

Electrophysiology Study

Your physician has recommended that you have an electrophysiology study (EPS). An EPS looks at the heart's conduction or electrical system. It shows the normal and abnormal electrical pathways of the heart. The EPS finds the cause of abnormal heart rhythms and helps the physician choose what types of treatments, if any, are best for you.

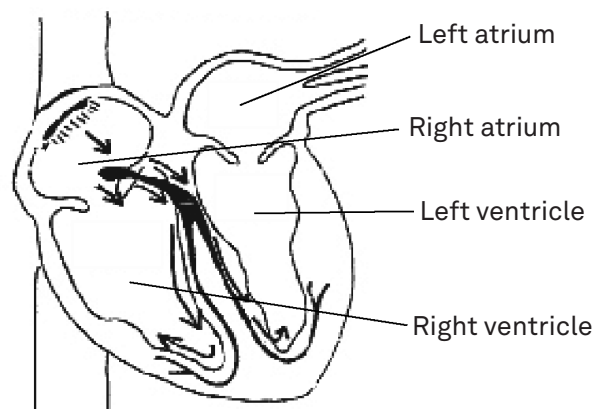
If you have any questions,
talk with your physician
or nurse.


This information will help you understand your heart, its electrical system and the EPS.

The conduction system

With each heartbeat, the heart pumps oxygen-rich blood through the body. It needs a “spark plug” or electrical impulse to start a heartbeat. The heart gets this electrical signal from the sinus node in the upper chamber or right atrium (Figure 1). This signal or spark starts the electrical activity along its path or circuit. The signal then moves through the upper chambers (atria) along a path to the lower chambers or ventricles.

Figure 1. The normal conduction system with an electrical impulse





This electrical circuit makes the heart contract and pump blood throughout the body. “Normal sinus rhythm” is when the circuit follows this normal path.

Arrhythmias

An arrhythmia (irregular heartbeat) happens when the electrical circuit does not follow the normal conduction path. This may result in the heart beating:

- › Too slow
- › Too fast
- › In an abnormal way

Bradycardia is an arrhythmia caused by a delay in the conduction path that makes the heart beat too slowly. Tachycardia is an arrhythmia that makes the heart beat too fast.

There are many different types of tachycardias. The 2 main types of tachycardia are supraventricular tachycardia and ventricular tachycardia.


Supraventricular tachycardia is a fast heart rhythm. It starts in the upper chambers of the heart. Ventricular tachycardia is a fast heart rhythm. It starts in the lower chambers or ventricles. Whether they begin in the upper or lower chambers of the heart, fast or slow heart rhythms can be harmful or even life-threatening.

Preparing for EPS

Before the EPS, you may need several tests. These tests give basic information about your heart function. Your nurse can tell you more about these if you need them. Some of these tests may include:

- › Blood tests
- › An electrocardiogram (ECG)
- › An echocardiogram
- › A 24-hour Holter monitor
- › An exercise stress test

The night before the test, do not to eat or drink anything after midnight. You may take any medication ordered by your physician with small sips of water.



Before the EPS, your physician will decide if you need to stop taking antiarrhythmic medications. They can affect the heart. Keep in mind that stopping medications may give you the following symptoms:

- › Palpitations (heart racing or skipping beats)
- › Dizziness
- › Shortness of breath
- › Chest pain

If you have any of these symptoms, tell the nurse or physician right away.

Day of the test

The care team will put a heart monitor on your chest while you are in the hospital.

A physician from the Electrophysiology Department will come to see you before your EPS. They will explain the test and the possible risks. After the physician has answered your questions, they will ask you to sign a consent form.

We will ask you to empty your bladder right before the test. You will need to take off your underwear and pajama bottoms. You may wear your glasses, dentures and hearing aids, if you have them, during the test.

The Electrophysiology (EP) Lab is on the 8th floor of Galter Pavilion at 201 East Huron Street. During the study, your family can wait in the visitors' waiting area on that floor. We will let them know when you return to your room. Please do not bring any valuables with you to the lab. Either leave valuables at home or with a trusted family member or friend.

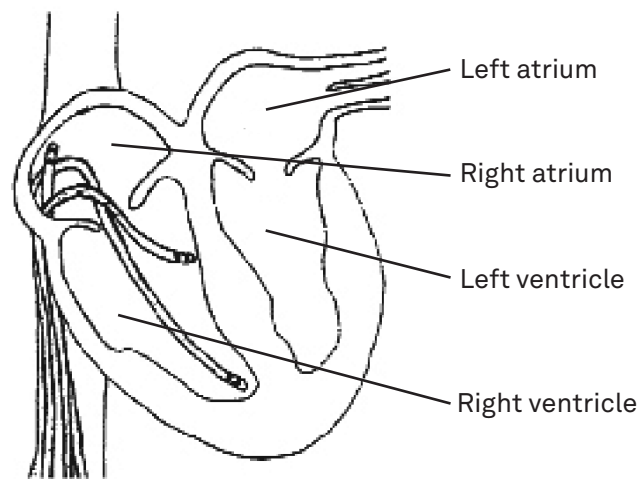
During the test

The EPS room has many heart monitors and machines. A specially trained team of physicians and nurses will be with you during the entire test. The EP nurses will connect you to a heart monitor. They will put 2 adhesive patches on your chest. They will attach the patches to a defibrillator. A defibrillator machine can send an electrical pulse to your heart to restore a normal heartbeat. The physician may use the defibrillator to send a shock to your heart to restore a normal rhythm, if needed.

They may start an IV (into the vein) line in your arm if you do not already have one. The care team will use the IV to give you any medication you need during the test. They will also use it to give you medication to keep you relaxed and comfortable during the procedure.


Most often, the care team will put the EPS catheter into a blood vessel in your groin. In some cases, they will insert it in your inner arm or neck. First, they will shave the area and wash it with special soap. Then, they will cover it with sterile sheets. To start the test, the physician will inject a numbing medication at the site. You will feel some burning as the medication goes in, but once it takes effect, the site will be numb. The physician will insert 3 or 4 small catheters (tubes) into the blood vessel in your groin. Once these tubes are in place, they will insert special pacing wires into them and use an X-ray to position these wires into the heart chambers (Figure 2).

Figure 2. Catheters in the heart chambers



The physician will use the wires to pace the heart and to measure its electrical activity. You may feel your heart racing or skipping beats; this is a normal part of the test. You also may feel palpitations or symptoms like those you have had in the past. If you feel pain, nausea, dizziness or any discomfort during the test, let the physician or nurses know right away.

If the physician triggers an abnormal heart rhythm, the nurse will ask you questions such as: “Do you feel dizzy or lightheaded? Are you short of breath? Do you have any pain?” The nurse may ask you to take a deep breath and cough. It is important to talk to the nurse about how you are feeling.



This abnormal heart rhythm may stop on its own. If it continues, the physician will try to restore your regular heart rhythm through the pacing wires. You may feel dizzy or even pass out for a few seconds. If that happens, the physician will use the defibrillator to give you an electrical shock through your chest. This may stop the arrhythmia and restore a normal rhythm. The physician will only use the defibrillator to give you a shock if they cannot stop the arrhythmia by pacing your heart and you begin to pass out. Throughout the EPS the physicians and nurses will be watching you very closely.

After the test

Once the test is over, the physician will remove the catheters and tubes. They will hold pressure at the site to prevent bleeding.

After the test, the care team will take you back to your room. They will check your heart rhythm, blood pressure and pulse often. You will stay in bed for 4 to 6 hours. It is important to keep your leg straight and not move it. This will prevent bleeding. You will be able to eat regular meals and raise the head of the bed 30 degrees. If you get any symptoms like numbness, tingling or bleeding at the groin site, tell the nurse right away.

As the numbing medication wears off, you may feel minor discomfort at the tube sites. If this happens, tell the nurse. They can give you pain medication. When you can get up, your nurse will help you out of bed. They will help you walk in the hallway.

Possible risks

Your physician will talk to you about the risks of the procedure in detail.

The main risks of the procedure are:

Bleeding (hematoma)

Bleeding can happen at the puncture site where your care team placed the tubes into the blood vessel. The physician will hold pressure over the sites when they take the tubes out. To decrease the chance of bleeding, you will be on bedrest for several hours after the procedure. The catheters inserted into the heart rarely cause internal bleeding. Your physicians will be prepared to take care of this problem if it happens.

Thrombosis (blood clot)

It is normal for small blood clots to form at the puncture site to prevent bleeding. There is a small risk that other blood clots may form in these blood vessels, causing a blockage. You will get blood-thinning medication during the procedure to prevent blood clots.

Infection

It is rare for an infection to happen inside the heart or at the tube insertion site.

Radiation

The physician uses radiation (X-ray) to place the catheters in the correct areas of your heart. You should not have EPS if there is any chance you might be pregnant.

EPS results

The EP physician will talk about the results of the study with you and your family. In general, the results of the EPS will show whether you have an arrhythmia that needs treatment. If you need treatment, there are medication and surgical options. Treatment options depend on the type of rhythm problem you have and the condition of your heart.

- › **Medication** – Most often, you will start taking the medication while you are on a heart monitor in the hospital. If standard treatment does not control the irregular heart rhythm, the physician may suggest that you join a research study.
- › **Surgery** – Your physician may suggest a catheter ablation or surgical insertion of an implantable cardioverter defibrillator (ICD) to treat your abnormal heart rhythm.

The care team will give you information about the treatment that is right for you.

If you do not have an arrhythmia that needs treatment, you will most likely go home without antiarrhythmic or heart rhythm medication.

Discharge instructions

After the EPS, follow these instructions to help you recover.

Diet

You may go back to your regular diet at discharge. Do not drink alcoholic beverages for 24 hours.

Activity

It can take up to 14 days for the artery to heal completely. During this time, bleeding or swelling can happen if you strain your abdominal or groin muscles.

- › On the day of discharge, limit your activities and get plenty of rest.
- › Do not drive for 24 hours.
- › You may go back to your usual daily activities the day after discharge. This includes normal social activities.
- › Do not do physical exercise or heavy lifting (more than 10 pounds) for 1 week. Talk with your physician or the EP Lab physician before you do heavy physical activity or your regular exercise program.
- › Limit muscle strain with sexual activity.

Wound healing

The healing puncture site should stay soft and dry. You may see a small bruise or tiny bump. Call your physician or the EP Lab physician if you have any of these symptoms:

- › Bruising that spreads to the thigh, over the buttock and/or groin
- › Pain at the groin site that is getting worse
- › Fever over 101.5 degrees F for more than 1 day
- › Drainage from the site
- › Redness or red streaks on your skin around the wound
- › Numbness or tingling in your foot, thigh or leg
- › Swelling of your ankle and/or foot
- › Color change and/or coolness of your leg or foot
- › Calf tenderness or pain

When to call the physician

Call your physician right away if you have:

- › Chest discomfort or pain that spreads to your neck, jaw or arm
- › Severe nausea that does not go away, vomiting or heavy sweating
- › Shortness of breath
- › An irregular heartbeat
- › Lightheadedness or dizziness that makes you lie down
- › Fainting

If you cannot reach your physician, call 911 or go to the nearest emergency department.

Bleeding

If you see a small amount of bleeding or oozing from the puncture site, do this:

1. Lie flat right away.
2. Put firm pressure just above the puncture site for 15 minutes. You may use a clean cloth or tissue to apply pressure. If possible, have another person apply pressure.
3. After 15 minutes, remove pressure. The wound should be dry and flat without bleeding. Cover the wound with a bandage.
4. Call your physician right away.

If the bleeding does not stop, go to the nearest emergency department or call 911.

Arterial bleeding

Although rare, this is an emergency and needs medical attention right away. The following signs could mean that the puncture in the artery has reopened and that there is bleeding:

- › Quickly increasing swelling of the area around the wound which may be pulsating
- › Continuous blood streaming from the wound
- › A jet of blood pumping from the puncture wound

Lie flat right away, apply hard pressure above the puncture site, and call 911.



Contact information

If you have questions or concerns, call your care team at the EP Lab:

- › During the week, call **312.695.4965 (TTY: 711)** during business hours, 8 am to 4 pm, Monday to Friday.
- › On nights and weekends call 312.695.4965 and ask the operator to page the EP Lab fellow on-call.
- › You may also call Northwestern Memorial Hospital at 312.926.6999 and ask the operator to page the EP Lab fellow on-call.

For more information about Northwestern Medicine, please visit our website at **[nm.org](https://www.nm.org)**.