

*If you have any questions or concerns, please ask your physician or nurse.*

## Electrophysiology Study (EPS)

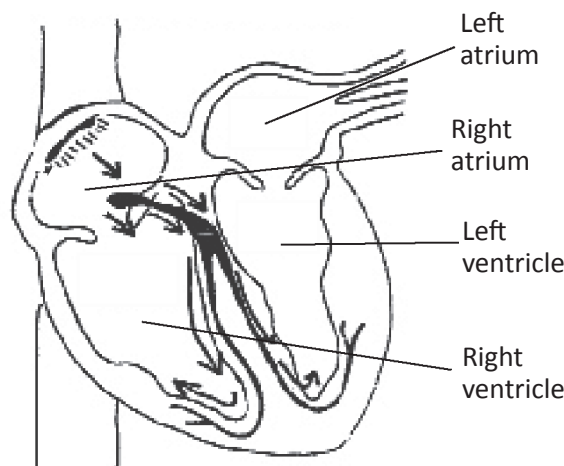
Your physician has recommended that you have an electrophysiology study or EPS. An EPS looks at the heart's conduction or electrical system. It reveals the normal and abnormal electrical pathways of the heart. The EPS finds the cause of abnormal heart rhythms and helps the physician decide what types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

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 receives this electrical signal from the sinus node in the upper chamber or right atrium (see Figure 1). This signal or spark starts the electrical activity along its path or circuit. The signal then travels 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. When the circuit follows this normal path, it is called "normal sinus rhythm."

## Arrhythmias

Arrhythmia is the term used 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

Arrhythmias caused by a delay in the conduction path make the heart beat too slowly and are called bradycardias. Arrhythmias that cause the heart to beat too rapidly are called tachycardias.

There are many different types of tachycardias. Their names refer to where in the heart the abnormal circuit is. The 2 main types are supraventricular tachycardia and ventricular tachycardia.

Supraventricular tachycardia is a fast heart rhythm that begins in the upper chambers of the heart. Ventricular tachycardia is a fast heart rhythm starting 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 be scheduled for several tests. These tests provide basic information about your heart function. Your nurse can tell you more about these tests.

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

You will be placed on a heart monitor during your hospital stay. Medications that affect the heart called antiarrhythmics may be stopped before the EPS. Your physician will decide if this is needed. It is important to be aware that stopping medications may bring on symptoms such as:

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

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

A physician from the Electrophysiology Department will visit you before your EPS to explain the test and the possible risks involved. After the physician has answered your questions, you will be asked to sign a consent form.

The night before the test, you will be asked not to eat or drink anything after midnight.

You may take sips of water with any medication ordered by your physician. Just before the test, you will be asked to empty your bladder. Underwear and pajama bottoms must be removed. Glasses, dentures or hearing aids may be worn during the test.

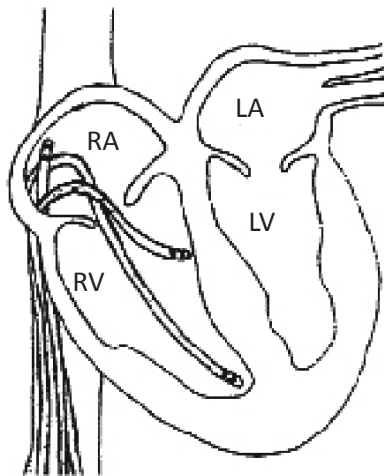
The Electrophysiology (EP) Lab is on the 8th floor of the Galter Pavilion at 251 East Huron Street. During the study, your family can wait in the visitors' waiting area on that floor. They will be called when you return to your room. Please do not bring any valuables with you to the lab. Either leave valuables at home or with a trusted family member or friend.

## During the test

The EPS is done in a room that 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 several heart monitors. An IV (into the vein) line may be placed in your arm if you do not already have one. It is used to give you any medicine you need during the test. You will also be given IV medicine to keep you relaxed and comfortable during the procedure.

Most often, your groin will be used for catheter placement. In some cases, your inner arm or neck area may also be used. These sites will be shaved and washed with special soap, and then covered with sterile sheets. To begin the test, the physician will inject a numbing medicine at the site. You will feel some burning as the medicine is given, but once it takes effect, the site will be numb. The physician will insert 3 or 4 small catheters (tubes) into the vein and/or artery in your groin. Once these tubes are in place, special pacing wires are inserted into them and X-ray is used to position these wires into the heart chambers (see Figure 2).

**Figure 2. Catheters in the Heart Chambers**



These wires are used 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 similar to those you've 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 attempt to pace your heart into a regular heart rhythm. You may feel dizzy or even pass out for a short period of time (seconds). At this point, an electrical shock is given through the chest to stop the arrhythmia and restore a normal rhythm.

Two adhesive patches are placed on your chest at the beginning of the EPS. They are attached to a machine called a defibrillator that delivers the shock. Again, the defibrillator is used to deliver a shock only when the arrhythmia cannot be stopped 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 catheters and tubes will be removed. When the tubes are removed, the physician will hold pressure at the site to prevent bleeding.

After the test, you will be taken back to your room, where your heart rhythm, blood pressure and pulse will be checked frequently. You will be on bedrest for 4 to 6 hours. It is important to keep your leg straight and motionless to prevent bleeding. You will be able to eat regular meals and raise the head of the bed 30 degrees. If you develop any symptoms like numbness, tingling or bleeding at the groin site, notify the nurse right away.

As the numbing medicine wears off, you may feel minor discomfort at the tube sites. If this occurs, tell the nurse so a pain reliever can be given. After the period of bedrest is finished, your nurse will assist you out of bed and to walk in the hallway.

### **Possible risks**

The EPS procedure is a very safe test; however, there is always a small chance of a complication. Your physician will discuss the risks of the procedure with you in detail.

The main risks of the procedure are:

#### ***Bleeding (hematoma)***

Bleeding may occur at the sites where the tubes are placed because your blood vessels have been punctured. When the tubes are removed, pressure is held at the site until bleeding stops. 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 arises.

### ***Thrombosis (blood clot)***

When the tubes are removed, pressure is held at the sites to allow a small blood clot to form. This is normal and prevents bleeding. There is a slight risk that other blood clots may form in these blood vessels, causing a blockage. Blood-thinning medicine is used during the procedure to prevent blood clots.

### ***Infection***

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

### ***Radiation***

Radiation is needed to place the catheters in the correct areas of your heart. An EPS should not be done if there is any chance you might be pregnant.

## **EPS results**

The EP physician will discuss the results of the study with you and your family. In general, the results of the EPS determine whether you have an arrhythmia that requires treatment. If treatment is not suggested, no further studies will be needed and you will typically go home on no antiarrhythmic or heart rhythm medicine. However, if your arrhythmia requires treatment, there are several options available to you.

Medical or surgical treatment may be recommended depending on the:

- Type of rhythm problem you have
- General condition of your heart

If medical treatment is suggested, a drug will be started. Most often, medication is started while you are on a heart monitor in the hospital. If standard treatment does not control the irregular heart rhythm, a research study may be suggested. The physicians and nurses will provide information about any recommended treatment.

Your physician may recommend a catheter ablation or surgical insertion of an implantable cardioverter defibrillator (ICD) to treat your abnormal heart rhythm. Information about these treatments will be made available to you. Regardless of treatment recommendations, you will be given instructions for follow-up care before you leave the hospital.

## **Discharge instructions**

After your EP Lab procedure, the following information will help your recovery.

### ***Diet***

You may resume 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 occur if the abdominal or groin muscles are strained.

- On the day of discharge, limit your activities and get plenty of rest.
- Do not drive for 24 hours.
- You may resume your usual daily activities the day after discharge. This includes normal social activities.
- Do not do physical exercise or heavy lifting (greater than 10 pounds) for 1 week. Consult your own physician or the EP Lab physician before resuming strenuous physical activity or your regular exercise program.
- Care should be taken to limit muscle strain when sexual activity is resumed.

### ***Wound healing***

The healing puncture site should remain soft and dry. A small bruise or tiny nodules may be present. Please call your physician or the EP Lab physician if you notice any of the following:

- Increased bruising extending 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 the skin around the wound
- Numbness or tingling in the foot, thigh or leg
- Swelling of the ankle and/or foot
- Color change and/or coolness of the leg or foot
- Calf tenderness or pain

### ***When to call the physician***

Please call your physician **right away** if you have:

- Chest discomfort or pain that radiates to your neck, jaw or arm
- Severe persistent nausea, vomiting or profuse sweating
- Shortness of breath with exertion
- An irregular heartbeat
- Lightheadedness or dizziness that makes you lie down
- A fainting spell

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

## ***Bleeding***

If you notice a small amount of bleeding or oozing from the puncture site, please do the following:

- Immediately lie flat.
- Apply 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.
- After 15 minutes, remove pressure. The wound should be dry and flat without bleeding. Cover the wound with a Band-Aid®. Call your physician right away.

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

## ***Arterial bleeding***

Although rare, this is an emergency and needs immediate medical attention. 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

**Immediately lie flat, apply hard pressure above the puncture site, and call 911.**

## **Contact information**

If you have questions or concerns, do not hesitate to call us at the following numbers:

- Electrophysiology Cardiology Clinic **312.695.4965** during business hours Monday to Friday 8 am to 4 pm.
- 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.

## **Northwestern Medicine – Health Information Resources**

For more information, contact Northwestern Memorial Hospital's Alberto Culver Health Learning Center (HLC) at [hlc@nm.org](mailto:hlc@nm.org), or by calling 312.926.5465. You may also visit the HLC on the 3rd floor, Galter Pavilion at 251 E. Huron St., Chicago, IL. Health information professionals can help you find the information you need and provide you with personal support at no charge.

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

*Para asistencia en español, por favor llamar al Departamento de Representantes para Pacientes al 312.926.3112.*

The entities that come together as Northwestern Medicine are committed to representing the communities we serve, fostering a culture of inclusion, delivering culturally competent care, providing access to treatment and programs in a nondiscriminatory manner and eliminating healthcare disparities. For questions, please call either Northwestern Memorial Hospital's Patient Representatives Department at 312.926.3112, TDD/TTY 312.926.6363 or the Northwestern Medical Group Patient Representatives Department at 312.695.1100, TDD/TTY 312.926.6363.

Developed by: NMH Electrophysiology Nursing Staff with Interventional Radiology