



Official reprint from UpToDate®  
[www.uptodate.com](http://www.uptodate.com) ©2013 UpToDate®



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: Foot care in diabetes mellitus (Beyond the Basics)

**Author**

David K McCulloch, MD

**Section Editor**

David M Nathan, MD

**Deputy Editor**

Jean E Mulder, MD

**Disclosures**

All topics are updated as new evidence becomes available and our [peer review process](#) is complete.  
**Literature review current through:** Nov 2013. | **This topic last updated:** Sep 21, 2012.

**INTRODUCTION** — Foot problems are a common complication in people with diabetes. Fortunately, most of these complications can be prevented with careful foot care. If complications do occur, daily attention will ensure that they are detected before they become serious. It may take time and effort to build good foot care habits, but self-care is essential. In fact, when it comes to foot care, the patient is a vital member of the medical team.

This topic review presents a general overview of diabetic foot complications and guidelines for good foot care.

**DIABETES AND FOOT COMPLICATIONS** — Diabetes can lead to many different types of foot complications, including athlete's foot (a fungal infection), calluses, bunions and other foot deformities, or ulcers that can range from a surface wound to a deep infection.

**Poor circulation** — Longstanding high blood sugar can damage blood vessels, decreasing blood flow to the foot. This poor circulation can weaken the skin, contribute to the formation of ulcers, and impair wound healing. Some bacteria and fungi thrive on high levels of sugar in the bloodstream, and bacterial and fungal infections can break down the skin and complicate ulcers.

More serious complications include deep skin and bone infections. Gangrene (death and decay of tissue) is a very serious complication that may include infection; widespread gangrene may require foot amputation. Approximately 5 percent of men and women with diabetes eventually require amputation of a toe or foot. This tragic consequence can be prevented in most patients by managing blood sugar levels and daily foot care.

**Nerve damage (neuropathy)** — Elevated blood glucose levels over time can damage the nerves of the foot, decreasing a person's ability to notice pain and pressure. Without these sensations, it is easy to develop callused pressure spots and accidentally injure the skin, soft tissue, bones, and joints. Over time, bone and joint damage can dramatically alter the shape of the foot. Nerve damage, also called neuropathy, can also weaken certain foot muscles, further contributing to foot deformities. (See "[Patient information: Diabetic neuropathy \(Beyond the Basics\)](#)".)

**RISK FACTORS** — Patients who have had a previous foot ulcer are more likely to have future foot complications. Nerve damage, poor circulation, and chronically high blood sugar levels also increase the likelihood of foot complications.

It is important to wear shoes that fit well. Shoes that are too tight can cause pressure ulcers. Going barefoot, even in the home, should be avoided as this increases the risk of injury to the foot.

**FOOT EXAMINATION** — People with type 1 diabetes for at least five years should have their feet examined at least once a year. People with type 2 diabetes should have their feet examined once per year.

During a foot exam, a healthcare provider checks for poor circulation, nerve damage, skin changes, and deformities. Patients should mention any problems they have noticed in their feet. An exam may reveal decreased or absent reflexes or decreased ability to sense pressure, vibration, pin pricks, and changes in temperature.

Special devices, including a monofilament or tuning fork, can help determine the extent of nerve damage. A monofilament is a very thin, flexible thread that is used to determine if a patient can sense pressure in various areas of the foot. A tuning fork is used to determine if a patient can sense vibration in various areas, especially the foot and toe joints.

### **Possible foot problems**

**Poor circulation** — Some simple clues can point to circulatory problems. Poor pulses, cold feet, thin or blue skin, and lack of hair signal that the feet are not getting enough blood.

**Nerve damage** — Nerve damage may lead to unusual sensations in the feet and legs, including pain, burning, numbness, tingling, and fatigue. Patients should describe these symptoms if they occur, including the timing, if the feet, ankles, or calves are affected, and what measures relieve the symptoms.

Nerve damage may cause no symptoms as the foot and leg slowly lose sensation and become numb. This can be very dangerous because the person may be unaware that they have improperly fit shoes, a rock or other irritant in a shoe, or other problems that could cause damage. (See "[Patient information: Diabetic neuropathy \(Beyond the Basics\)](#)".)

**Skin changes** — Excessive skin dryness, scaling, and cracking may indicate that circulation to the skin is compromised. Other skin changes may include healed or new ulcers, calluses, and broken skin between the toes ([picture 1](#)).

**Deformities** — The structure and appearance of the feet and foot joints can indicate diabetic complications. Nerve damage can lead to joint and other foot deformities. The toes may have a peculiar "claw toe" appearance, and the foot arch and other bones may appear collapsed. This destruction of the bones and joints is called Charcot arthropathy ([picture 2](#)).

**PREVENTING FOOT PROBLEMS IN DIABETES** — Controlling blood sugar levels can reduce the blood vessel and nerve damage that often lead to diabetic foot complications. If a foot wound or ulcer does occur, blood sugar control reduces the risk of requiring amputation. (See "[Patient information: Self-blood glucose monitoring in diabetes mellitus \(Beyond the Basics\)](#)".)

Foot care is important, although patients should also continue to follow other general guidelines for managing diabetes.

The following strategies can reduce the chances of developing foot problems.

**Quit smoking** — Smoking can worsen heart and vascular problems and reduce circulation to the feet. (See "[Patient information: Quitting smoking \(Beyond the Basics\)](#)".)

**Avoid activities that can injure the feet** — Some activities increase the risk of foot injury and are not recommended, including walking barefoot, using a heating pad or hot water bottle on the feet, and stepping into the bathtub before testing the temperature.

**Use care when trimming the nails** — Trim the toe nails along the shape of the toe and file the nails to remove any sharp edges ([figure 1](#)). Never cut (or allow a manicurist to cut) the cuticles. Do not open blisters, try to free ingrown toenails, or otherwise break the skin on the feet. See a healthcare provider or podiatrist for even minor procedures.

**Wash and check the feet daily** — Use lukewarm water and mild soap to clean the feet. Gently pat your feet dry and apply a moisturizing cream or lotion.

Check the entire surface of both feet for skin breaks, blisters, swelling, or redness, including between and underneath the toes where damage may be hidden. Use a mirror if it is difficult to see all parts of the feet or ask a family member or caregiver to help.

**Choose socks and shoes carefully** — Select cotton socks that fit loosely, and change the socks every day. Select shoes that are snug but not tight, and break new shoes in slowly to prevent any blisters ([figure 2](#)). Ask about customized shoes if the feet are misshapen or have ulcers; specialized shoes can reduce the chances of developing foot ulcers in the future. Shoe inserts may also help cushion the step and decrease pressure on the soles of the feet.

**Ask for foot exams** — Screening for foot complications should be a routine part of most medical visits, but is sometimes overlooked. Don't hesitate to ask the healthcare provider for a foot check at least once a year, and more frequently if there are foot changes.

**TREATMENT OF FOOT PROBLEMS WITH DIABETES** — The treatment of foot problems depends upon the presence and severity of foot ulcers.

Treatment of superficial ulcers (involving only the top layers of skin) usually includes cleaning the ulcer and removing dead skin and tissue (debridement) by a healthcare provider ([picture 3](#)). There are a number of debridement techniques available.

If the foot is infected, antibiotics are generally prescribed. The patient (or someone in his or her household) should clean the ulcer and apply a clean dressing twice daily. The patient should keep weight off the foot ulcer as much as possible, meaning that they should not walk with the affected foot. The foot should be elevated when sitting or lying down. The ulcer should be checked by a healthcare provider at least once per week to make sure that the ulcer is improving.

Ulcers that extend into the deeper layers of the foot, involving muscle and bone, usually require hospitalization ([picture 4](#)). More extensive laboratory testing and x-rays may be done, and intravenous antibiotics are often necessary. Surgery may be necessary to remove infected bone or to place a cast on the foot to take pressure off the ulcer.

If part of the toes or foot become severely damaged, causing areas of dead tissue (gangrene), partial or complete amputation may be required. Amputation is reserved for patients who do not heal despite aggressive treatment, or whose health is threatened by the gangrene. Untreated gangrene can be life-threatening.

Some patients with severe foot ulcers and peripheral vascular disease (poor circulation) may require a procedure to restore blood flow to the foot. (See "[Patient information: Peripheral artery disease and claudication \(Beyond the Basics\)](#)".)

**NEW TREATMENTS** — Several experimental approaches are being evaluated for the treatment of diabetic foot complications. New options include synthetic wound dressings, skin grown in a laboratory, substances that stimulate healing and support the growth of infection-fighting cells, electrical stimulation, and exposure to elevated oxygen levels.

For people with diabetes, foot complications are an ever-present risk. However, it is possible to design a plan for keeping the feet as healthy as possible. It is important to learn as much as possible about diabetic foot care and to take an active role in medical decisions and care. While routine medical exams are important, everyday foot care plays the biggest role in preventing foot complications before they start.

**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 web site ([www.uptodate.com/patients](http://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: Type 2 diabetes \(The Basics\)](#)

[Patient information: Nerve damage caused by diabetes \(The Basics\)](#)

[Patient information: The ABCs of diabetes \(The Basics\)](#)

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

[Patient information: Diabetes and infections \(The Basics\)](#)

**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: Diabetes mellitus type 1: Overview \(Beyond the Basics\)](#)

[Patient information: Diabetes mellitus type 2: Alcohol, exercise, and medical care \(Beyond the Basics\)](#)

[Patient information: Diabetes mellitus type 2: Overview \(Beyond the Basics\)](#)

[Patient information: Hypoglycemia \(low blood sugar\) in diabetes mellitus \(Beyond the Basics\)](#)

[Patient information: Preventing complications in diabetes mellitus \(Beyond the Basics\)](#)

[Patient information: Diabetic neuropathy \(Beyond the Basics\)](#)

[Patient information: Self-blood glucose monitoring in diabetes mellitus \(Beyond the Basics\)](#)

[Patient information: Quitting smoking \(Beyond the Basics\)](#)

[Patient information: Peripheral artery disease and claudication \(Beyond the Basics\)](#)

**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.

[Clinical manifestations and diagnosis of diabetic polyneuropathy](#)

[Evaluation of the diabetic foot](#)

[Management of diabetic foot lesions](#)

The following organizations also provide reliable health information.

- National Library of Medicine

([www.nlm.nih.gov/medlineplus/healthtopics.html](http://www.nlm.nih.gov/medlineplus/healthtopics.html))

- National Institute of Diabetes and Digestive and Kidney Diseases

([www.niddk.nih.gov](http://www.niddk.nih.gov))

- American Diabetes Association (ADA)

(800)-DIABETES (800-342-2383)

([www.diabetes.org](http://www.diabetes.org))

- The Endocrine Society

([www.endo-society.org](http://www.endo-society.org))

[1-4]

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

## REFERENCES

1. Ramsey SD, Newton K, Blough D, et al. Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care* 1999; 22:382.
2. Mayfield JA, Reiber GE, Sanders LJ, et al. Preventive foot care in diabetes. *Diabetes Care* 2004; 27 Suppl 1:S63.
3. Pham H, Armstrong DG, Harvey C, et al. Screening techniques to identify people at high risk for diabetic foot ulceration: a prospective multicenter trial. *Diabetes Care* 2000; 23:606.
4. Litzelman DK, Marriott DJ, Vinicor F. The role of footwear in the prevention of foot lesions in patients with NIDDM. Conventional wisdom or evidence-based practice? *Diabetes Care* 1997; 20:156.

Topic 1739 Version 7.0