEG appointment.

If the EEG is booked without a sedative but you think your child will need it, please contact the neurophysiology department a week before the appointment at 416-813-6297.
Epilepsy monitoring unit: Testing with video EEG

After an EEG, the next step to prepare your child for surgery is to have an epilepsy monitoring unit (EMU) session in the hospital. Your child’s team will give you a date to go to the hospital and your child will be admitted as an inpatient for a few nights.

The test will last three to five days, depending on how often your child has a seizure.

Child prepped for epilepsy monitoring unit (EMU) session

Why does my child need a session in the EMU?
The aim of an EMU session is to capture the electrical activity in your child’s brain during a seizure.

During the session, the electrical activity in your child’s brain will be measured using a special EEG machine that is connected to a video camera and a microphone. This allows your child’s doctors to match the wavy lines on the EEG with your child’s behaviour to try and find out exactly where seizures begin in their brain.

The EMU is a controlled and safe environment to record your child’s typical seizures. The doctors and nurses are there to help control your child’s seizures with fast-acting anti-seizure medication.

How do I prepare my child for an EMU session?
- Explain what will happen during the EMU session in words your child understands.
- Pack enough changes of clothes for three to five days and some enjoyable activities (such as colouring books, movies, video games or music) to keep your child entertained while they are in the hospital.
- Make sure your child’s hair is freshly washed. Check for any signs of head lice and tell the nurse at the hospital if you see anything.
- To help the EEG electrodes stay in place on your child’s scalp, do not use conditioner or styling products in your child’s hair after you wash it.

What happens when my child arrives for the EMU session?
1. Once your child is admitted to the EMU, an EEG technologist will measure and mark your child’s scalp with a wax pencil so they know where to place the electrodes.
2. The technologist will clean the marked areas on your child's head with a gel and use special skin glue called collodion to attach the electrodes to your child's scalp. The glue keeps the electrodes on your child’s scalp for several days while your child is awake and asleep.
3. The technologist will then connect the electrodes to the special video EEG machine in the EMU room.

EMU room with camera and computer to capture seizures

What happens during the EMU session?
The EEG electrodes on your child’s scalp will be attached to a special video EEG machine, which will record the EEG brain wave patterns, video and sound activity.

Just as in a routine EEG, the technologist may ask your child to do different activities, such as:

- breathing deeply for three minutes
- opening and closing their eyes
- watching flashing bright lights for a few minutes
- having the test while sleepy or asleep.

These activities stimulate different types of brain activity, which in turn create different types of EEG patterns. They also make a seizure more likely, which helps your child’s team identify specific seizure causes.

The video EEG should generally not hurt, but your child may feel some pain from the EEG electrodes pulling on their hair or may experience skin irritation from the special glue.

May I stay with my child during the EMU session?
The EMU is a care-by-parent unit, which means you can stay with your child during the EMU session. Your child will also be closely monitored by nurses and doctors.

Does the test have any risks or side effects?
Your child will not experience risks or side effects from the EMU session. However, there is a risk that your child may have several seizures during their stay.

Please be assured that the EMU is a safe environment where doctors, nurses and technologists can help your child quickly when needed.

What should I expect after an EMU stay?
Once your child’s team has captured your child’s typical seizure and checked the quality of the recordings, the electrodes will be removed from your child’s scalp. Your child will then be released from the EMU.

Your child’s hair may be a little sticky from the special glue. You can easily wash it away with shampoo and water.
When will I get the test results?
Your doctor will receive the EMU test results and discuss them with you and your child at a follow-up appointment within four to six weeks.

Key points
- A session in the epilepsy monitoring unit (EMU) lasts three to five days and allows your child's team to record their brain activity and behaviour during a seizure.
- During the session, your child will be asked to do different activities while EEG electrodes on their scalp are attached to a special video EEG machine.
- Your child will be carefully monitored by their care team. You can also stay with your child in the EMU.
- You can discuss the EMU results with your child's doctor about four to six weeks after the session.

At SickKids
If your doctor has told you that your child needs a sedative (medicine to keep them calm) to put on the EEG wires, a nurse from the neurophysiology department will contact you with instructions on when your child needs to stop eating and drinking before being admitted to the EMU.

If the EMU is booked without arranging a sedative, but you think your child will need it, please contact the neurophysiology department one week before the appointment at 416-813-6297.
Magnetic resonance imaging (MRI) before epilepsy surgery

A magnetic resonance imaging (MRI) scan uses a strong magnet to take pictures of your child’s brain.

The MRI scanner is a large, round, noisy machine with a tunnel in the centre. During the scan, your child wears a special helmet and lies on a narrow bed that slides into the MRI machine. The scan does not hurt.

Magnetic resonance imaging (MRI) scan

The MRI scan takes about one hour. However, if your child needs a sedative for the scan (see below), please allow up to three to four hours for your hospital visit. This allows enough time for the scan and for any medicine to wear off before your child goes home.

Why does my child need an MRI scan?
The MRI takes picture of your child’s brain. Doctors are trained to look at these pictures to identify what is the cause of the epilepsy.

How do I prepare my child for an MRI scan?
- Explain what will happen during the MRI in words your child understands.
- Before the scan, tell the MRI team about any metal implants inside your child, such as metal rods, screws, braces or clips, and if your child has any body piercings. It is important to share this information to minimize the risk of harm from the strong magnet in the MRI scanner.

Will my child need to be sedated for an MRI scan?
Some children may need a sedative (medicine to keep them calm) to help them lie still for about an hour during the scan.

What happens when my child arrives for the scan?
1. An MRI team member will check if your child can lie still comfortably in the MRI machine.
2. Your child will empty their clothes pockets and remove any watches, purses, jewellery and makeup. They can store these in a locker during the scan.
3. Your child will change into a hospital gown and enter the MRI room.

What happens during an MRI scan?
The technologist will place your child’s head in a head coil, which is like a helmet. Your child will also wear earplugs or headphones to help reduce the loud knocking noise from the MRI machine.
Sometimes, doctors may need to give your child a special liquid called contrast to help the MRI images show more information about the brain. This liquid is put into the vein in your child’s hand or arm through an intravenous catheter.

When your child is ready, they will then lie on the narrow bed that moves into the tunnel. The MRI technologist will talk to them through a speaker from outside the MRI room and remind them to stay still during the whole scan.

If your child is able to stay still without taking any medicine, they may watch a movie to pass the time.

May I stay with my child during the MRI scan?
You may stay in the MRI room with your child if:

- your child is not asleep during the study
- the technologist is sure that it is safe for you to do so, for example by asking about any metal implants or piercings.

Does the scan have any risks or side effects?
If your child receives contrast, it may cause a rash or puffiness around the face and neck. This is very rare, however. The MRI team will watch your child very closely during and after the MRI to check for any reaction to the contrast and help ease any symptoms.

What should I expect after an MRI?
Once the scan is done, your child may get dressed and go home. If your child took any sedative (medicine to help them stay calm) during the MRI, they may leave the hospital only when they are alert and fully recovered.

When will I get the test results?
Your doctor will receive the report of the MRI scan results and discuss them with you and your child at a follow-up appointment, usually about four to six weeks after the scan.

Key points
- An MRI scan uses a strong magnet to take pictures of your child's brain.
- Before the scan, tell the team about any metal implants or piercings in your child to reduce any harm from the magnet in the MRI scanner.
During the scan, your child will need to lie still in the MRI machine for about an hour. Some children may need a sedative to help them with this.

You may discuss the results of the MRI scan with your child's doctor about four to six weeks after the test.

**At SickKids**
If your doctor has told you that your child needs a sedative for the MRI, someone from the MRI department will contact you with instructions on when your child needs to stop eating and drinking before their appointment.

If the MRI is booked without a sedative but you think your child needs it, please contact the MRI department at 416-813-5774 and choose option 3.
Functional MRI before epilepsy surgery

A functional magnetic resonance imaging (fMRI) scan takes about an hour. It is similar to a standard MRI except that your child will be asked to do simple activities such as listen to a story, play simple word games and tap their fingers or toes during the scan. While they do these activities, the machine will find the parts of the brain that handle important functions such as speech and movement.

Functional magnetic resonance imaging (fMRI) scan

Like an MRI scan, the fMRI uses a strong magnet, which may harm your child if they have certain metal implants. Before the scan, tell the MRI team about any metal implants inside your child, such as metal rods, screws, braces or clips, and if your child has any body piercings. Sharing this information is important for minimizing the risk of harm from the strong magnet in the MRI scanner.

What happens when my child arrives for an fMRI?

1. An MRI team member will check if your child will be able to lie still comfortably during the fMRI scan.
2. Your child will be told about the activities they will do during the test and will have a chance to practise some of them.
3. Your child will empty their clothes pockets and remove any watches, purses, jewellery and makeup. They can store these in a locker during the scan.
4. Your child will change into a hospital gown and enter the MRI room.

What happens during an fMRI scan?

The technologist will place your child’s head in a head coil, which is like a helmet, and may also give your child special goggles. Your child may also wear earplugs or headphones to help reduce the loud knocking noise from the MRI machine.

When your child is ready, they will then lie on the narrow bed that moves into the tunnel. The technologist will talk to your child through a speaker from outside the room and guide them through the activities.
The technologist will also remind your child to keep very still during the fMRI. Even when they are asked to do a specific activity such as tapping their finger, they must keep the rest of their body and head very still.

fMRI scan of the brain

The coloured spots show brain activity.

May I stay with my child during the fMRI scan?
You may stay in the MRI room with your child if the technologist is sure that it is safe to do so, for example by asking about any metal implants or piercings.

Does the fMRI scan have any risks or side effects?
There are typically no risks or side effects from having an fMRI.

What should I expect after an fMRI scan?
Once the scan is done, your child may get dressed and go home.

When will I get the test results?
Your doctor will receive a report of the fMRI scan and discuss the results with you at a follow-up appointment, usually about four to six weeks after the scan.

Key points
- A functional MRI tells your child's doctor which parts of your child's brain control movement and language so they can better plan your child's epilepsy surgery.
- Before the scan, tell the team about any metal implants or piercings in your child to reduce any harm from the magnet in the MRI scanner.
- During the scan, your child will do simple activities while they lie in the MRI scanner.
- You may discuss the results of the fMRI with your child's doctor about four to six weeks after the scan.
Magnetoencephalography (MEG) before epilepsy surgery

A magnetoencephalography (MEG) scan measures magnetic signals from the brain. The scan takes two to three hours, depending on how much activity is being mapped.

Magnetoecephalography (MEG) machine

Your child must be sleepy for the MEG scan to make sure it gathers the best information. If your child needs a sedative for the scan (see below), please allow up to three to four hours for your hospital visit. This allows enough time for the scan and for any medicine to wear off before your child goes home.

Why does my child need a MEG scan?
Cells in the brain give off magnetic as well as electrical signals. A MEG scan uses special electrodes attached to your child’s scalp to measure these magnetic signals and pinpoint the abnormal brain activity where your child’s seizures start.

How do I prepare my child for a MEG scan?

- Explain what will happen during the MEG in words your child understands.
- Make sure your child’s hair is freshly washed. Check for any signs of head lice and tell the nurse at the hospital if you see anything.
- Leave your child’s hair loose for the scan and remove any hair extensions.
- To help the electrodes stay in place during the test, do not use conditioner or styling products in your child’s hair.
- Follow the instructions from your child’s MEG team to make sure your child is sleepy or asleep for the scan. You will be told to put your child to bed later than usual the night before the MEG and wake them up several times during the night. Even if your child is tired, do not allow them to sleep on their way to the scan.
- Give your child their medication as usual, unless your doctor tells you otherwise.
Will my child need to be sedated for a MEG scan?
Yes, some children may need a sedative (medicine to help them keep calm or help them sleep).

What happens when my child arrives for the MEG?
1. A technologist will check if your child can lie still comfortably in the MEG machine.
2. Your child will empty their clothes pockets and remove any watches, purses, jewellery and makeup. They can store these in a locker during the scan.
3. They will then change into a hospital gown and go into the MEG room.
4. The MEG technologist will then measure your child’s head and make small marks on the scalp with a washable marker or pen. They will also make small marks on your child’s nose and in front of their ears.
5. They will put electrodes on your child’s nose and in front of their ears. These electrodes are connected to the MEG machine.
6. The technologist will also put EEG electrodes on your child’s scalp.

What happens during a MEG scan?
When your child is ready, the technologist will place a MEG helmet on their head and your child will lie on the MEG bed.

The MEG will be turned on and the helmet will start to record your child’s brain activity. The MEG room is quiet during the scan and will also be darkened so that your child can fall asleep.
The MEG technologist will sit just outside the MEG room and monitor your child through a video camera.

Your child will have to keep their head still during the scan. Depending on the specific part of their brain where your child’s seizures start, they will do one or more of the following tests:

- somatosensory evoked fields (SEF)
- visual evoked fields (VEF)
- auditory evoked fields (AEF).

Somatosensory evoked fields (SEF) test
Your child will have this test if their seizures start in the area of the brain that controls sensation. It takes 20 to 30 minutes.

If your child’s seizures start in or near the area of the brain that controls arm sensation, your child will have a small stimulator placed on their wrist. The stimulator will receive a small electrical signal that will make your child’s thumb move or ‘dance’. In turn, this will send a message to the part of the brain that controls sensation. This stimulation is done on both wrists and takes about 20 minutes.

If your child’s seizures start in or near the area of the brain that controls leg sensation, the stimulator will be placed on your child’s inner ankle. This time, the small electrical signal will make the big toe ‘dance’. This stimulation is done on both ankles and takes about 30 minutes.

During the SEF test a child lies with their head in the MEG machine while a small electrical stimulator is attached to their wrist or ankle

Visual evoked fields (VEF) test
Your child will have this test if their seizures start in or near the visual area of the brain (the part that controls sight). It takes about 30 minutes.

During the test, your child will look at a screen showing a moving black and white checkerboard pattern. They will be asked to focus on a dot in the centre of the screen while the black and white squares move. This will send a message to the part of the brain that processes what your child sees.
During a VEF test a child lies with their head in the MEG machine while they look a screen with a moving checker board pattern above them.

Auditory evoked fields (AEF) test
Your child will have this test if their seizures start in or near the auditory part of the brain (the area that controls your child’s hearing). It takes about 30 minutes.

During the test, your child will listen to beeps in one ear and white noise in the other ear while they lie still in the MEG scanner. Your child will be asked to concentrate on the sounds. This will send a message to the part of the brain that processes what your child hears. This test is done for both ears.

Doctors will study the scan so that they can find the area of your child’s brain that controls hearing.

May I stay with my child during the MEG scan?
The MEG machine is very sensitive and will pick up the brain activity of everyone in the room. As a result, your child must be in the MEG room alone. You may wait outside the MEG room and see your child on a screen.

Does the scan have any risks or side effects?
There are typically no risks or side effects from having a MEG scan.

What should I expect after a MEG scan?
Once your child completes the SEF, VEF and/or AEF test, the technologist will remove the EEG wires and electrodes. Your child will then have a few round stickers placed on top of their nose and in front of their ears, where the electrodes were placed. They will then have a short MRI scan, which will take about 10 minutes.

Once all the tests are done, the technologist will remove the stickers from your child. Your child may then get dressed and leave. If your child took a sedative, they may leave only when they are alert and fully recovered.

Your child’s hair may be a little sticky from the paste that was used to attach the electrodes to their scalp. You can easily wash it away with shampoo and water.
When will I get the test results?
Your doctor will receive the report of the MEG results and discuss them with you and your child at a follow-up appointment about four to six weeks after the scan.

Key points
- A MEG scan measures magnetic signals in your child's brain to pinpoint where your child's seizures start.
- Your child must be sleepy for the scan to make sure it gathers the best results.
- During the scan, your child may have up to three tests, depending on whether seizures start in the part of their brain that controls sensation, sight or hearing.

You may discuss the results of the MEG with your child's doctor about four to six weeks after the scan.

At SickKids
If your doctor has told you that your child needs a sedative for the MEG, someone from the MEG team will contact you with instructions on when your child needs to stop eating and drinking before their appointment.

If the MEG is booked without a sedative but you think your child needs it, please contact the MEG team at 416-813-5774 and choose option 3.
Positron emission tomography (PET) scan before epilepsy surgery

A positron emission tomography (PET) scan takes pictures of the brain’s metabolism (how it builds up and breaks down materials) to identify where seizures start.

Positron emission tomography (PET) machine

The scan takes one to two hours, including preparation. If your child needs a sedative (medicine to keep them calm) for the PET scan, please allow up to three hours for your hospital visit. This allows enough time for the scan and for any medicine to wear off before your child goes home.

Why does my child need a PET scan?
The PET scan will tell the doctor where seizure starts in the brain. It will provide additional information to clarify or confirm the location of seizures, especially in patients where other tests such as EEG or MEG are not clear, when an MRI is normal or when the MRI findings are unclear.

How do I prepare my child for a PET scan?
- Explain what will happen during the PET scan in words your child understands.
- Do not let your child eat, drink or chew gum for four hours before the test. If your child has diabetes, contact the PET team for special instructions.
- Give your child any required medication as usual with a small amount of water, unless your child’s doctor tells you otherwise.
- Make sure your child’s hair is freshly washed. Check it for any signs of head lice and tell the nurse at the hospital if you see anything.
- To help the electrodes stay in place during the test, do not use conditioner or styling products in your child's hair after you wash it.
Will my child need to be sedated for a PET scan?
Some children may need to take a mild sedative to help them lie still for the full scan.

What happens when my child arrives for the PET scan?
EEG wires attached to scalp

1. Your child will have a small needle prick in their finger so the nurse can check their blood sugar level. If the level is too high, the test will be cancelled and you will need to make another appointment.
2. If the blood sugar level is acceptable, your child will then be injected with a very small amount of radioactive liquid. This liquid helps to show where abnormal metabolism is happening in the brain.
3. The technologist may place EEG electrodes on your child’s scalp.
4. Your child will need to wait about 30 to 45 minutes for the injected liquid to flow to their brain. During this time, they will be in a quiet, darkened room to let them relax. You are free to wait with them in this room.
5. When this time has passed, the technologist will ask your child to empty their bladder in the washroom so that they can lie comfortably during the PET scan.
6. Your child will then go into the PET room.

What happens during a PET scan?
During the PET scan, your child will lie inside the scanner tunnel and will stay very still and quiet while the scanner takes pictures of their brain.

The PET scan itself takes about 30 minutes. The PET technologist will watch the scan through a window and a TV camera.

May I stay with my child during the PET scan?
Yes, you may stay with your child during the scan.
Does the test have any risks or side effects?
There is a low risk from the radioactive liquid your child receives for the PET scan. The dose of liquid that is given to your child equals about two to four years of natural background radiation, depending on your child’s age and weight. Your child’s body will break down the radioactive liquid very quickly and pass it out in urine within 24 hours.

The potential benefits of the PET scan outweigh any potential risk from the radiation.

What should I expect after the PET scan?
When the scan is done, you and your child may go home.

If your child took any sedative for the PET scan, they may leave the hospital only when they are alert and fully recovered. Afterwards, they may eat, drink and return to their usual activities.

When will I get the results of the scan?
Your doctor will receive the PET scan results and discuss them with you and your child at a follow-up appointment, usually four to six weeks after the scan.

Key points
- A PET scan takes pictures of how the brain builds up and breaks down substances to identify where seizures start.
- Your child cannot eat, drink or chew gum for four hours before the scan. The test may be cancelled if their blood sugar level is too high.
- During the scan, your child will be injected with a tiny amount of radioactive liquid and lie still in the PET scanner while electrodes attached to their scalp record brain activity.
- You may discuss the results of the PET scan with your child's doctor about four to six weeks after the test.
A single photon emission computed tomography (SPECT) scan takes pictures of the blood flow in your child’s brain. When a seizure starts, more blood flows to the brain. The SPECT scan shows the part of the brain where seizures start as a “hotspot” for blood flow.

The SPECT scan is done during your child’s stay at the epilepsy monitoring unit (EMU). Your child will need two types of SPECT scan:

- an ictal scan while your child is having a seizure
- an interictal scan between seizures.

Each scan takes about 45 minutes. When they are both complete, your child’s team will compare the different levels of blood flow.

Single photon emission computed tomography (SPECT) machine

Why does my child need a SPECT scan?
The SPECT scan will tell the doctor where seizure starts in the brain. It will provide additional information to clarify or confirm the location of seizures, especially in patients where the other tests such as EEG, MEG or PET scan are not clear, when the MRI is normal or when the MRI findings are unclear.

How do I prepare my child for a SPECT scan?
As the scan is done while your child is staying in the EMU, you will not need to do any special preparation.

Will my child need to be sedated for the scan?
Some children may need a sedative (medicine to keep them calm) to help them lie still during the scan.

Ictal scan
An ictal scan is done while your child is having a seizure.

What happens before the ictal scan?
1. Your child’s team may lower or stop your child’s epilepsy medication for a short time during your child’s EMU stay.
2. A technologist will place EEG electrodes on your child’s scalp.
3. An intravenous (IV) line will be placed in your child’s arm.
4. As soon as your child starts having a seizure, a small amount of radioactive liquid will be injected into the IV line. The
radioactive liquid makes the blood flow easier to see.

What happens during the ictal scan?
Your child will have the SPECT scan two to four hours after receiving the radioactive liquid through the IV. This scan will show the blood flow in the brain at the moment the liquid was injected.

During the scan, your child must lie very still to make sure the images are clear.

**Interictal scan**
This scan shows the typical blood flow in your child’s brain. It is also done during your child’s stay in the EMU and may take place before or after an ictal SPECT scan, usually on a different day.

Two types of SPECT scans of the brain

May I stay with my child during the SPECT scan?
The EMU is a care-by-parent unit, which means you can stay with your child during the SPECT scan. Because of the radioactive liquid given to your child, women who are pregnant or believe they may be pregnant should stay outside the scan room. Another parent or caregiver can stay with your child.

**Does the SPECT scan have any risks or side effects?**
There is a low risk from the radioactive liquid your child receives for the SPECT scan. The dose of liquid given to your child equals about two to four years of natural background radiation, depending on your child’s age and weight. Your child’s body will break down the radioactive liquid very quickly and pass it out in urine within 24 hours.

The potential benefits of the test outweigh any potential risk from the radiation.

**What should I expect after a SPECT scan?**
After a SPECT scan (ictal or interictal), the technologist will remove the IV line and the EEG electrodes and wires.

Once your child has recovered from any sedative, they may go back to their normal activities and eat their usual diet in the hospital.

**When will I get the test results?**
Your doctor will receive the report of the SPECT scan results and discuss them with you and your child at a follow-up appointment, usually four to six weeks after the scan.

**Key points**
- A SPECT scan is takes pictures of the blood flow in your child's brain during a seizure.
- The scan takes place during a stay at the epilepsy monitoring unit and has two parts: an ictal scan during a seizure and an interictal scan between seizures.
- Before an ictal scan, your child's team may lower your child's anti-epileptic drugs for a short time and inject your child with a small amount of radioactive liquid to better show blood flow during a seizure.
- You may discuss the results of the SPECT scan with your child's doctor about four to six weeks after the test.

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If your doctor has told you that your child needs a sedative for the SPECT scan, someone from the nuclear medicine department will contact you with instructions on when your child needs to stop eating and drinking before the SPECT appointment.

If the SPECT is booked without arranging a sedative, but you think your child will need it, please contact the nuclear medicine department at 416-813-7654 ext. 206065.
Neuropsychological assessment before epilepsy surgery

A neuropsychological assessment takes a day to a day and a half, depending on your child's age, and is done by a neuropsychologist or an assistant at the hospital. The assessment uses a number of tests and observations to measure your child's thinking, behaviour and problem-solving skills.

Why does my child need a neuropsychological assessment?
A neuropsychological assessment is intended to help your child’s team:

- understand the impact of your child's neurological (brain) condition on their cognitive functioning (their thinking)
- plan the best treatment for your child.

When is a neuropsychological assessment done?
A neuropsychological assessment is done before your child has surgery. It provides baseline information about your child's condition and can help predict if surgery will put your child at risk for language and memory problems.

Another assessment is done one year after surgery to see if there are any changes in your child’s thinking, behaviour and problem-solving skills and to identify areas where your child would benefit from rehabilitation.

The assessment may also be repeated later to:

- record any change in your child's functioning
- provide up-to-date information if required
- record your child’s functioning at important transition points in their life, such as starting high school or post-secondary education
- help with career planning.

How do I prepare my child for the assessment?

- Explain the assessment to your child in words they understand. For instance, tell your child that the testers want to find out how they think about, learn and remember things.
- Help prepare a young child by explaining the tests, answering questions and using drawing and special toys such as puzzles and blocks.
- Prepare an older child by telling them the assessment is like a fun test at school.

Regardless of age, put your child at ease by explaining that there will be no injections or painful procedures.
What types of tests are done during the neuropsychological assessment?
Not all tests are done on all children. The specific tests will depend on your child's:

- age
- level of skill
- ability to co-operate
- seizure history
- medication history
- behaviour issues
- school performance.

The assessment measures the following general skills:

- intelligence: your child's overall knowledge, thinking and problem-solving skills
- perception: how well your child's brain integrates information that is coming in, for example being able to copy shapes that are shown to them
- motor function: your child's muscle control
- attention: your child’s ability to focus on tasks that continue for some time
- memory: how well your child learns and remembers new information, for example answering questions about a story they have just been told
- working memory: the ability to keep something in mind while doing another task, for example taking directions to a location and finding it on a map
- language skills and vocabulary: the ability to understand and use language
- concept formation and problem solving: how well your child solve problems that they have not seen before
- planning and organization: how your child plans and organizes
- processing speed: how quickly your child can think
- academic skills: how well your child can read, write and do basic math
- behaviour, emotions and personality: whether your child is depressed or anxious or has any behaviour problems. This is based on what the tester sees during testing as well as any reports on your child’s behaviour at home or school.

You may be asked to take part in some of the tests, especially with a young child.

How long does the assessment take?
The baseline (first) assessment usually takes a full day, with breaks for rest and lunch. The length of the assessment partly depends on your child's age and attention level and how fast they can work. Some children may need to have more than one appointment across more than one day.
What should I expect after the assessment?
Once the assessment is done, the neuropsychologist will score the tests and interpret the results in light of your child's medical history.

The report of your child’s neuropsychological assessment will go into your child’s hospital medical record and be shared with your child’s epilepsy team when they are discussing your child’s condition at team meetings. Outside of these situations, your child’s team will treat the information as confidential and share it outside the team only if required by law.

When will I get the results of the assessment?
A few weeks after the assessment, the neuropsychologist will send a report to you and your referring doctor. You will be able to meet with a psychologist to discuss the results a few weeks later.

Key points
- A neuropsychological assessment measures your child's thinking, behaviour and problem-solving skills so your child's team can plan the best treatment.
- In general, the assessment uses tests and observation to measure things such as your child's intelligence, attention, motor function, language skills, memory and behaviour.
- The assessment generally takes one day, but the precise length and tests depend on your child's age, skill level, seizure history and ability to co-operate.
- Your child will have one assessment before surgery and further assessments at set periods to assess the impact of surgery and record their functioning at important points in their life.
Etomidate speech and memory (eSAM) test before epilepsy surgery

The eSAM test, also known as a Wada test, is a neuropsychological test that requires your child to answer some questions and do some tasks while half of their brain is “frozen” or put to sleep. They will have an EEG during the test. The test takes about one and a half hours.

To take part, your child will need to be able to lie still and follow instructions for the full test.

Why does my child need an eSAM and EEG?
An eSAM will tell your child’s doctor which side of the brain is responsible for speech or memory. The test is done if your child’s fMRI does not provide clear results.

An EEG measures electrical activity in the brain to help your child’s doctors see more clearly where seizures start.

Together, the eSAM and EEG will help your child’s healthcare team identify which side of the brain is important for your child’s speech and memory. This allows them to better plan your child’s surgery so that those areas of the brain can be left intact.

How do I prepare my child for the eSAM test?
- Explain what will happen during the eSAM test in words your child understands.
- Make sure your child’s hair is freshly washed. Check for any signs of head lice and tell the nurse at the hospital if you see anything.
- To help the electrodes stay in place during the test, do not use conditioner or styling products in your child's hair after you wash it.
- Your child may need to have an empty stomach for the test. The doctor or nurse will explain when your child should stop eating and drinking before the test.

A few days or weeks before the test, your child will have a set of neuropsychological tests to let the healthcare team get baseline information about your child’s language, cognitive (thinking) skills and memory. Your child’s healthcare team will schedule these tests with you and explain what is involved.

Will my child need to be sedated before the eSAM test?
Your child will need to be awake to follow the instructions during the test, but if they are very
anxious, they can receive a sedative (medicine to help keep them calm).

**What happens when my child arrives for the eSAM test?**
Before the test, the doctor will explain the procedure to you and your child.

1. An EEG technologist will place EEG electrodes on your child’s scalp to monitor the brain activity during the test.
2. Your child will be asked to lie down on an X-ray table.
3. An interventional radiologist (doctor specializing in scans and x-rays) will inject a local anaesthetic into your child’s groin. Apart from the prick of the needle, your child may feel slight pressure and a mild burning sensation.
4. The radiologist will make a small cut and insert a thin catheter (tube) into an artery in the groin so that dye can be injected into the arteries that bring blood to the brain.

**What happens during the eSAM test?**
The test has two parts:

1. an angiogram
2. an eSAM test.

**1. Angiogram**
An angiogram is an x-ray of blood vessels.

Your child’s doctor will inject special dye into your child’s artery to help them monitor blood flow more easily. At first, your child may feel heat or pressure, a metallic taste in their mouth and slight pain. These will all wear off within minutes.

The blood flow in your child’s brain will then be x-rayed over the following 10 minutes. Your child will need to stay still during this time.
2. eSAM test
Following the x-rays, your child will receive an injection of medication called etomidate. This puts one half of the brain to sleep but allows the other side to function normally.

Immediately after the injection, your child will not be able to move one side of their body (the side opposite the location of the injection) and may not be able to speak.

A neuropsychologist will ask your child questions to test their language and memory. Depending on how your child answers, and if they can answer, the healthcare team will see which side of the brain is responsible for language and memory. For instance, if your child is unable to speak while the left side of their brain is asleep, it will be clear that the left side of their brain is crucial for language function.

This information will help the team identify the centres of language and memory in your child’s brain so they can best plan the epilepsy surgery.

Once the etomidate wears off (usually within 10 minutes), the catheter will be moved to the artery that supplies blood to the other side of the brain. Your child will receive a second injection of etomidate and the test will be repeated for the other side of the brain.

What should I expect after the eSAM test?
As soon as both sides of the brain are tested, the interventional radiologist will remove the catheter, apply pressure to stop any bleeding and place a bandage over the injection site. Your child should not normally need any stitches.

Your child may be slightly sore or bruised, but an ice pack can be applied to ease the pain.

Your child will be asked to rest in the hospital for several more hours before going home. If they feel nauseous, cold or numb or have a strange sensation in their groin, tell the nurse right away.

As your child may need to urinate more than usual, give them plenty of fluids over the next few hours.

When will I get the test results?
Your child’s doctor will use the results of the eSAM test alongside other test results to decide on the best treatment or surgery for your child. When your doctor receives the results, they will discuss them with you and your child at a follow-up appointment.

Key points
- An eSAM, or Wada test, involves answering questions and doing tasks while an EEG records brain activity and one side of your child's brain is put to sleep.
- The test is divided in two parts: an angiogram to x-ray the blood flow in your child's brain and an eSAM to test your child's language and memory skills.

Does the test have any risks or side effects?
There are typically no risks from having an eSAM test. However, the dye for the angiogram may make your child urinate more than usual.
Once the eSAM is done for one side of the brain, it is repeated for the other side. Your child's doctor will use the results of the eSAM with other test results to decide on the best treatment or surgery for your child.

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Your child will be sedated for the eSAM to allow testing of each half of their brain. You will receive instructions from the neurology team on when your child should stop eating and drinking before the eSAM appointment.

If you have any questions about the test, contact your child’s neurologist or call the intervention radiology department at 416-813-6054 and choose option 1 or 3.
Invasive electroencephalography (EEG) monitoring before epilepsy surgery

Invasive EEG monitoring is a test to pinpoint where seizures start in the brain. It is also called invasive subdural grid/depth and strip epilepsy mapping.

The test involves using a grid of electrodes placed directly on your child’s brain to monitor your child’s brain activity so doctors can find and record the onset of your child’s typical seizures.

Your child will need brain surgery to place the electrodes and will then be monitored over three to five days.

Why does my child need invasive EEG monitoring?

Invasive EEG monitoring is needed if:

- the source of your child’s seizures cannot be found with a scalp EEG or other standard brain monitoring tests
- seizures occur in parts of the brain that are close to important functional areas, such as areas related to speech and hearing.
What happens before my child’s surgery?
Once your child is scheduled for invasive EEG monitoring, you will meet your child’s neurosurgeon (who will perform the surgery), the epilepsy neurologist (who will review the EEG data) and epilepsy nurse. This team will explain the goals of the surgery to place the electrodes and what to expect before, during and after invasive EEG monitoring. They will also give you a date and time for your child’s surgery and explain how to prepare your child.

Different types of invasive electrodes

Grid and strip electrodes are placed on the surface of the brain. Depth electrodes are placed into the deeper parts of the brain.

How do I prepare my child for invasive EEG monitoring?
- Explain what will happen during invasive EEG monitoring in words your child understands.
- Make sure your child stops eating and drinking from midnight the night before surgery. If these instructions are not followed, the surgery will be cancelled.

What happens when my child arrives for invasive EEG monitoring?
When you arrive at the neurosurgery unit, a nurse and an anaesthesiologist will assess your child and prepare them for surgery.
They will then take your child to the operating room. There, the anaesthesiologist will give your child sleep medicine.

Once your child is asleep, the neurosurgeon will expose your child’s brain and place the special grid of embedded electrodes on the brain’s surface. Sometimes the surgeon will also place depth electrodes to monitor deeper parts of the brain.

When all the electrodes are placed, they will be tested to see if they are working and your child's scalp will then be stitched closed. Your child’s head will then be bandaged and your child will be taken to the critical care unit for recovery and the start of invasive EEG monitoring.

**What happens during invasive EEG monitoring?**
Your child will be in bed for three to five days while invasive EEG monitoring takes place. The electrodes placed on their brain will be connected to a video EEG machine that will continuously record their brain’s electrical activity and capture any seizures on video.

**Does invasive EEG monitoring have any risks or side effects?**
There are typically no risks or side effects from invasive EEG monitoring.

**What should I expect after invasive EEG monitoring?**
Once all the EEG seizure data has been captured and analyzed, you will meet the epilepsy surgery monitoring team to discuss the results.

- If the source of seizures in your child’s brain is identified, your child will have surgery the next day to remove the electrodes and remove the area of the brain that is causing their seizures.
- If doctors cannot find the source of your child’s seizures, they will try again over the following few days. If they still cannot find the source, your child will then have the electrodes removed. As it will not be possible to remove the source of the seizures, you and your child’s healthcare team will use the information from invasive EEG monitoring to discuss other treatment options.

**Key points**
- Invasive EEG monitoring involves placing electrodes directly on your child's brain to pinpoint exactly where seizures start.
- Once your child has surgery to place the electrodes, they will be monitored with a video EEG for three to five days while they stay in the hospital's critical care unit.
- If the source of the seizures is found, your child will have surgery to remove the electrodes and the area of the brain that is causing seizures.
- If the source is not found, the healthcare team will try again and/or use the information to plan other treatment options.
At SickKids
If you have any questions about the test, please contact your child’s neurologist.