

The content on the UpToDate website is not intended nor recommended as a substitute for medical advice, diagnosis, or treatment. Always seek the advice of your own physician or other qualified health care professional regarding any medical questions or conditions. The use of this website is governed by the [UpToDate Terms of Use](#) ©2013 UpToDate, Inc.

Patient information: Deep vein thrombosis (DVT) (Beyond the Basics)

Authors

Menaka Pai, MD
James D Douketis, MD, FRCPC,
FACP, FCCP

Section Editor

Lawrence LK Leung, MD

Deputy Editor

Geraldine Finlay, MD

Disclosures

All topics are updated as new evidence becomes available and our [peer review process](#) is complete.

Literature review current through: Aug 2013. | **This topic last updated:** Jul 24, 2013.

DEEP VEIN THROMBOSIS OVERVIEW — Venous thrombosis is a condition in which a blood clot (thrombus) forms in a vein. This clot can limit blood flow through the vein, causing swelling and pain. Most commonly, venous thrombosis occurs in the "deep veins" in the legs, thighs, or pelvis ([figure 1](#)); this is called a deep vein thrombosis, or DVT.

DVT is the most common type of venous thrombosis. However, venous thrombosis can form anywhere in the venous system. If a part or all of the blood clot in the vein breaks off from the site where it is formed, it can travel through the venous system; this is called an embolus. If the embolus lodges in the lung, it is called pulmonary embolism (PE), a serious condition that leads to over 50,000 deaths a year in the United States. In most cases, PE is caused by a DVT when part of a blood clot breaks off and lodges in the lung. The term "venous thromboembolism" is sometimes used when discussing both DVT and PE.

This topic review discusses the risk factors, signs and symptoms, diagnostic process, and treatment of a deep vein thrombosis. The diagnosis and treatment of pulmonary embolisms are discussed separately. (See "[Patient information: Pulmonary embolism \(Beyond the Basics\)](#)".)

DEEP VEIN THROMBOSIS RISK FACTORS — There are a number of factors that increase a person's risk of developing a deep vein thrombosis.

Inherited thrombophilia — Inherited thrombophilia refers to a genetic problem that causes the blood to clot more easily than normal. Various factors in the blood clotting process may be involved, depending on the type of genetic problem present.

An inherited thrombophilia is frequently present in people with a venous blood clot (ie, thrombus). For example, deficiencies of antithrombin, protein C, or protein S can be found in approximately 5 percent of patients who have had a venous blood clot and are less than 50 years of age. Other factors, such as factor V Leiden or the prothrombin gene mutation, are found in up to 5 percent of otherwise healthy Caucasians and can occur in approximately 20 to 25 percent of people with a venous blood clot. Venous thrombosis is infrequent before adolescence in people with inherited thrombophilia.

If a person is found to have a DVT and there is no known medical condition or recent surgery that could have caused the DVT, it is possible that an inherited condition is the cause. This is especially true in people with a family member who has also experienced a DVT or pulmonary embolism. In these cases, testing for an inherited thrombophilia may be recommended. However, finding an inherited thrombophilia does not change the way that doctors treat the venous

thromboembolism, and may not increase the chance of the blood clot coming back. (See '[Finding the cause of venous thrombosis](#)' below.)

Elevated clotting factors — Having an increased level of one or more factors involved in blood clotting, such as factor VIII, increases the risk of a blood clot.

Medical conditions or medications — Some medical conditions and medications increase a person's risk of developing a blood clot:

- Pregnancy
- Obesity
- Smoking
- Heart failure
- Previous DVT or PE
- Increased age
- Cancer — Some cancers increase substances in the blood that cause blood to clot.
- Kidney problems, such as nephrotic syndrome (see "[Patient information: The nephrotic syndrome \(Beyond the Basics\)](#)")
- Certain medications (eg, birth control pills, hormone replacement therapy, erythropoietin, [tamoxifen](#), [thalidomide](#)). The risk of a blood clot is further increased in people who use one of these medications, and also smoke or are obese.

Surgery and related conditions — Surgical procedures, especially those involving the hip, pelvis, or knee, increase a person's risk of developing a blood clot. During the recovery period, this risk often continues because the person is less active. Inactivity during long trips can also increase a person's risk of developing a blood clot. Precautions to reduce the risk of blood clots are discussed below (see '[Deep vein thrombosis prevention](#)' below).

- Major surgery (especially orthopedic surgery and neurosurgery)
- Trauma, especially if blood vessels are injured
- Prolonged sitting, especially sitting for six or more hours on a plane, or bed rest

Acquired thrombophilia — Some types of thrombophilia are not inherited, but can still increase a person's risk of developing a blood clot.

- Certain disorders of the blood, such as polycythemia vera or essential thrombocythemia
- Antiphospholipid antibodies (antibodies in the blood that can affect the clotting process) (see "[Patient information: The antiphospholipid syndrome \(Beyond the Basics\)](#)")

DEEP VEIN THROMBOSIS SYMPTOMS — The signs and symptoms of DVT may be caused by a clot, or may be related to another condition. Imaging studies are needed to determine if a clot is present.

Deep vein thrombosis — Classic symptoms of DVT include swelling, pain, warmth, and redness in the involved leg.

Superficial phlebitis — Superficial phlebitis (SP) causes pain, tenderness, firmness, and/or redness in a vein due to inflammation, infection, and/or a blood clot (thrombus). It is most commonly seen in the inner part of the lower legs.

Superficial phlebitis differs from a deep vein thrombosis because the veins that are affected are near the surface of the skin. Symptoms of SP typically develop over hours to days and resolve in days to weeks. The area may continue to be firm for several weeks to months. Treatment usually includes warm or cool compresses, elevation of the leg, a non-steroidal antiinflammatory agent (NSAID) such as [ibuprofen](#) (Advil, Motrin), or anticoagulation. In most people with SP, there is a low risk of developing a pulmonary embolism, so anticoagulation is not usually needed.

DEEP VEIN THROMBOSIS DIAGNOSIS — If the patient's history, symptoms, and physical exam suggest a DVT, tests are needed to confirm this. Tests to diagnose DVT may include compression ultrasonography, contrast venography, magnetic resonance imaging (MRI), computed tomography (CT scan), and/or a blood test called D-dimer.

If a person with a DVT also has signs or symptoms of a pulmonary embolus, additional testing will be needed. (See

["Patient information: Pulmonary embolism \(Beyond the Basics\)".](#))

D-dimer — D-dimer is a substance in the blood that is often increased in people with DVT or PE. D-dimer testing is sometimes useful for patients with a suspected DVT or PE. If the D-dimer test is negative and the patient has a low risk of DVT or PE based upon his/her history and physical examination, DVT or PE are unlikely and further diagnostic testing may not be needed.

Compression ultrasonography — Compression ultrasonography uses sound waves to generate pictures of the structures inside the leg. For this type of exam, a person lies on his/her back and then stomach as an ultrasound wand is applied to the leg. In most circumstances, compression ultrasonography is the test of choice for patients with suspected DVT.

Contrast venography — During contrast venography, a catheter is threaded into a vein and a dye is injected. This allows the clinician to see the vein with x-ray. Venography is generally reserved for situations in which ultrasound cannot be done, when other tests have not been helpful, or when other tests are negative but the clinician feels strongly that a venous thrombosis is present.

Magnetic resonance imaging (MRI) — MRI uses a strong magnet to produce detailed pictures of the inside of the body. MRI is as accurate as contrast venography. MRI is expensive, and its use may be limited to situations in which contrast venography cannot be performed, such as in patients with poor kidney function, during pregnancy, or because of allergy to the dye required in contrast venography.

Finding the cause of venous thrombosis — After determining that DVT or PE is present, the healthcare provider will want to know what caused it. In many cases, there are obvious risk factors such as recent surgery or immobility. (See '[Acquired thrombophilia](#)' above.) In other cases, the clinician may test for the presence of an inherited form of thrombophilia or for another medical condition associated with an increased risk for venous thrombosis. (See '[Inherited thrombophilia](#)' above.)

Persons with some acquired or inherited abnormalities may require additional treatment or prevention measures to reduce the risk of another thrombosis. Some experts recommend that the family members of a person with an inherited thrombophilia be screened for the inherited condition if this information would affect their care as well, although this issue is controversial. It is important that the healthcare provider discusses the pros and cons of screening for an inherited thrombophilia with the patient before this testing is done.

DEEP VEIN THROMBOSIS TREATMENT — The treatment of DVT and PE are similar. In DVT, the main goal of treatment is to prevent a PE. Other goals of treatment include preventing the clot from becoming larger, preventing new blood clots from forming, and preventing long-term complications of PE or DVT.

The primary treatment for venous thrombosis is anticoagulation. Other available treatments, which may be used in specific situations, include thrombolytic therapy or placing a filter in a major blood vessel (the inferior vena cava).

Anticoagulation — Anticoagulants are medications that are commonly called "blood thinners". These medications do not actually thin the blood, but rather helps to prevent new blood clots from forming. Patients with venous thrombosis are usually treated first with an injectable anticoagulant. There are several such anticoagulants available, including:

- Unfractionated [heparin](#), often given into a vein (intravenous)
- Low molecular weight [heparin](#) ([enoxaparin](#)/Lovenox, [dalteparin](#)/Fragmin, or [tinzaparin](#)/Innohep)
- [Fondaparinux](#) (Arixtra)

These agents can all be injected under the skin (ie, subcutaneous injection) by the patient, a family member, or a home health nurse. This allows selected patients to be treated at home. [Heparin](#), low molecular weight heparin, or [fondaparinux](#) are usually continued for at least five days, along with another medication called [warfarin](#) (Coumadin). Warfarin is a pill that is taken by mouth. After approximately five days, the heparin, low molecular weight heparin or fondaparinux are discontinued while the warfarin is continued for at least three months.

Other treatment options include [rivaroxaban](#) (Xarelto), which is a pill that is taken by mouth, and does not require an

overlap with an injectable anticoagulant. Less commonly, the patient does not take [warfarin](#) or rivaroxaban but takes a daily injection of low molecular weight [heparin](#) or [fondaparinux](#) for the entire treatment period. Low molecular weight heparin, fondaparinux, and rivaroxaban are more expensive than warfarin, but they do not need to be monitored with blood clotting tests.

For patients taking [warfarin](#), the clotting factors in the blood need to be measured on a regular basis with a blood test called the International Normalized Ratio (INR). The target level INR for people on warfarin is usually between 2 and 3. (See "[Patient information: Warfarin \(Coumadin\) \(Beyond the Basics\)](#)".)

The choice of anticoagulant usually depends upon the healthcare provider's preference, the patient's medical condition, and cost issues.

Duration of treatment — [Warfarin](#) (Coumadin) is recommended for a **MINIMUM** of three months in a patient with DVT.

- In patients who had a reversible risk factor contributing to their DVT, such as trauma, surgery, cancer, or being confined to bed for a prolonged period, the person is often treated with anticoagulation for three months or until the risk factor is resolved.
- Expert groups recommend that people who develop a venous thrombosis and who do not have a known risk factor for thrombosis be treated with an anticoagulant for an indefinite period of time [1]. However, this decision should be discussed with the person's healthcare provider after three months of treatment, and then reassessed on a regular basis. Some people prefer to continue the anticoagulant, which may carry an increased risk of bleeding, while others prefer to stop the anticoagulant at some point, which may carry an increased risk for repeat thrombosis.
- People who have an underlying medical risk factor for thrombosis, such as the antiphospholipid syndrome, are advised to continue anticoagulation indefinitely after a first spontaneous DVT or PE.
- Most experts recommend continuing anticoagulation indefinitely for people with two or more episodes of venous thrombosis or if a permanent risk factor is present (eg, a mechanical heart valve).

Walking during DVT treatment — Once an anticoagulant has been started and symptoms (eg, pain, swelling) are under control, the person is strongly encouraged to get up and walk around. Studies show that there is no increased risk of complications (eg, pulmonary embolus) in people who get up and walk, and walking may in fact help the person feel better faster.

Thrombolytic therapy — In some cases, a healthcare provider will recommend an intravenous medicine to dissolve blood clots. This is called thrombolytic therapy. This therapy is reserved for patients who have serious complications related to PE or DVT, and who have a low risk of serious bleeding as a side effect of the therapy. The response to thrombolytic therapy is best when there is a short time between the diagnosis of DVT/PE and the start of thrombolytic therapy.

Inferior vena cava filter — An inferior vena cava (IVC) filter is a device that blocks the circulation of clots in the bloodstream. It is placed in the inferior vena cava (the large vein leading from the lower body to the heart). The IVC filter typically is inserted through a small incision in a neck vein with the use of a local anesthetic and takes 20 to 30 minutes to perform. An IVC filter is often recommended in patients with venous thromboembolism who cannot use anticoagulants because of a very high bleeding risk.

Use of an IVC filter may be recommended in patients who develop recurrent thromboembolism despite anticoagulation, and in patients with pulmonary problems due to chronic recurrent embolism, although this is controversial. In the long term, IVC filters can increase the risk of developing blood clots.

DEEP VEIN THROMBOSIS PREVENTION

Surgical patients — Certain high risk patients undergoing surgery (especially bone or joint surgery and cancer

surgery) may be given anticoagulants to decrease the risk of blood clots. Anticoagulants may also be given to women at high risk for venous thrombosis during and after pregnancy.

In surgical patients with a moderate to low risk of blood clots, other preventive measures may be used. For example, some surgical patients are fitted with inflatable compression devices that are worn around the legs during and immediately after surgery and periodically fill with air. These devices apply gentle pressure to improve circulation and help prevent clots.

Graduated compression stockings may also be recommended; these stockings apply pressure to the lower legs, with the greatest pressure at the ankle. The pressure gradually decreases up to the knee. For all patients, walking as soon as possible after surgery can decrease the risk of a blood clot.

Extended travel — Prolonged travel appears to confer a two- to fourfold increase in risk of venous thromboembolism (VTE) [2]. There are a few tips that may be of benefit during extended travel ([table 1](#)).

SPECIAL PRECAUTIONS FOR PEOPLE WITH DEEP VEIN THROMBOSIS

Second thrombosis — Patients being treated for venous thrombosis are at an increased risk for developing another blood clot, although this risk is significantly smaller when an anticoagulant is used. The patient should watch for new leg pain, swelling, and/or redness. If these symptoms occur, the patient should speak to his/her healthcare provider or seek medical attention as soon as possible.

Other symptoms may indicate that a clot in the leg has broken off and traveled to the lung, causing a pulmonary embolism. These may include:

- New chest pain with difficulty breathing
- A rapid heart rate and/or a feeling of passing out

This complication may be life-threatening and requires **immediate attention**. Emergency medical services are available in most areas of the United States by calling 911.

Bleeding — Anticoagulants such as [heparin](#) and [warfarin](#) can have serious side effects and should be taken **exactly** as directed. If a dose is forgotten, the patient should call his/her provider or clinic for advice. The dose should not be changed to make up for missed doses, unless the provider or clinic directs the patient to do so. Patients should immediately report to the pharmacist or physician if the pill or tablet looks different from the previous bottle. Other precautions are necessary when taking warfarin, and are outlined in a separate topic review. (See "[Patient information: Warfarin \(Coumadin\) \(Beyond the Basics\)](#)".)

Patients may bleed easily while taking anticoagulants. Bleeding may develop in many areas, such as the nose or gums, excessive menstrual bleeding, bleeding in the urine or feces, bleeding or excessive bruising in the skin, as well as vomiting material that is bright red or dark brown like coffee grounds. In some cases, bleeding can develop inside the body and not be noticed immediately. Bleeding inside the body can cause a person to feel faint, or have pain in the back or abdomen. A healthcare provider should be notified immediately if there is any sign of this problem. A healthcare provider should also be notified immediately if the patient on anticoagulants sustained an injury that could lead to bleeding inside the body.

Wear an alert tag — People who take [warfarin](#) should wear a bracelet, necklace, or similar alert tag at all times. If medical treatment is required and the person is too ill to explain his/her condition, the tag will alert responders about the patient's use of warfarin and risk of excessive bleeding.

The alert tag should list the person's medical conditions, as well as the name and phone number of an emergency contact. One device, Medic Alert, provides a toll-free number that emergency medical workers can call to find out a person's medical history, list of medications, family emergency contact numbers, and healthcare provider names and numbers.

Reduce the risk of bleeding — Some simple modifications can limit the risk of bleeding:

- Use a soft bristle toothbrush
- Floss with waxed floss rather than unwaxed floss
- Shave with an electric razor rather than a blade
- Take care when using scissors or knives
- Avoid potentially harmful activities (eg, contact sports)
- Do not take [aspirin](#) or other NSAIDS (eg, [ibuprofen](#), Advil, Aleve, Motrin, Nuprin) unless directed to do so by a healthcare provider. Other nonprescription pain medications, such as [acetaminophen](#), may be a safe alternative.

WHERE TO GET MORE INFORMATION — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our website (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient information: Varicose veins and other vein disease in the legs \(The Basics\)](#)

[Patient information: Deep vein thrombosis \(blood clots in the legs\) \(The Basics\)](#)

[Patient information: Staying healthy when you travel \(The Basics\)](#)

[Patient information: Swelling \(The Basics\)](#)

[Patient information: Hip replacement \(The Basics\)](#)

[Patient information: Knee replacement \(The Basics\)](#)

[Patient information: Pulmonary embolism \(blood clot in the lungs\) \(The Basics\)](#)

[Patient information: Medicines to prevent blood clots: Warfarin \(Coumadin\) \(The Basics\)](#)

[Patient information: Doppler ultrasound \(The Basics\)](#)

[Patient information: Factor V Leiden \(The Basics\)](#)

[Patient information: Medicines to prevent blood clots: Dabigatran, rivaroxaban, apixaban \(The Basics\)](#)

[Patient information: Patent foramen ovale \(The Basics\)](#)

[Patient information: Superficial phlebitis \(The Basics\)](#)

[Patient information: Vein ablation \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient information: Pulmonary embolism \(Beyond the Basics\)](#)

[Patient information: The nephrotic syndrome \(Beyond the Basics\)](#)

[Patient information: The antiphospholipid syndrome \(Beyond the Basics\)](#)

[Patient information: Warfarin \(Coumadin\) \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Anticoagulation during pregnancy](#)

[Approach to the diagnosis and therapy of lower extremity deep vein thrombosis](#)

[Deep vein thrombosis in pregnancy: Epidemiology, pathogenesis, and diagnosis](#)

[Deep vein thrombosis and pulmonary embolism in pregnancy: Prevention](#)

[Deep vein thrombosis and pulmonary embolism in pregnancy: Treatment](#)
[Diagnosis of suspected deep vein thrombosis of the lower extremity](#)
[Etiology, clinical features, and diagnosis of cerebral venous thrombosis](#)
[Evaluation of the patient with established venous thrombosis](#)
[Fibrinolytic \(thrombolytic\) therapy in acute pulmonary embolism and lower extremity deep vein thrombosis](#)
[Hypercoagulable disorders associated with malignancy](#)
[Placement of inferior vena cava filters and their complications](#)
[Low molecular weight heparin for venous thromboembolic disease](#)
[Management of anticoagulation before and after elective surgery](#)
[Management of inherited thrombophilia](#)
[Overview of the causes of venous thrombosis](#)
[Prevention of venous thromboembolic disease in medical patients](#)
[Prevention of venous thromboembolic disease in surgical patients](#)
[Therapeutic use of heparin and low molecular weight heparin](#)
[Therapeutic use of warfarin](#)
[Treatment of lower extremity deep vein thrombosis](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- National Heart, Lung, and Blood Institute

(www.nhlbi.nih.gov/)

- American Heart Association

(www.americanheart.org)

[1-9]

ACKNOWLEDGMENT — UpToDate would like to acknowledge Kenneth A Bauer, MD and Gregory YH Lip, MD, FRCPE, FESC, FACC who contributed to earlier versions of this topic review.

Use of UpToDate is subject to the [Subscription and License Agreement](#).

REFERENCES

1. Kearon C, Akl EA, Comerota AJ, et al. Antithrombotic therapy for VTE disease: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012; 141:e419S.
2. Kelman CW, Kortt MA, Becker NG, et al. Deep vein thrombosis and air travel: record linkage study. *BMJ* 2003; 327:1072.
3. Chee YL, Watson HG. Air travel and thrombosis. *Br J Haematol* 2005; 130:671.
4. Martinelli I. Risk factors in venous thromboembolism. *Thromb Haemost* 2001; 86:395.
5. Hyers TM. Venous thromboembolism. *Am J Respir Crit Care Med* 1999; 159:1.
6. Qaseem A, Snow V, Barry P, et al. Current diagnosis of venous thromboembolism in primary care: a clinical practice guideline from the American Academy of Family Physicians and the American College of Physicians. *Ann Intern Med* 2007; 146:454.
7. Segal JB, Streiff MB, Hofmann LV, et al. Management of venous thromboembolism: a systematic review for a

practice guideline. *Ann Intern Med* 2007; 146:211.

8. Snow V, Qaseem A, Barry P, et al. Management of venous thromboembolism: a clinical practice guideline from the American College of Physicians and the American Academy of Family Physicians. *Ann Fam Med* 2007; 5:74.
9. Blann AD, Lip GY. Venous thromboembolism. *BMJ* 2006; 332:215.

Topic 693 Version 19.0

GRAPHICS

Deep veins of the leg



In people with deep vein thrombosis, blood clots can form in the deep veins of the legs (shown in blue).

Tips to avoid lower leg swelling and deep vein thrombosis during prolonged travel

All travelers should consider the following recommendations for flights longer than six to eight hours:

- Stand up and walk around every hour or two
- Wear loose-fitting, comfortable clothing
- Flex and extend the ankles and knees periodically, avoid crossing the legs, and change positions frequently while seated
- Consider wearing knee-high compression stockings
- Avoid medications (eg, sedatives, sleeping pills) or alcohol, which could impair your ability to get up and move around