

# Erectile Dysfunction

National Kidney and Urologic Diseases Information Clearinghouse



National Institute of  
Diabetes and Digestive  
and Kidney Diseases

## What is erectile dysfunction (ED)?

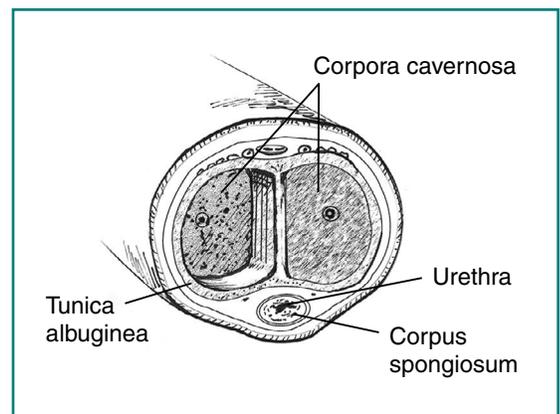
Erectile dysfunction is a condition in which a man is unable to get or keep an erection firm enough for sexual intercourse. ED is present when a man

- can get an erection sometimes, though not every time
- can get an erection, yet it does not last long enough for sexual intercourse
- is unable to get an erection at any time

ED is sometimes called impotence; however, health care providers use this term less often now.

## How does an erection occur?

An erection occurs when blood flow increases into the penis, making it expand and become firm. Two long chambers inside the penis, called the corpora cavernosa, contain a spongy tissue that draws the blood into the chambers. The spongy tissue contains smooth muscles, fibrous tissues, blood-filled spaces, veins, and arteries. A membrane, called the tunica albuginea, encases the corpora cavernosa. The urethra, which is the tube that carries urine and semen outside of the body, runs along the underside of the corpora cavernosa in the middle of a third chamber called the corpus spongiosum.



Cross section of the penis

An erection requires a precise sequence of events:

- An erection begins with sensory or mental stimulation, or both. The stimulus may be physical—touch, sound, smell, sight—or a sexual image or thought.
- When the brain senses a sexual urge, it sends impulses to local nerves in the penis that cause the muscles of the corpora cavernosa to relax. As a result, blood flows in through the arteries and fills the spaces in the corpora cavernosa like water filling a sponge.
- The blood creates pressure in the corpora cavernosa, making the penis expand.

- The tunica albuginea helps trap the blood in the corpora cavernosa, thereby sustaining the erection.
- The erection ends after climax or after the sexual arousal has passed. The muscles in the penis contract to stop the inflow of blood. The veins open and the extra blood flows out of the spaces and back into the body.
- multiple sclerosis, an autoimmune disease that attacks the nerves
- injury from treatments for prostate cancer, including radiation and prostate surgery
- injury to the penis, spinal cord, prostate, bladder, or pelvis
- surgery for bladder cancer
- Peyronie's disease, a disorder in which scar tissue, called a plaque, forms in the penis

## What causes erectile dysfunction?

A variety of physical and psychological or emotional issues can cause ED. Physical causes include damage to the nerves, arteries, smooth muscles, and fibrous tissues in the penis. Diseases and disorders that cause damage and can lead to ED include

- high blood pressure
- diabetes, a complex group of diseases characterized by high blood glucose, also called high blood sugar or hyperglycemia
- atherosclerosis, the buildup of a substance called plaque on the inside of arteries
- heart and blood vessel disease
- chronic kidney disease

Lifestyle choices, such as smoking, drinking too much alcohol, using illegal drugs, being overweight, and not exercising, can lead to ED.

Psychological or emotional issues, such as the following, can also contribute to ED:

- anxiety
- depression
- fear of sexual failure
- guilt
- low self-esteem
- stress

Even when ED has a physical cause, psychological or emotional factors may make the condition worse. For example, a

physical problem that slows a man's sexual arousal can create anxiety, which can worsen the ED.

In addition, ED can be a side effect of many common medications, such as blood pressure medications, antihistamines, antidepressants, tranquilizers, appetite suppressants, and ulcer medications. MedlinePlus, a website of the U.S. National Library of Medicine, provides a list of specific medications that can cause ED. Read more at [www.nlm.nih.gov/medlineplus/ency/article/004024.htm](http://www.nlm.nih.gov/medlineplus/ency/article/004024.htm).

A small number of ED cases result from a reduced level of the male hormone testosterone.

### Who is more likely to develop erectile dysfunction?

Men with an underlying disease that can cause ED are more likely to develop ED. ED affects men of all races and in all regions. Researchers estimate that ED affects as many as 30 million men in the United States.<sup>1</sup> While the likelihood of ED increases with age, the aging process does not cause ED. For example, ED occurs in

- about 12 percent of men younger than 60
- 22 percent of men age 60 to 69
- 30 percent of men age 70 or older<sup>2</sup>

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<sup>1</sup>Nunes KP, Labazi H, Webb RC. New insights into hypertension-associated erectile dysfunction. *Current Opinion in Nephrology and Hypertension*. 2012;21(2):163–170.

<sup>2</sup>Heidelbaugh JJ. Management of erectile dysfunction. *American Family Physician*. 2010;81(3):305–312.

### Seek Medical Attention for Erectile Dysfunction, Which May Indicate a More Serious Condition

Erectile dysfunction is a medical problem and requires medical attention. A man who has ED for more than several weeks or a few months should see his health care provider. If he has other health issues, such as diabetes or heart disease, new or worsening ED may be a sign that the other condition needs attention.

Men may find it difficult to talk with a health care provider about ED; however, they should remember that a healthy sex life is part of a healthy life. The health care provider may refer a man with ED to a urologist—a doctor who specializes in sexual and urinary problems.

## What are the complications of erectile dysfunction?

Complications of ED may include

- an unfulfilled sex life
- emotional problems such as depression, anxiety, and low self-esteem
- a loss of intimacy between the couple, resulting in a strained relationship
- the inability to get the partner pregnant

## How is erectile dysfunction diagnosed?

A health care provider diagnoses ED with a

- medical and sexual history
- physical exam

Other tests that may be helpful to the health care provider include

- blood tests
- a nocturnal, or nighttime, erection test
- an injection test
- a Doppler ultrasound
- a mental health exam

### Medical and Sexual History

Taking a medical and sexual history is one of the first things a health care provider may do to help diagnose ED. He or she will ask the patient to provide information, such as

- how the patient would rate his confidence that he can get and keep an erection
- how often the patient's penis is hard enough for penetration when he has erections from sexual stimulation

- how often the patient is able to maintain his erection after penetration during sexual intercourse
- how often sexual intercourse is satisfying for the patient
- if the patient has an erection when he wakes up in the morning
- how the patient would rate his level of sexual desire
- how often the patient is able to reach climax and ejaculate
- any operations that may have damaged the nerves or blood vessels near the patient's penis
- any prescription or over-the-counter medications the patient may take
- if the patient uses illegal drugs, drinks alcohol, or smokes

This information will help the health care provider understand the problem and define the degree and nature of the ED. The medical history can show diseases that lead to ED, and reviewing sexual activity can help diagnose problems with sexual desire, erection, ejaculation, or orgasm.

### Physical Exam

A health care provider will perform a physical exam to help diagnose the causes of ED. During a physical exam for ED, a health care provider most often

- checks the penis to determine if it is sensitive to physical touch. If the penis lacks sensitivity, a problem in the nervous system may be the cause.
- checks for unusual characteristics of the penis itself, which could suggest the source of the problem. For example, Peyronie's disease causes the penis to bend or curve when erect.

- looks for loss of body hair or breast enlargement, which can point to hormonal problems.
- checks blood pressure.
- checks the pulse in the wrist and ankles to determine if the patient has a problem with circulation.

### **Blood Tests**

A blood test involves drawing blood at a health care provider's office or a commercial facility and sending the sample to a lab for analysis. Blood tests can uncover possible causes of ED, such as diabetes, atherosclerosis, chronic kidney disease, and hormonal problems.

### **Nocturnal Erection Test**

During a nocturnal erection test, done at home or in a special sleep lab, the patient wears a plastic, ringlike device around the penis to test whether he has erections during the night while he sleeps. If the patient has an erection, the device will break. A more complicated version of this test uses an electronic monitoring device that will record how firm the erections are, the number of erections, and how long they last.

Each night during deep sleep, a man normally has three to five erections. If the man has erections during either type of test, he is physically capable of having an erection and the cause of the ED is more likely a psychological or emotional issue. If the man does not have erections during either test, the ED is more likely due to a physical cause.

### **Injection Test**

During an injection test, also called intracavernosal injection, a health care provider will inject a medication into the base of the penis to cause an erection. In some instances, a health care provider may insert the medication into the urethra, instead of using an injection, to cause an erection. The health care provider will evaluate how full the penis becomes and how long the erection lasts. Either test helps the health care provider find the cause for the ED. The tests most often take place in a health care provider's office.

### **Doppler Ultrasound**

An x-ray technician most often performs a Doppler ultrasound in a health care provider's office or an outpatient center. The ultrasound can detect poor blood flow through the penis. An x-ray technician passes a handheld device lightly over the penis to measure blood flow. Color images on a computer screen show the speed and direction blood is flowing through a blood vessel. A radiologist—a doctor who specializes in medical imaging—or urologist interprets the images. During this exam, a health care provider may inject medication into the penis to create an erection.

### **Mental Health Exam**

A health care provider may interview the patient and use a questionnaire to help diagnose any psychological or emotional issues that may be causing the ED. The health care provider may also interview the patient's sexual partner to gather more information about the couple's emotional and physical relationship and how it may affect the ED.

## How is erectile dysfunction treated?

A health care provider treats ED by

- treating the underlying cause of the ED:
  - lifestyle changes
  - changing medications that treat other health conditions
  - counseling
- prescribing ED medications:
  - oral medications
  - injectable medications
- prescribing a vacuum device
- performing surgery:
  - implanted devices
  - artery reconstruction

### Treating the Underlying Cause of the Erectile Dysfunction

A health care provider can sometimes treat ED by making recommendations that treat the underlying cause.

**Lifestyle changes.** Healthy lifestyle changes may help solve the problem. A man can

- quit smoking
- limit or stop drinking alcohol
- increase physical activity
- stop illegal drug use

**Changing medications that treat other health conditions.** If a medication may be the cause of ED, a health care provider may suggest a different dose or a different medication.

**Counseling.** A man can see a counselor if psychological or emotional issues cause the ED. A counselor can teach techniques to decrease anxiety or stress associated with intercourse. The partner can help with the techniques, which include gradual development of intimacy and stimulation. Such techniques can help relieve anxiety or stress when treating the physical causes of ED.

### Prescribing Erectile Dysfunction Medications

A health care provider may prescribe medications to help a man get an erection, including medications a man can take orally, inject into the penis, or insert into the urethra at the tip of the penis.

**Oral medications.** A health care provider may prescribe an oral medication, such as one of the following, to help a man get and maintain an erection:

- sildenafil (Viagra)
- vardenafil (Levitra, Staxyn)
- tadalafil (Cialis)
- avanafil (Stendra)

Researchers are testing additional oral medications for safety and effectiveness.

All of these medications work by relaxing smooth muscles and increasing blood flow in the penis during sexual stimulation.

A man should not take any of these medications to treat ED if he is currently taking nitrates—medication used to treat heart conditions.

A health care provider may prescribe testosterone to men who have low testosterone levels in their blood. Making

testosterone levels normal may help ED; however, it is often ineffective if ED is caused by circulatory or nerve problems and may lead to some side effects, including a high red blood cell count and problems urinating.

### Alternative Medications

Some men claim that other oral medications help them get and maintain an erection, including

- yohimbe, an herbal supplement
- dopamine agonists, medications that treat Parkinson's disease
- serotonin receptor agonists, medications that treat migraine headaches
- trazodone, a medication that treats depression

Scientists continue to study these claims, yet the results are inconsistent. Improvements that the user observes after taking these medications or supplements may be examples of the placebo effect—a change that results simply from the person's belief that an improvement will occur. To help ensure coordinated and safe care, people should discuss their use of alternative medications, including use of vitamin and mineral supplements, with their health care provider.

**Injectable medications.** While oral medications can improve the response to sexual stimulation, they do not trigger an automatic erection. Many men achieve stronger erections by injecting a medication into the penis, causing it to become engorged with blood. The most commonly used injectable medication, alprostadil (Caverject, Edex), widens blood vessels. A health care provider, most often a specially trained urologist, will provide detailed instructions and training on how the man should administer the medication.

Instead of using an injectable medication, some men insert a pellet or suppository of alprostadil (MUSE) into the urethra. A health care provider will prescribe a prefilled applicator to deliver the pellet about an inch into the urethra. The man will receive detailed instructions and training on how to put the pellet in the urethra. An erection will begin within 8 to 10 minutes and may last 30 to 60 minutes.

Medications that men take by mouth, through an injection, or as a pellet in the urethra can have side effects, including a persistent erection known as priapism. Men should call a health care provider immediately if an erection lasts 4 hours or longer.

Men should ask their health care provider about the latest advances as new injectable medications become available.

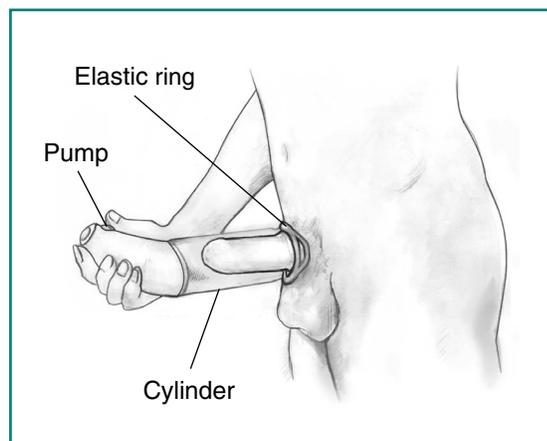
## Prescribing a Vacuum Device

Vacuum devices cause an erection by creating a partial vacuum, which pulls blood into the penis. The penis becomes engorged with blood, causing an erection. The devices have three components:

- a plastic cylinder, which the man puts around his penis
- a pump, which draws air out of the cylinder
- an elastic ring, which the man moves from the end of the cylinder to the base of the penis as he removes the cylinder

The elastic ring maintains the erection during intercourse by preventing blood from flowing back into the body. The elastic ring can remain in place up to 30 minutes. The man should remove the ring after that time to restore normal circulation and to prevent skin irritation.

Couples may find that using a vacuum device requires some practice or adjustment. An erection achieved with



Vacuum device

a vacuum device may not feel like an erection achieved naturally. The penis may feel cold or numb and have a purple color. Bruising on the shaft of the penis may occur; however, the bruises are most often painless and disappear in a few days. Vacuum devices may weaken ejaculation because the elastic ring blocks some of the semen from traveling through the urethra; however, in most cases, the devices do not affect the pleasure of orgasm.

## Performing Surgery

A urologist may perform surgery to

- implant a device to make the penis erect
- reconstruct arteries to increase blood flow to the penis

A urologist performs the surgery at a hospital.

**Implanted devices.** Implanted devices, known as prostheses, can cause an erection in many men with ED. The two types of devices are inflatable and malleable implants.

Inflatable implants consist of paired cylinders that expand with pressurized fluid. During surgery, a urologist inserts inflatable implants in the penis. He or she then inserts a fluid reservoir and a pump that connect to the cylinders.

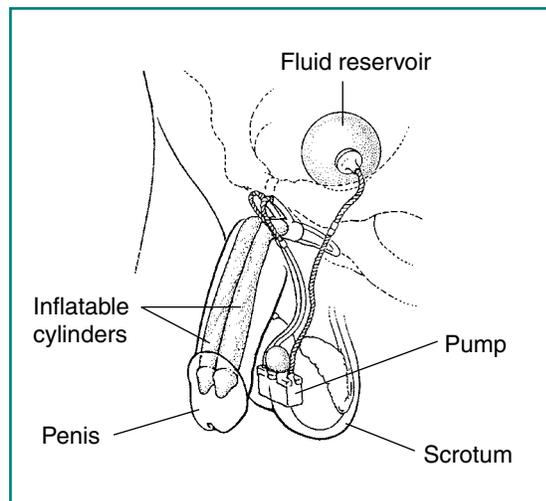
After recovering from surgery, the patient inflates the cylinders by pressing on the small pump, located under the skin in the scrotum. The pump causes fluid to flow from a reservoir in the lower pelvis to the

cylinders in the penis. Inflatable implants can expand the length and width of the penis to some degree. Inflatable implants also leave the penis in a natural state when not inflated.

Malleable implants most often consist of paired rods that a urologist inserts into the corpora cavernosa during surgery. The patient manually adjusts the position of the penis and, therefore, the rods. Adjustment does not affect the width or length of the penis.

The patient can leave the hospital the day of or day after the operation. The health care team will provide discharge instructions, and the patient should be able to use the implant 4 to 6 weeks after the operation.

Once a patient has either an inflatable or a malleable implant, he must use the device to get an erection. Possible problems with implants include mechanical breakdown and infection, although mechanical problems have decreased in recent years because of technological advances.



Inflatable implant

**Artery reconstruction.** Surgery to repair arteries can reduce ED caused by obstructions that block blood flow to the penis. Men younger than 30 who have an isolated blockage of an artery due to a groin injury or pelvis fracture are the best candidates for this type of surgery.<sup>3</sup> In most cases, the procedure is unsuccessful in men older than 55 who have widespread blockage.<sup>3</sup>

Choosing an ED treatment is a personal decision. Therefore, a man should talk with his partner about which treatment fits them best as a couple.

## How can erectile dysfunction be prevented?

Men can prevent many of the causes of ED by making healthy lifestyle choices, such as being physically active, quitting smoking, and following a healthy diet.

### Physical Activity

Physical activity increases blood flow throughout the body, including the penis. Men should talk with a health care provider before starting new activities. Beginners should start slow, with easier activities such as walking at a normal pace or gardening. They can work up to harder activities such as walking briskly or swimming. Men should aim for at least 30 minutes of activity most days of the week.

<sup>3</sup>Burnett AL. Evaluation and management of erectile dysfunction. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, eds. *Campbell-Walsh Urology*. 10th ed. Vol. 1. Philadelphia: Elsevier, Inc.; 2012: 721–748.

## Quitting Smoking

Smoking is associated with heart and blood vessel disease, which can lead to ED. Even when heart and blood vessel disease and other possible causes of ED are taken into account, smoking still increases the chances that a man will have ED.

## Eating, Diet, and Nutrition

To help maintain erectile function, men should eat a healthy diet of whole-grain foods, fruits and vegetables, low-fat dairy foods, and lean meats. A diet that contributes to being overweight and heart and blood vessel disease can also contribute to ED. Men should avoid foods high in fat and sodium, the main ingredient in salt. They should also avoid drinking too much alcohol or using illegal drugs.

## Points to Remember

- Erectile dysfunction (ED) is a condition in which a man is unable to get or keep an erection firm enough for sexual intercourse. ED is present when a man
  - can get an erection sometimes, though not every time
  - can get an erection, yet it does not last long enough for sexual intercourse
  - is unable to get an erection at any time
- A variety of physical and psychological or emotional issues can cause ED. Physical causes include damage to the nerves, arteries, smooth muscles, and fibrous tissues in the penis. Lifestyle choices, such as smoking, drinking too much alcohol, using illegal drugs, being overweight, and not exercising, can lead to ED.
- A health care provider diagnoses ED with a
  - medical and sexual history
  - physical exam
- Other tests that may be helpful to the health care provider include
  - blood tests
  - a nocturnal, or nighttime, erection test
  - an injection test
  - a Doppler ultrasound
  - a mental health exam
- A health care provider treats ED by
  - treating the underlying cause of the ED
  - prescribing ED medications
  - prescribing a vacuum device
  - performing surgery
- Men can prevent many of the causes of ED by making healthy lifestyle choices, such as being physically active, quitting smoking, and following a healthy diet.

## Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) sponsors programs aimed at understanding and treating ED. One team of researchers is exploring the effect of weight loss on ED in men who are obese and sexual dysfunction in women who are obese. One group of participants in the study received bariatric surgery or a lap band procedure to bring about weight loss. Another group lost weight through counseling and behavior change. At the beginning of the study, participants filled out surveys that measured erectile or sexual function. Four years after surgery or weight loss counseling, they will retake the surveys. The Changes in Sexual Function Following Bariatric Surgery study, funded under National Institutes of Health (NIH) clinical trial number NCT00670098, will test the theory that weight loss can improve erectile function.

Other investigators are studying how better control of blood sugar and blood pressure in diabetes could help reduce the chances of developing ED.

Clinical trials are part of clinical research and at the heart of all medical advances. Clinical trials look at new ways to prevent, detect, or treat disease. Researchers also use clinical trials to look at other aspects of care, such as improving the quality of life for people with chronic illnesses. To learn more about clinical trials, why they matter, and how to participate, visit the NIH Clinical Research Trials and You website at [www.nih.gov/health/clinicaltrials](http://www.nih.gov/health/clinicaltrials). For information about current studies, visit [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

## For More Information

### **American Association of Sexuality Educators, Counselors, and Therapists**

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### **American Diabetes Association**

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### **Urology Care Foundation**

1000 Corporate Boulevard  
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