

# *Deep Vein Thrombosis and Pulmonary Embolism*

## **Take Steps to Prevent DVTs and PEs**

Deep vein thrombosis and pulmonary embolism are serious conditions that can affect people of any age or race. Fortunately, there are steps you can take to prevent them. The information in this material is meant to help you understand deep vein thrombosis and pulmonary embolism, how they are diagnosed and treated, and how you can help prevent them. If you have questions, talk with a member of your health care team.

## **How Your Veins Work**

To better understand DVT and PE, first, it can help to understand your veins and how they work.

Your body has two types of blood vessels: arteries and veins.

The left side of the heart pumps oxygen-rich blood through the arteries to the entire body. The body's veins carry oxygen-depleted blood from the body back to the right side of the heart. The heart then pumps blood to the lungs to get re-oxygenated. The oxygen-rich blood then travels to the left side of the heart and the process begins again. Your body has three types of veins. See Figure 1.

- **Superficial veins** are just under the skin.
- **Deep veins**, located deep within the muscle layers of your limbs, carry most of the blood back to the heart.
- **Perforating or communicating veins** carry blood from the superficial veins to the deep veins.

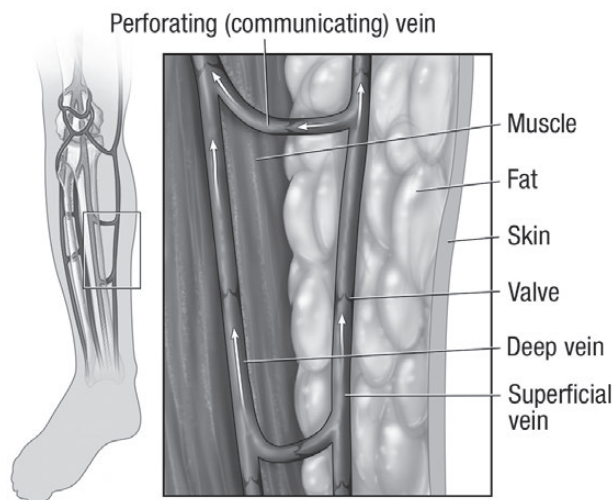
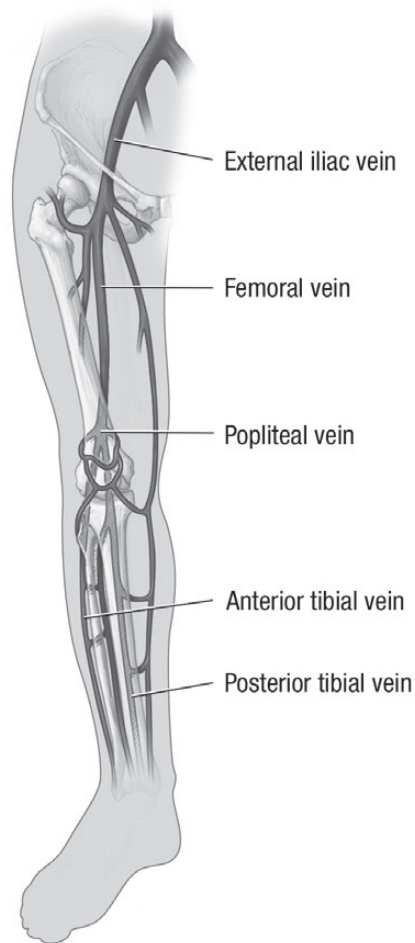


Figure 1. Types of veins

The iliac, femoral, popliteal and tibial veins are deep veins in the leg. See Figure 2.



**Figure 2.** Deep veins in the leg

Veins in your legs and arms have valves that open when blood flows toward the heart. The valves then close to keep the blood from flowing backward to the feet and hands.

Deep veins are surrounded by muscles. Muscles squeeze veins and help to pump blood back to the heart. This explains why walking can be a good way to prevent DVTs and improve blood flow through your veins.

## About Deep Vein Thrombosis

Venous thrombosis happens when a blood clot forms in one of more veins. When the blood clots stick to the wall of the vein and cause pain, redness and swelling in the surrounding area, it is called thrombophlebitis.

One type of thrombophlebitis—**deep vein thrombosis (DVT)**—happens when a blood clot forms in a deep vein. The blood clot can partially or completely block blood flow in the deep vein. See Figure 3.

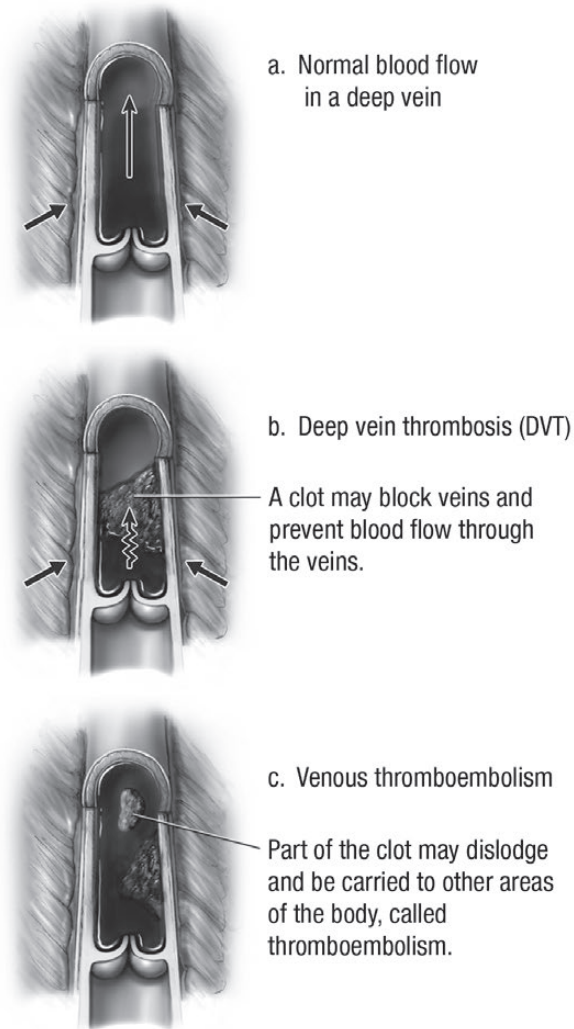


Figure 3. DVT and venous thromboembolism

## Symptoms of a DVT

Your arm or leg with a DVT may become:

- Tender or painful
- Swollen
- Warm to the touch
- Reddish-blue in color

Many people do not have any symptoms, including pain, caused by a DVT.

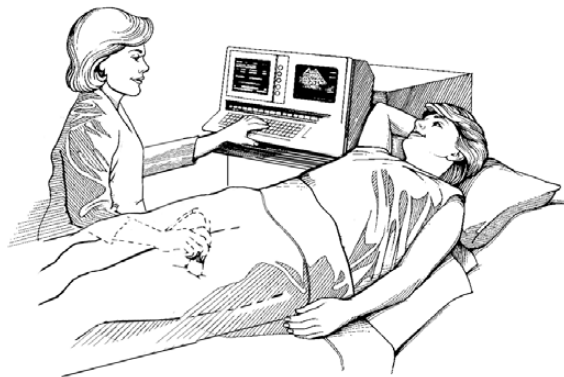
## Diagnosing DVTs

Although you may have symptoms, this does not mean you have a DVT. To find out, your health care provider will ask you questions about your risk factors and do a physical examination. Your health care provider may recommend one or more tests. A health care provider cannot diagnose a DVT by just doing a physical exam. Tests are very important.

If you have questions about the tests, ask a member of your health care team.

## Duplex ultrasound scan

A venous duplex ultrasound scan is a type of ultrasound that shows veins and blood flow. See Figure 4.



**Figure 4.** Duplex ultrasound scan

During this painless test, a wand-like device, called a transducer, is placed over your affected arm or leg. The transducer sends out sound waves that travel through your tissue and bounce back to it. A computer changes the waves into a moving image on a video screen. A blood clot may be visible in the image.

## **Venogram**

During a venogram, dye is injected into a large vein in your foot or ankle. An X-ray procedure creates an image of the veins in your legs and feet which may reveal a clot.

A venogram is done in the hospital by radiologists.

## **Blood tests**

Almost all people who have a DVT have an elevated level of a substance called “fibrin D dimer” in their blood. However, other conditions can cause elevated D dimer. A test for D dimer may be done along with other tests to diagnose DVT. Mayo Clinic Laboratories offers the following test which can be ordered by your physician: DDIT / D-Dimer, Plasma.

## **Coagulation (clotting) testing**

Coagulation testing, including genetic studies, may be done if you have a family history of blood clots. Test results can change plans for your treatment. Talk to your health care provider about genetic testing. Coagulation testing is not usually done at the time you have a DVT or PE, but may be done later to help plan treatment.

## About Pulmonary Embolisms

Prompt diagnosis and treatment of pulmonary embolism are critical! 30 percent of people who have a PE and do not get treatment die. To save your life, seek emergency medical care if you believe you are having symptoms of a PE.

If part or all of a DVT breaks off, that is, embolizes, and travels through the veins, it is called venous thromboembolism. For most people, this does not cause problems. However, if a DVT is pumped into your lung circulation, it can block an artery. This is called a **pulmonary embolism (PE)**. See Figure 5. This stops blood flow to the lungs.

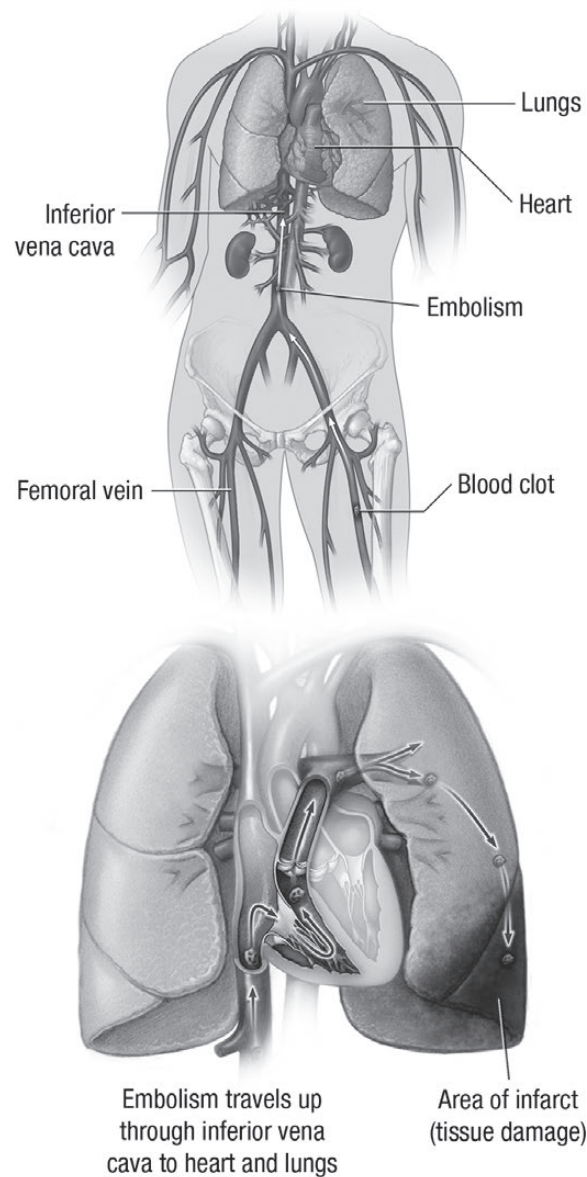


Figure 5. Pulmonary embolism

A PE may be a life-threatening situation and often requires a hospital stay. Your health care provider can help determine the best way to treat a PE.

## **Symptoms of a Pulmonary Embolism**

Most pulmonary embolisms do not cause symptoms. If you have symptoms, they may include:

- Chest pain
- Difficult or painful breathing
- Rapid heartbeat

Much less common symptoms include:

- Cough that may produce blood-streaked sputum
- Light-headedness
- Bluish-colored skin
- Clammy skin, excessive sweating or fever

In extreme cases, loss of consciousness or even sudden death may happen.

## **Diagnosing Pulmonary Embolisms**

Pulmonary embolism can be hard to diagnose, especially in people who have heart or lung disease. Your health care provider may do one or more tests to help find the cause of your symptoms.

### **Computed tomography (CT) scan**

A CT scan is the most common test used for diagnosing a pulmonary embolism. A CT scan allows your health care provider to see your organs in two-dimensional "slices" as a series of very thin X-ray beams pass through your body.

### **Lung scan**

This test, rarely done, is also called a ventilation perfusion (VQ) scan. The test uses small amounts of radioactive tracers, called radioisotopes. The test allows your health care provider to evaluate air and blood flow.

You inhale a small amount of radioactive tracer. Then a small amount of a different tracer is injected into a vein in your arm. The small amount of radioactive material should not cause any side effects or complications.

### **Pulmonary angiogram**

During this procedure, a catheter is inserted into a large vein, usually in your groin, and then threaded through your heart into the pulmonary arteries. A special dye is then injected into the catheter and X-rays are taken as the dye travels along arteries in your lungs. This is the most accurate test. However, it has a high risk of complications so it is only done if you are going to have surgery.

The test usually takes about one hour, but you need to rest in bed for a few hours afterward.

## **Chest X-ray**

This test shows images of your heart and lungs. Results from a chest X-ray cannot be used to diagnose pulmonary embolism, but they can be used to help rule out other conditions.

## **Complications**

Pulmonary embolism is a complication of a DVT. Rarely, a PE can happen by itself, but this is usually only after an injury has happened.

Other serious DVT complications include:

### **Venous stasis disease**

DVT may damage the valves in the affected veins, especially in the deep veins of the legs. The valves normally prevent backward flow of blood when you stand up. When the valves in the veins do not work properly, the following can happen:

**Varicose veins.** The pooling of blood can lead to ballooning of the veins, resulting in varicose veins.

**Swelling in the arm or leg.**

**Skin discoloration.** With chronic limb swelling and increased pressure on the skin, discoloration may happen. Some people develop skin ulcers.

**Vein obstruction.** If you have several episodes of deep vein thrombosis, a permanent obstruction can develop in the vein.

**Post-phlebitic syndrome.** The affected arm or leg can have constant aching or discomfort and swelling. These symptoms can be short- or long-term.

### **Heart attack or stroke**

If there is a hole in the heart that allows blood to flow from the right to the left chamber—either between the upper or lower chambers—a traveling blood clot can cause a heart attack or stroke. This complication is very rare.

### **Treating a DVT or PE**

If you have been diagnosed with a DVT or a PE, your treatment plan depends on the location and size and your medical history. Talk to your health care provider about the best treatment plan for you. Sometimes a combination of treatments works best. You may need these treatments for a few months, or, possibly, for the rest of your life.

It is important to follow the treatment plan, including attending follow-up appointments, as recommended by your health care provider.

## Medication

You may be prescribed anti-clotting medication to prevent further blood clots. You swallow these medications as pills and you usually take them for several months or longer following a DVT or PE.

These medications are called anticoagulants. One example is warfarin (Coumadin™ or Jantoven™). With these medications, a blood test called your INR will be closely monitored.

Another example is called a target-specific oral anticoagulant. You may also hear this type called a “novel” anticoagulant. Examples include apixaban (Eliquis™), rivaroxaban (Xarelto™), edoxaban (Savaysa™) or dabigatran (Pradaxa™). When you take target-specific anticoagulants, you do not need to have your INR monitored.

Both types slow the blood clotting process. Your health care provider will talk with you about which type is best for you.

Your health care provider may also prescribe low-molecular-weight heparin, which is given by injection under the skin, for about five days. This is to treat the DVT or PE while giving warfarin time to work. If you take some medications—such as rivaroxaban or apixaban—you may not need to take heparin first. Some people may continue to inject blood-thinning medication rather than taking pills.

While taking blood-thinning medication, do not take these medications unless your health care provider tells you otherwise:

- Aspirin or products that contain aspirin such as Ascriptin™, Excedrin™, Anacin™
- Ibuprofen such as Motrin™ or Advil™
- Naproxen such as Aleve™, Naprosyn™

For pain relief, you can take products that contain acetaminophen (for example, Tylenol™), but do not take more than two grams per day. Acetaminophen can affect how blood-thinning medications works.

Take all prescription or over-the-counter medications as instructed. **Before** you start or stop taking any other prescription or over-the-counter medications or supplements (including herbal supplements), or change the amount you take, talk to the health care provider managing your blood-thinning medication. If needed, your blood can be checked and your medication dosage changed. This is especially important if you are taking warfarin.

Tell all your health care providers, including your dentist and pharmacist, that you take blood- thinning medication.

## **Blood tests for people who take warfarin**

If you take warfarin, you will regularly need a blood test, called international normalized ratio (INR) tests, to measure how long your blood takes to clot. Your warfarin dosage will be changed, if necessary, based on these test results. If you do home INR testing, you will be given information about contacting your health care provider regarding adjusting your medication dosage.

A normal INR for a person not taking warfarin is 1.0. If you take warfarin, usually, the recommended INR range may be from 2.0 to 3.0, although this can vary. Talk to the health care provider who manages your warfarin about your target INR range.

Follow these guidelines if you take warfarin:

- Know your target INR range and what high and low numbers mean.
- Go to all your scheduled blood tests.
- Ask for your INR results.
- Keep a record of your INR results and warfarin dosages.
- Know when your INR should be checked next.
- Discuss your INR results with the health care provider who manages your warfarin.
- While you take warfarin, the amount of vitamin K you get from your diet has a significant effect on your INR. It is important to keep your vitamin K intake consistent.
- Avoid big changes in your diet if possible. If your diet does change significantly, contact your health care provider as your INR may need to be checked and your warfarin dose adjusted.

For more information about taking blood-thinning medications, including blood tests and diet guidelines, ask your health care provider.

## **Activity instructions**

Unless your provider tells you otherwise, follow these activity instructions while you recover from a DVT or PE:

- If your affected limb is painful or swollen, raise it above the level of your heart as often as possible.
- If you use supplemental oxygen, be sure you understand how to use the equipment.
- Resume your normal activity when your health care provider tells you to. Choose moderate activities such as walking or swimming.
- Protect yourself from cuts and bruises. Anticoagulant medication makes your blood clot more slowly and may increase your risk of bleeding.
- Use caution when handling scissors, knives and other sharp objects. Avoid activities with a higher risk of injury such as contact sports. Wear a helmet when you ride a bicycle or do other activities where you might injure your head.

## **Compression**

Your health care provider may recommend prescription compression wraps or stockings for your legs.

Compression wraps or stockings steadily squeeze your legs, helping your veins and leg muscles move blood more efficiently. Compression helps prevent swelling and reduces the risk of DVT complications.

## Clot removal procedures

Your treatment plan may include doing a clot removal procedure which includes:

- Catheter-directed thrombolysis, which is a procedure done to deliver a clot-dissolving medication directly to the blood clot through a long, thin, plastic tube called a catheter. The catheter is inserted into a vein in the leg.
- Mechanical thrombectomy, a procedure in which a physician opens up the blocked vein and removes the clot. Mechanical thrombectomy can also be done using a catheter inserted into a vein in the leg.
- Balloon angioplasty is done to widen the vein after the blood clot is dissolved. A wire, mesh tube, called a stent, inserted into the vein, also may be used to keep the vein open.

## Treating Pulmonary Embolism

Blood-thinning medications are given to keep the blood clot from getting bigger. The medication also can prevent other blood clots from forming. Thrombolytic therapy may be given to dissolve a large blood clot. Very rarely, surgery may be needed to remove a blood clot.

## Preventing DVT and PE

Although more than two million Americans develop blood clots in their veins every year, many blood clots can be prevented with a few simple steps.

### Prevention steps while you are in the hospital

- **Low-dose heparin or oral anticoagulants.** Blood-thinning medication, such as heparin and warfarin, may be given to people at risk for developing blood clots before and after surgery and to people who have had a heart attack or stroke.
- **Use of compression.** Compression offers a safe, simple and inexpensive way to keep blood moving after surgery. However, for compression to work, the wraps or stockings have to be worn properly. People who have recently had a stroke should not wear compression stockings due to the risk of skin irritation and skin breakdown.
- **Walking** soon and frequently after surgery.
- **Calf muscle exercises.** Flexing your calf muscles can keep blood flowing effectively.
- **Use of pneumatic compression.** This treatment uses calf-high cuffs that automatically inflate every few seconds to massage and compress the veins in your legs.

### Prevention steps when you travel

Sitting during a long flight or car ride increases your risk for developing blood clots in the veins of your legs. To help prevent a blood clot from forming:

- Take a walk around the airplane once every hour or so. If you are driving, stop every hour and walk around the car a couple of times.
- Flex and rotate your ankles or press your feet against the seat in front of you. Or, try raising your toes up and down.
- Flex your calf muscles.
- Drink plenty of fluids before and during the trip. Dehydration can contribute to the development of blood clots.
- Continue to wear compression stockings to help promote circulation as instructed by your health care provider.

## When to Seek Medical Care

### Call 911 or ask someone to immediately take you for emergency medical care if you have:

- Chest pain.
- Difficulty breathing or shortness of breath.
- Vomiting or you are coughing up blood.
- Large amounts of rectal bleeding.
- Symptoms of stroke:
  - Sudden numbness, weakness or paralysis (inability to move a body part) of the face, arm or leg, usually on one side of the body
  - Difficulty speaking or trouble understanding others
  - Sudden blurred or decreased vision, or sudden double vision
  - Dizziness, loss of balance or loss of coordination
  - Sudden, severe headache
- Prolonged bleeding from a cut or injury that does not stop after you apply constant pressure for 10 minutes. Keep the pressure on; do not let up on the pressure to see if the bleeding has stopped.
- Prolonged bleeding from the gums or nose that does not stop or is making it hard for you to breathe.
- Blood in your stool that is red or black, or urine that is red or dark brown that continues or is accompanied by light-headedness.
- Fainting, light-headedness, dizziness or weakness.
- Severe stomach or back pain.

### Contact your health care provider as soon as possible if you have:

- Unusually heavy menstrual flow or vaginal bleeding.
- Mild bleeding from the rectum such as blood on the toilet paper.
- Increased swelling, redness or pain in your affected limb.
- Bumped your head.
- An unusually long headache.
- Persistent cough.
- Temperature of 100.4 degrees Fahrenheit (38 degrees Celsius) or higher.
- Chills or night sweats.

If you have questions about DVT or PE, call your health care provider.

*This material is for your education and information only. This content does not replace medical advice, diagnosis or treatment. New medical research may change this information. If you have questions about a medical condition, always talk with your health care provider.*

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