Understanding Prostate Changes: A Health Guide for All Men

National Institutes of Health
National Cancer Institute
“I’ve had a number of people write me, and I’ve tried to get back to every one of them because I know the unanswered questions that were in my mind at the time my prostate problem was discovered. I just tell them what I did. I don’t recommend anything other than a positive attitude and being proactive—find out, find out, find out.”

—Marv Levy, longtime head coach of the Buffalo Bills, on his advice to people inquiring about his battle with prostate cancer. Levy underwent prostate cancer surgery midway through the 1995 football season.
Introduction

The prostate, scarcely noticed by the public a decade ago, is now in the limelight, featured in thousands of reports in the general press and in medical journals.

Why has interest soared? There are several reasons. Famous figures such as Harry Belafonte, Bob Dole, and Norman Schwartzkopf have gone public after being struck by prostate cancer. By doing that, they have spurred interest in the small gland and rallied support for increased research and better treatment choices.

Also, more men are living to older ages—when prostate enlargement is common and prostate cancer becomes more likely—and huge numbers of previously unsuspected, symptom-free prostate cancers are being identified through simple blood-screening tests.

Despite all the attention, however, issues surrounding the prostate, and prostate cancer in particular, are immersed in uncertainty. It is not known, for instance, if the potential benefits of prostate cancer screening outweigh the risks, if surgery is better than radiation, or if treatment is better than no treatment in some cases.

Because of these uncertainties, doctors and medical organizations offer conflicting advice for men who are weighing their options. As a result, men often find themselves confused about what to do next.

By providing some insight into the prostate and prostate disorders, this booklet aims to help you consult knowledgeably with your doctor in order to weigh your alternatives. Words that appear in bold on the pages that follow are defined in the Glossary that begins on page 30.
**The Prostate**

The prostate gland, a key part of the male reproductive system, is linked closely with the urinary system. It is a small gland that secretes much of the liquid portion of semen, the milky fluid that transports sperm through the penis when a man ejaculates.

The prostate is located just beneath the bladder, where urine is stored, and in front of the rectum. It encircles, like a donut, a section of the urethra. The urethra is the tube that carries urine from the bladder out through the penis. During ejaculation, semen is secreted by the prostate through small pores in the urethra's walls.

The prostate is made up of three lobes encased in an outer covering, or capsule. It is flanked on either side by the seminal vesicles, a pair of pouch-like glands that contribute secretions to the semen. Next to the seminal vesicles run the two vas deferens, tubes that carry sperm from the testicles. The testicles, in addition to manufacturing sperm, also produce testosterone, a male sex hormone that controls the prostate's growth and function.

**Disorders of the Prostate**

The prostate usually is healthy in younger men. As a man grows older, however, the prostate gland frequently becomes a source of trouble. The three most common prostate problems are inflammation (prostatitis), prostate enlargement (benign prostatic hyperplasia/BPH), and prostate cancer.

Neither prostatitis nor prostate enlargement is known to cause cancer. However, it is possible for men who have one or both of these conditions to develop prostate cancer as well.
I. Prostatitis

Prostatitis, or prostate inflammation, can cause difficult or painful urination that often is accompanied by a burning sensation, by a strong and frequent urge to urinate that often results in only small amounts of urine, and by pain in the lower back or abdomen.

The causes of prostatitis are unclear. Sometimes, it is the result of a bacterial infection. At other times, the cause is unknown. Occasionally, prostatitis is accompanied by chills and a high fever. When prostatitis is the result of a bacterial infection, it usually can be cleared up with antibiotics.

“BPH is a troublemaker because the prostate, as it enlarges, blocks the flow of urine.”
II. Benign Prostatic Hyperplasia (BPH)

Benign prostatic hyperplasia (BPH) is an enlarged prostate. Benign means noncancerous and hyperplasia means excessive growth of tissue. BPH is the result of small noncancerous growths inside the prostate. It is not known what causes these growths, but they may be related to hormone changes that occur with aging. By age 60, more than half of all American men have microscopic signs of BPH, and by age 70, more than 40 percent will have enlargement that can be felt on physical examination.

The prostate normally starts out about the size of a walnut. By the time a man is age 40, the prostate may already have grown to the size of an apricot; by the age of 60, it may be as big as a lemon.

BPH, which usually does not affect sexual function, is a troublemaker because the prostate, as it enlarges, presses against the bladder and the urethra, blocking the flow of urine.

A man with BPH may find it difficult to initiate a urine stream or to maintain more than a dribble. He also may need to urinate frequently, or he may have a sudden, powerful urge to urinate. Many men are forced to get up several times a night; others have an annoying feeling that the bladder is never completely empty.

Straining to empty the bladder can make matters worse; the bladder stretches, the bladder wall thickens and loses its elasticity, and the bladder muscles become less efficient. The pool of urine that collects in the bladder can foster urinary tract infections, and trying to force a urine stream can produce back-pressure that eventually damages the kidneys. The kidneys are where urine is formed, as waste products are filtered from the blood.

BPH sometimes leads to problems. For instance, a completely blocked urethra is a medical emergency requiring immediate catheterization, a procedure in which a tube called
a catheter is inserted through the penis into the bladder to allow urine to escape. Other serious potential complications of BPH include bladder stones and bleeding.

**Diagnosing BPH**

A detailed medical history focusing on the urinary tract—kidneys, ureters (the pair of tubes that carry urine from the kidneys to the bladder), the bladder, and the urethra—allows the doctor to identify symptoms and to evaluate the possibility of infection or other urinary problems.

The initial medical workup typically includes a physical exam called a digital rectal examination (DRE), a urinalysis to check for infection or bleeding, and a blood test to measure kidney function. Some physicians may also check the amount of prostate-specific antigen (PSA), using a PSA test (see Evaluating Prostate Health), to help rule out the likelihood of cancer. PSA is a protein that is produced by the cells of the prostate gland.

In addition, other tests may help a urologist—a doctor who specializes in disorders of the urinary tract and the male reproductive tract—to determine if BPH has affected the bladder or kidneys. These include tests that measure the speed of urine flow, pressure in the bladder during urination, and how much urine is left in the bladder after urinating.

Some other tests that are widely used, according to an expert panel sponsored by the
United States Public Health Service (USPHS) practice guidelines, are expensive, sometimes risky, and, for most men, unnecessary. These include **cystoscopy**, in which the doctor inserts a viewing tube up the urethra to get a direct look at the bladder; an **x-ray** called a **urogram**, in which urine is made visible on an x-ray after dye is injected into a vein; and **ultrasound**, which obtains images of the kidneys and bladder after a probe is placed on the abdomen.

**Treating BPH**

About half of the men with BPH develop symptoms serious enough to warrant treatment. BPH cannot be cured, but its symptoms can be relieved by surgery or by drugs in many cases.

BPH does not necessarily grow worse. According to one review, mild to moderate symptoms worsened in only about 20 percent of the cases. They improved (without any specific treatment) in another 20 percent, and stayed about the same in the rest.

Men whose symptoms are mild often opt for an approach called **watchful waiting**. This means that they report for regular checkups and have further treatment only if and when their symptoms become too bothersome.

The USPHS Clinical Practice Guidelines call watchful waiting “an appropriate treatment strategy for the majority of patients.” Men who choose watchful waiting should have regular, perhaps annual, checkups, including DREs and laboratory tests.

For those who choose watchful waiting, a number of simple steps may help to reduce bothersome symptoms. These include limiting fluid intake in the evening, especially beverages containing alcohol or caffeine, which can trigger the urge to urinate and can interfere with sleep; taking time to empty the bladder completely; and not allowing long intervals to pass without urinating.
Men monitoring prostate conditions should also be aware that certain medications they are taking for other ailments may make their symptoms worse. These include some over-the-counter cough and cold remedies, prescribed tranquilizers, antidepressants, and drugs to control high blood pressure. Switching to a different prescription may help.

Watchful waiting, of course, is not always enough for BPH, and surgery or drug therapy may be required. Here is a close look at both options:

**BPH Surgery**

Although the popularity of prostate surgery has diminished since drug therapy became available (a total of 250,000 procedures were performed in 1996, down from 400,000 in 1988), operations for BPH remain the most common surgery performed on American men.

Several types of surgery can relieve the symptoms of an enlarged prostate. They are:

**Transurethral Resection of the Prostate (TURP).** This procedure accounts for more than 90 percent of all BPH surgeries. TURP relieves symptoms quickly, typically doubling the urinary flow within weeks.

Here is how the surgery is done. The patient is numbed from the waist down with an *anesthetic* injection known as a *spinal block*. The surgeon then inserts a slim fiberoptic tube through the penis and up the urethra as far as the prostate. Using either a tiny blade or an electric loop, the surgeon pares away the urethra’s lining and
bits of excess prostate tissue. Gradually the passageway is expanded.

A TURP patient is usually hospitalized for several days after surgery. During convalescence, a catheter remains in the bladder through the penis to drain out urine. By the time the patient leaves the hospital, he is usually able to urinate on his own.

The TURP procedure ordinarily does not pose the two main dangers generally linked to prostate surgery: incontinence (loss of urinary control) and problems with sexual function, especially sexual impotence (the inability to have an erection).

About 5 percent of men become partially incontinent after the TURP procedure—although the incontinence sometimes clears up over time. In addition, some men develop scarring in the urethra that can block urination. As many as 10 percent will need repeat surgery because prostate tissue grows back.

About 5 percent of men become impotent after the TURP procedure. But TURP does not usually affect a man's ability to have an erection or an orgasm, since the nerves that control erection lie outside the prostate and are not touched by the operation. A more common side effect is a dry, or retrograde, ejaculation. It occurs after surgery when the neck of the bladder fails to close properly during ejaculation. The result is that semen spurts backward into the bladder rather than through the penis. Men who experience this side effect still have the sensation of an orgasm but are unable to father children.

Transurethral Incision of the Prostate (TUIP). This procedure is used on small prostate glands of 30 grams or less and is used far less frequently than TURP.

Like TURP, TUIP is performed by passing an instrument through the penis to reach the prostate. The difference is that a doctor makes only one or two
small cuts to relieve pressure in the prostate rather than trimming away tissue. Like TURP, the procedure considerably increases the urine flow.

TUIP is an outpatient procedure with a low risk of side effects. Because of that, the USPHS, Clinical Practice Guidelines recommend that the technique be used more often.

**Transurethral Needle Ablation (TUNA).** This recently approved technique, which can be done with a local anesthetic on an outpatient basis, uses radio frequency energy delivered through needles to kill excess prostate tissue. A catheter that deploys the needles toward the obstructing prostate tissue is inserted into the urethra before the procedure begins. Some clinical studies have reported that TUNA improves the urine flow with minimal side effects when compared with other procedures.

**Open Prostatectomy.** The word “open” refers to the fact that a surgeon makes an incision to reach the prostate, instead of inserting an instrument through the urethra. Open prostatectomy may involve either a radical or a partial procedure. A radical prostatectomy, which removes the whole prostate, is done for cancer. The incision is made through either the lower abdomen or the perineum. Partial prostatectomy, which leaves the posterior portion of the prostate intact, is used to treat BPH. The incision for a partial prostatectomy is usually through the abdomen. Open prostatectomy once was the sole recourse for an enlarged prostate. Today it is used only on extremely large prostates, which represent about 5 percent of all cases.
BPH Drug Therapy

Millions of American men have chosen drugs over surgery since drug therapy for BPH made its debut in the early 1990s. Although regarded as less effective than surgery, drugs are also less invasive and usually free of major side effects.

There are two major classes of drugs: alpha adrenergic blockers and finasteride.

Alpha adrenergic blockers were originally used for the treatment of high blood pressure, to relax smooth muscles in blood vessel walls. In BPH, they relax the muscular portion of the prostate and the bladder neck. This allows urine to flow more freely. In the average patient, these drugs increase the rate of urine flow and reduce symptoms, often within days. Side effects include dizziness, fatigue, and headache.

Finasteride shrinks the prostate by blocking an enzyme that converts the male hormone testosterone into a more potent, growth-stimulating form. Some, but not all, studies show that taking finasteride for at least six
months can increase urinary flow rate and reduce symptoms. It seems to work best for men who have greatly enlarged prostates. In a small percentage of men, the drug can affect sexual activity, decreasing a man’s interest in sex, diminishing his ability to have an erection, and causing problems with ejaculation. It sometimes also causes tenderness or swelling of the breasts. It may cause a drop in PSA levels. These side effects can be reversed by stopping the drug.

Some doctors think that combining the two types of drugs may produce better results.

Researchers are working to develop BPH treatments that are more effective and less traumatic, with fewer side effects. These include using laser surgery, powerful electric currents, and microwaves. Doctors have also tried to enlarge the urethra by inserting a balloon into it and inflating it with fluid, and by inserting a stent (a small metal coil) into the urethra to hold it open.

Testing Drug Therapies for BPH

Some 3,000 volunteers are participating in a National Institutes of Health clinical trial at 17 sites across the country. The trial will compare finasteride with an alpha adrenergic blocker and with an inactive look-alike (placebo). The goal of the trial is to see if drugs, in addition to relieving symptoms, will keep symptoms of BPH from progressing.
Choosing a Treatment for BPH

If a man has no serious complications such as the inability to urinate, kidney damage, frequent urinary tract infections, major bleeding through the urethra, or bladder stones, the best approach for treating BPH is not clear.

The USPHS Clinical Practice Guidelines advise doctors to leave treatment decisions to the patient, after a discussion of the benefits and side effects of each treatment option.

The options selected by an individual man are tied to his own preferences. For instance, some men want immediate relief and are willing to undergo surgery or embrace a drug regimen to get that relief. Some men also are eager to take drugs even if their only symptom is an elevated PSA level. Others are reluctant, often unwilling, to undergo surgery or to take pills daily for an extended period.

“Patients...who have the same levels of symptoms when offered treatment choices will choose quite differently. Their choices will reflect concern about sexuality and how much symptoms bother them. So this concept of the degree of ‘botheredness’ is a new dimension in decision-making.”

—USPHS Clinical Practice Guidelines
Self-Test for BPH

To help patients, and their physicians, assess the severity of BPH symptoms, the American Urological Association has developed a seven-question index.

Over the past month, how often have you:

- had a sensation of not emptying your bladder completely after urinating?
- had to urinate again less than two hours after urinating?
- found you stopped and started again several times during urination?
- found it difficult to postpone urination?
- had a weak urinary stream?
- had to push or strain to begin urination?
- had to get up several times to urinate, from the time you went to bed at night until the time you got up in the morning (how many times)?

Here is how to score.

For the first six questions, give yourself a score of 1 for having problems less than one time in five, a score of 2 for having problems less than half the time, a score of 3 for having problems about half the time, a score of 4 for having problems more than half the time, and a score of 5 for having problems almost all the time. For the seventh question, give yourself 1 for each time you got up in the night. (If you had to get up five times or more, use 5 for scoring.)

Symptoms are classified as mild if your score totals 1 to 7, moderate from 8 to 19, and severe from 20 to 35.
III. Evaluating Prostate Health

Digital Rectal Examination (DRE). The standard technique for evaluating the health of the prostate is by physical examination called a digital rectal exam (DRE). Typically, a patient is asked to bend forward over a table while the doctor inserts a gloved and lubricated finger (called a digit in the medical community) into the patient’s rectum. This allows the physician to feel the back portion of the prostate gland. In addition to gauging the gland’s size, the doctor is able to evaluate its firmness and texture. The doctor looks for answers to some key questions: Has its usual rubbery feel changed? Are there any hard areas or lumps, which could signal a cancer? Has a growth spread beyond the prostate?

Prostate-Specific Antigen (PSA). This is a substance produced by cells of the prostate gland. PSA circulates in the blood and can be detected and measured with a relatively simple blood test. When the gland enlarges, PSA levels rise. PSA levels can also rise if cancer develops.

Generally, doctors consider readings below 4 nanograms per milliliter (ng/ml) to be normal, scores between 4 and 10 to be slightly elevated, scores between 10 and 20 to be moderately elevated, and anything above that to be highly elevated. Most men with BPH have levels of 10 ng/ml or below.

“Compared with most cancers, prostate cancer tends to grow slowly. It may be decades from the time the earliest cell changes can be detected under a microscope until the cancer gets big enough to cause symptoms.”
However, many factors can influence PSA levels. Some prostate glands naturally produce more PSA than others. PSA scores also tend to increase with age. Another influence on PSA levels is race: PSA levels tend to be higher in African-Americans, and lower among Japanese, than in white Americans.

A variety of conditions can raise PSA levels temporarily. These include prostatitis, prostate biopsy, and transurethral prostate surgery.

**Transrectal Ultrasound (TRUS).** This procedure uses a small probe that is inserted into the rectum. The probe emits and picks up high-frequency sound waves. The sound waves bounce off the prostate, producing a pattern that is converted into a video image. Areas of cancer produce a different pattern than healthy tissue. The value of a TRUS is strongly influenced by the quality of the equipment and the skill of the person operating it.

While ultrasound does not provide enough specific information to make it a good screening tool by itself, doctors find it useful as a followup to a suspicious DRE or PSA. TRUS is also used to guide biopsies in sampling abnormal areas of the prostate, to estimate the volume of the prostate for calculating **PSA density**, and to situate radiotherapy implants.
IV. Prostate Cancer

Like other cancers, prostate cancer is a disease of cells growing out of control. Spurred by changes in the genes, the glandular cells of the prostate multiply abnormally. These cancer cells may cross tissue barriers and may then spread throughout the body.

Compared with most cancers, prostate cancer tends to grow slowly. It may be decades from the time the earliest cell changes can be detected under a microscope until the cancer gets big enough to cause symptoms.

By age 50, one-third of American men have microscopic signs of prostate cancer, and by age 75, half to three-quarters of men’s prostates will have cancerous changes. Most of these cancers either remain latent, producing no signs or symptoms, or they are so slow-growing, or indolent, that they never become a serious threat to health.

A much smaller number of men will actually be treated for prostate cancer. About 16 percent of American men will be diagnosed with prostate cancer.
during their lifetime; 8 percent will develop significant symptoms; and 3 percent will die of the disease.

The late 1980s saw a sharp hike in the number of cases being diagnosed. By 1997, the number of new cases of prostate cancer reached an estimated 209,000, more than double the 90,000 cases identified just 10 years earlier. However, recent statistics show that the incidence rate (the number of cases diagnosed per 100,000 men per year) has begun to decline.

Much of the dramatic surge in the detection of prostate cancer cases can be traced to the growing use of procedures and tests that, intentionally or not, reveal small, symptom-free cancers, many of which otherwise would have gone unnoticed.

Before the 1980s, prostate cancer usually was diagnosed either when it caused symptoms or during a digital rectal exam (DRE).

It was in the mid-1980s, when doctors began using the transurethral resection of the prostate (TURP) procedure to treat benign prostate enlargement, that small, even microscopic cancers began turning up in prostate tissue samples removed at surgery.

The number of prostate cancer diagnoses rose even faster in the late 1980s when doctors began to add the blood test for prostate-specific antigen (PSA) to regular checkups. A National Cancer Institute (NCI) study showed that doctors increased their use of the PSA test for men ages 65 or older—the age group most susceptible to prostate cancer—from 1,430 per 100,000 men in 1988 to 18,000 per 100,000 men in 1991.

Until recently, death rates, too, were edging steadily upward. In 1932, prostate cancer killed 17 of every 100,000 American men. By 1991, this number reached 25 of every 100,000. The figures for African-American men are even higher—55 of every 100,000. However, in the past several years, death rates, like incidence rates, appear to have been declining.
No one knows why prostate death rates went up. It is possible that, as more older men were diagnosed with prostate cancer, the disease was sometimes listed as the cause of death even when a man died of something else.

The reasons for the more recent death-rate decrease are also unclear, but the decrease may reflect improved treatment.

Risk Factors for Prostate Cancer

A risk factor is something that increases a person's chances of getting cancer. Risk factors don't necessarily cause cancer. Rather, they are indicators, statistically associated with an increase in a person's chances for getting a particular disease.

One risk factor for prostate cancer is age. Simply growing older increases a man's risk for getting prostate cancer. More than 75 percent of prostate cancer cases are diagnosed in men ages 65 or older; just 7 percent of cases occur in men younger than age 60. The average age at diagnosis is 72.

Another risk factor is race. African-American men have the world's highest incidence of prostate cancer—a third higher than white Americans. By contrast, Asian immigrants to the United States have much lower rates.

Family history also may play a role. For instance, risk increases for men whose father or brothers have prostate cancer. The risk is more than 10 times higher for a man who has three relatives with the disease. Risk may also be increased to some extent for men whose female relatives have a high incidence of breast cancer.

Researchers increasingly are looking at hormonal and hereditary factors and at diet, environmental exposures, and other lifestyle changes in relation to prostate cancer. For example, in countries such as China and Japan where low-fat diets are the norm, few men are diagnosed with prostate cancer. However, the incidence of prostate cancer is considerably higher among men who move from these
countries to the United States, and the higher incidence persists in their sons’ generation.

Researchers also are looking at the role of vasectomy in prostate cancer. Vasectomy is a surgical procedure that prevents men from fathering children. Some studies have suggested that vasectomies increase the risk of prostate cancer, although other studies failed to find such a link.

**Symptoms of Prostate Cancer**

Prostate cancer can grow quietly for years, which means most men with the disease have no obvious symptoms. When symptoms finally appear, they often are similar to those caused by prostate enlargement: difficulty urinating; a weak stream; a frequent urge to urinate, especially during the night; painful or burning urination; blood in the urine.

When cancer grows through the prostate capsule, it invades nearby tissues. It also may spread to the lymph nodes of the pelvis, or it may spread throughout the body (metastasize) via the bloodstream or the lymphatic system. Because prostate cancer tends to metastasize to the bone, bone pain, particularly in the back, can be another symptom of prostate cancer.

**Early Detection of Prostate Cancer**

Some doctors recommend screening for prostate cancer. Screening, as distinct from diagnosis, looks for signs of disease in people who have no cancer symptoms.

Screening for prostate cancer is controversial, because it is not yet known if the process actually saves lives, and it is not always clear that benefits outweigh the risks of diagnostic tests and treatments.

The main screening tools for prostate cancer are the DRE and the PSA test (see Evaluating Prostate Health).

The higher a man’s PSA level, the more likely that cancer could be in the picture. During screenings in men ages 50 or older, 85 of every 100 men will have normal PSA levels (4 ng/ml
or below). Among the remaining 15 men, only 3 will have biopsies that show cancer.

Neither PSA nor DRE accurately identifies all cancers. The PSA test does a better job than DRE, but it still misses about one-third of cancers that are \textit{clinically localized} (appear not to have grown through the prostate capsule).

It should be noted, though, that in spite of possible inaccuracy, most \textit{tumors} that are found through screening are indeed early cancers.

Still, it is troublesome that PSA and DRE can falsely suggest cancer where none exists. Most men with an elevated PSA (or an abnormal DRE) go on to have additional diagnostic tests. Yet the majority of these men do not have cancer and will suffer needless anxiety.

Some recent refinements designed to make PSA testing more accurate and more precise are under \textit{clinical study}. For instance, PSA density relates a man's PSA level to the size of his prostate, which can be estimated through ultrasound. \textbf{PSA velocity} is based on changes in PSA levels over time; a sharp rise from a baseline level raises the suspicion of cancer.

PSA circulates in the blood in two forms: free or attached to a \textit{protein molecule}. In the case of a benign enlargement, there is more free PSA, while cancer produces more of the attached form, although the reasons for this difference are not well understood.
As for DRE, this test is most accurate when performed by a doctor who is highly skilled in such a procedure. But the procedure does have problems, often missing many small cancers, especially cancers toward the front of the prostate gland or deep within it. The exam also is notoriously unpopular among men and even among some doctors. Many men say they find the test embarrassing and uncomfortable. Studies also suggest that some physicians are reluctant to do rectal exams.

Even with early detection, there is as yet no proof that finding and treating asymptomatic prostate cancers do more good than harm. The reason: Many prostate cancers found through screening are slow-growing and might never cause symptoms. So far, it has not been possible to distinguish these slow-growing tumors from tumors that are aggressive and deadly. What is known is that treatment can have serious side effects, some of which are permanent.

Some insight into the detection dilemma could be forthcoming from the NCI’s Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial. Some 37,000 men ages 55 to 74 are being screened, and those positive on either PSA or DRE will receive a diagnostic followup.

The study will determine if these men are less likely to die of prostate cancer than a comparison group of men who have not been screened. The trial will also assess how well PSA levels correspond to the presence and size of a tumor.

When completed, this study, along with similar PSA/DRE studies that are going on in Europe, should make it clear whether the possible benefit of screening outweighs the harm.

In the meantime, each man needs to consult with his doctor and come to his own decision.
Do You Want To Be Screened?
The theoretical advantage of finding cancers early, before they cause symptoms, is that early cancers are less likely to have spread and may be easier to treat. Like other advanced cancers, advanced-stage prostate cancer can be a terrible disease.

But the disadvantage of screening is that it often leads to unnecessary additional diagnostic procedures.

Two basic questions still have no definitive answers: How frequently do the screening procedures such as PSA and DRE identify cancer? How frequently will finding prostate cancer produce a net benefit?

Studies designed to answer these questions are under way, but results won’t be available for years. Earlier studies suffer from a variety of shortcomings, and none has proven that screening for prostate cancer decreases the risk of dying from the disease.

Lacking clear-cut answers, different organizations propose different guidelines. For example:

• The American Cancer Society (ACS) recommends that both the PSA blood test and DRE should be offered annually to men ages 50 or older with at least a 10-year life expectancy. ACS adds that all men who are offered the option of screening should be given complete information on the benefits and risks of the procedures. African-American men or men with a strong family history of prostate cancer may
be offered screening earlier, at age 45, for example. A strong family history means that prostate cancer has been detected in two or more first-degree relatives such as a father or brother.

- The American Urological Association endorses the American Cancer Society’s screening policy: Men who choose to undergo screening should begin at age 50. However, men in high risk groups may begin at age 45.
- The United States Preventive Services Task Force, its Canadian counterpart, and the American College of Physicians take a different position from that of the American Urological Association and the American Cancer Society: They recommend against the use of the PSA test for routine screening.

As you can see, opinions vary widely. Few doctors would recommend screening to a man older than age 80 or to a man in poor health. But for most men there is no “right” answer. It is important for you to make your own decision, taking into consideration the advice of your doctor and the best, most up-to-date information you can gather.

Do you want to be screened for prostate cancer?

In coming to your decision, it’s important to consider how you would respond to a diagnosis of cancer. Prostate cancer is usually a slow-growing type of disease, but there are some fast-growing prostate cancers as well. Doctors can’t always be sure what type of prostate cancer growth is present in your particular case. If you find out that you have prostate cancer, would you be able and willing to undergo surgery or radiotherapy, which carry the risk of incontinence and sexual impotence?

If you answer “yes,” screening is an option. If “no,” screening for prostate cancer may not be for you.
Diagnosing and Evaluating Prostate Cancer

BIOPSY
Like other cancers, prostate cancer can actually be diagnosed only by examining tissue under a microscope. Whenever cancer is suspected, the diagnosis must be confirmed by a biopsy.

If your symptoms, the DRE, or your PSA test suggest cancer, your doctor will refer you to a urologist for a biopsy. The biopsy is typically performed in the urologist’s office. The urologist gets an image of the prostate through a transrectal ultrasound probe. Then, to obtain tissue samples, the doctor inserts thin biopsy needles into areas of the gland that feel or look suspicious. Bits of tissue are removed from each site through the hollow needles. Each snip causes a sharp sting.

The tissue samples are then turned over to a pathologist, a doctor who specializes in the study of the microscopic cell and tissue changes produced by disease.

When a biopsy is prompted by an elevated PSA, rather than an abnormal area in the prostate gland detected by a rectal exam, the urologist may take random samples from six or more prostate areas. In a so-called pattern biopsy, the tissue samples are obtained from carefully spaced sectors of the gland; this helps establish the size and extent of any cancer.

Most men who have biopsies following routine exams do not have cancer. About three-quarters of the biopsies triggered by an abnormal DRE, and more than four-fifths of those instigated by an elevated PSA, reveal no cancer.

You may want to talk with your physician about the biopsy results. If there is any doubt about the diagnosis, you can get a second opinion from another pathologist.

Biopsies can miss cancer, too, about one time out of five. If your doctor strongly suspects cancer on clinical grounds, but the biopsy was negative, he or she may recommend a second biopsy.
IF A BIOPSY IS POSITIVE
A diagnosis of prostate cancer obviously presents a man with complex decisions. He needs to understand the ramifications of the various options available to him. There are several levels, or stages, of prostate cancer, all of which call for different approaches to treatment. Moreover, for some stages of prostate cancer, there are several types of treatment, and it is not always clear which one is best. In fact, because treatment can produce some serious and life-long side effects—and because prostate cancer may grow very slowly—treatment may not always be better than no treatment. For a much more complete discussion of these issues, see What You Need To Know About Prostate Cancer, a booklet available from NCI.

Preventing Prostate Cancer
Researchers are investigating the possibility that drugs might keep latent prostate cancers from developing into active cancers. In the NCI’s Prostate Cancer Prevention Trial (PCPT), 18,000 healthy men age 55 or older are taking either finasteride (currently used to shrink the prostate in BPH) or a placebo every day for 7 to 10 years. Smaller trials are testing a variety of other medications or chemicals for their ability to prevent prostate cancer.

Since prostate cancer is less common in populations with low-fat, high-fiber diets, scientists are also looking into the possibility of using diet to prevent prostate cancer from developing. There is still no evidence to show that switching to a healthy diet after years of eating high-fat foods will make a difference, but small studies are testing the effects of a low-fat, high-soy diet among men who have an increased risk of prostate cancer and men who have already been treated for prostate cancer. One study found less prostate cancer among men who eat lots of tomato-based foods, especially tomato sauce cooked with a little olive oil.
Questions
To Ask Your Doctor
We hope that this booklet has answered many of your questions about prostate changes. However, no booklet can take the place of talking directly with your doctor. If you don’t fully understand what the doctor is saying, ask him or her to explain further.

Many men find it helpful to write down their questions ahead of time. Below is a list of some common questions that men have. You may have others. Jot them down as you think of them and take the list with you when you see your doctor.

• What is causing my prostate symptoms? Are they a sign of cancer?

• What tests do you recommend? Why?

• If I don’t have cancer, what can I do about my symptoms? What if they get worse?

• If I do have prostate cancer, where can I get information about my treatment options?
References


Glossary

Abdomen: The part of the body that contains the stomach, intestines, and other organs. The prostate is located in the lower part of the abdomen, also known as the pelvis.

Aggressive: Rapidly growing and likely to spread (said of a tumor).

Alpha adrenergic blockers: Drugs used to treat benign prostatic hyperplasia (BPH). Alpha blockers work by relaxing the muscular portion of the prostate and the bladder neck.

Anesthetic: Drug or gas that produces a loss of feeling or awareness. A local anesthetic causes loss of feeling in a part of the body, but the patient remains awake. A general anesthetic puts a person to sleep.

Anus: The opening at the lower end of the rectum through which solid wastes leave the body.

Asymptomatic: Producing no symptoms.

Benign: Not cancerous.

Benign prostatic hyperplasia (BPH): Enlargement of the prostate. BPH is not cancer, but it can cause some of the same symptoms.

Biopsy: The removal of a sample of tissue, which is then examined under a microscope to check for cancerous changes.

Bladder: The organ where urine is stored.

Bladder neck: Area where the bladder opens into the urethra. Acting on signals from the brain, the bladder-neck muscles either can tighten to hold urine in the bladder or can relax to allow urine out.

Cancer: A term for diseases in which abnormal cells divide without control. Cancer cells have the potential to invade nearby tissues and to spread through the bloodstream and lymphatic system to other parts of the body.

Capsule: The outer covering of the prostate gland.
Catheter: A tube inserted into the body. One type of catheter can be inserted into the bladder through the penis to allow urine to drain out.

Catheterization: The insertion of a catheter.

Clinical study: A research study that involves people. Each study is designed to answer medical questions and to find better ways to prevent or treat disease.

Clinically localized: Prostate cancer that is judged, on the basis of physical examination and other clinical evidence, to be contained within the prostate capsule. In contrast, pathologically localized prostate cancer is diagnosed by microscopically examining a prostate gland removed at surgery.

Cystoscopy: A procedure in which the doctor inserts a lighted instrument through the urethra to look inside the bladder.

Diagnosis: The identification of a disease by its signs, symptoms, and laboratory findings.

Digital rectal examination (DRE): A procedure in which the doctor inserts a finger into the rectum to examine the rectum and prostate.

DNA: The chemical compound in a cell that carry genetic information.

Ejaculation: The release of semen through the penis during sexual climax. In dry ejaculation, semen spurts backward into the bladder rather than out through the penis.

Enzyme: A natural substance that affects the rate at which chemical changes take place in the body.

Erection: Swelling and hardening of the penis in response to sexual excitement.

Finasteride: A generic drug that shrinks the prostate by blocking an enzyme that converts testosterone into a more potent form.

Gene: A unit of inheritance; a working subunit of DNA. Each gene typically codes for a protein.
Gland: An organ that produces and releases one or more substances for use by various parts of the body.

Hereditary: Inherited; having to do with information that is passed from parents to children through DNA in the genes.

Hormones: Body chemicals that are secreted by glands, circulate in the bloodstream, and produce specific effects on target organs and tissues.

Hormone-responsive (tumors): Cancer cells with molecules on their surface called receptors. These cells change their growth speed when the receptors interact with hormones.

Hyperplasia: Excessive growth of tissue.

Impotence: See Sexual impotence.

Incontinence: Loss of urinary control.

Indolent: Slow-growing.

Intervention: Any treatment or activity designed to bring about a change.

Invasive: Said of techniques that “invade” the body’s barriers by cutting or puncturing the skin or by inserting instruments into the body.

Kidneys: The pair of organs where urine is formed.

Latent: Producing no symptoms.

Lymph: An almost colorless fluid that travels through the lymphatic system and carries cells and substances that help fight infection and disease.

Lymph nodes: Small, bean-shaped organs that are part of the body’s immune system. Lymph nodes are located throughout the body along the channels of the lymphatic system. Lymph nodes also are called lymph glands.

Lymphatic system: The tissues and organs (including bone marrow, spleen, and lymph nodes) that produce and store cells and substances that fight infection and disease. These organs are connected by a bodywide system of channels, similar to blood vessels, which carry lymph.
Metastasize: To spread throughout the body (said of cancer cells).

Microscopic: Something so small that it can be seen only when magnified by a microscope.

Molecule: The smallest possible unit of any particular substance.

Observation: See Watchful waiting.

Open prostatectomy: Surgery to remove all or part of the prostate by making an incision in the patient’s lower abdomen or perineum. Open prostatectomy can be either a partial or radical procedure. See Radical prostatectomy and Partial prostatectomy.

Orgasm: Sexual climax.

Partial prostatectomy: Open surgery to remove part of the prostate gland, leaving the posterior portion intact. Partial prostatectomy is usually performed through an incision in the lower abdomen (retropubic prostatectomy).

Pathologist: A doctor who identifies diseases by studying cells and tissues under a microscope.

Pattern biopsy: A biopsy taking samples of tissue from half a dozen or more carefully spaced sections of the prostate gland.

Pelvis: The lower part of the abdomen, located between the hip bones.

Penis: The external male organ of urination and reproduction.

Perineum: The space between the scrotum and the anus.


Prostate cancer: A disease of cells growing out of control. Spurred by changes in the genes, the glandular cells of the prostate multiply abnormally.
Prostate Cancer Prevention Trial (PCPT): A study in which healthy men are taking either the drug finasteride or a placebo every day for 7 to 10 years to see if the drug helps to prevent latent cancers from developing into active cancers.

Prostate enlargement: See Benign prostatic hyperplasia (BPH).

Prostate gland: A male sex gland. The prostate produces fluid that forms part of semen.

Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial: A large-scale NCI-sponsored study to determine if certain tests will reduce the number of deaths from prostate, lung, colorectal, and ovarian cancers.

Prostate-specific antigen (PSA): A protein produced by cells of the prostate gland. PSA circulates in the blood and can be measured with a simple blood test. PSA levels go up in the blood of some men who have prostate enlargement, inflammation, infection, or cancer.

Prostatitis: Inflammation of the prostate gland, sometimes due to infection.

Protein molecule: Natural substance essential to the body’s structure and proper functioning.

PSA density: A measure relating a man’s PSA level to the size of his prostate.

PSA test: A test that measures the PSA level in a sample of blood. PSA levels can be useful in detecting prostate cancer, in staging prostate cancer, and in monitoring response to treatment.

PSA velocity: A measure indicating how rapidly a man’s PSA level rises. This measure is calculated after the collection of many PSA readings over a period of time.

Radical prostatectomy: Open surgery to remove the entire prostate gland along with nearby tissues such as the seminal vesicles. Radical prostatectomy can be performed through an incision either in the lower abdomen (retropubic prostatectomy) or in the space between the scrotum and the anus (perineal prostatectomy).
Rectum: The lower part of the large intestine. The rectum stores solid waste until it leaves the body through the anus.

Risk factor: Something that increases a person’s chance of developing a disease.

Screening: Checking for signs of disease in a person who has no symptoms.

Scrotum: The pouch of skin that contains the testicles.

Semen: The thick, whitish fluid released through the penis during orgasm. Semen is made up of substances produced by the prostate, the seminal vesicles, and other male sex glands, and it contains sperm that come from the testicles.

Seminal vesicles: A pair of pouch-like glands, adjacent to the prostate, that contribute substances to semen.

Sexual impotence: Inability to achieve an erection sufficient for sexual intercourse.

Side effects: Unintentional results, often troublesome. The potential side effects of treatment for prostate cancer include incontinence and impotence.

Signs: Effects of disease that can be observed and/or measured. For example, very high PSA values may be a sign of prostate cancer. See Symptoms.

Sperm: Male reproductive cells, produced in the testicles.

Spinal block: An anesthetic injection that numbs the lower half of the body.

Stages: Different levels of disease, which indicate the extent of a cancer’s growth.

Staging: Doing tests to establish the extent of a cancer, especially whether it has spread beyond its original site to other parts of the body.

Stent: A small, surgically inserted tube or metal coil, used to hold a passageway open.

Surveillance: See Watchful waiting.
Symptoms: Effects of disease as experienced by the patient. Pain, for example, is a symptom. See Signs.

Testicles: The pair of egg-shaped glands, contained in the pouch-like scrotum, that produce sperm and male hormones. The testicles are also called the testes.

Testosterone: A male sex hormone, produced primarily by the testicles. Testosterone plays an important role in a man’s sexuality. It also fuels the growth of prostate cancer.

Transrectal ultrasound (TRUS): The use of sound waves to image the prostate. The sound waves are emitted by an instrument inserted into the rectum. As the waves bounce off the prostate, they create a pattern that is converted by a computer into a picture.

Transurethral incision of the prostate (TUIP): Surgery for an enlarged prostate. Performed with instruments inserted through the urethra, TUIP relieves pressure on the urethra by making cuts into the enlarged prostate gland.

Transurethral needle ablation (TUNA): Surgery for an enlarged prostate. Performed with instruments inserted through the prostate, TUNA transmits bursts of radio-frequency (low-energy) radiation through fine needles.

Transurethral resection of the prostate (TURP): Surgery for an enlarged prostate. Performed with instruments inserted through the penis, TURP cuts away excess prostate tissue.

Tumors: Abnormal growths of tissue. Tumors can be either malignant (cancerous) or benign (noncancerous).

Ultrasound: An imaging technique that uses sound waves to produce pictures (sonograms) of body tissues. See Transrectal ultrasound (TRUS).

Ureters: The pair of tubes that carry urine from the kidneys to the bladder.
**Urethra**: In males, a tube extending from the bladder to the tip of the penis. It carries urine from the bladder and, during ejaculation, semen from the prostate gland, out through the penis.

**Urinalysis**: Examination of the urine for infectious agents, cells, or other substances that are signs of disease.

**Urination**: The act of discharging water and waste products from the bladder.

**Urine**: The fluid containing water and waste products that is secreted by the kidneys, stored in the bladder, and discharged through the urethra.

**Urogram**: An x-ray that makes use of an injected dye to show urine inside the bladder.

**Urologist**: A doctor who specializes in disorders of the urinary system and the male reproductive system.

**Vas deferens**: A pair of tubes that carry sperm from the testicles to the prostate gland.

**Vasectomy**: Surgery to prevent a man from fathering children (sterilization), achieved by cutting the vas deferens.

**Watchful waiting**: Following the patient closely and postponing aggressive therapy unless symptoms or other signs of disease progress. Watchful waiting is a treatment option for both an enlarged prostate and early-stage prostate cancer.

**X-rays**: High-energy forms of radiation. X-rays form an image of body structures by passing through the body and striking a sheet of film.
Additional Resources

by Telephone...
The Cancer Information Service (CIS), a national information and education network, is a free public service of the National Cancer Institute, the Nation’s primary agency for cancer research. The CIS answers cancer-related questions in English and Spanish and distributes NCI materials to patients, the public, and health professionals.

Toll-free phone number:
1-800-4-CANCER
(1-800-422-6237)
TTY: 1-800-332-8615

by Internet...
National Cancer Institute (NCI) Web site
For news, educational tutorials, CancerNet™, or PDQ, visit NCI’s Web site at http://www.nci.nih.gov

by E-mail...
CancerMail
Get PDQ and other NCI information by computer. To obtain a contents list, send e-mail to cancermail@icicc.nci.nih.gov with the word “help” in the body of the message.

by Fax...
CancerFax®
For NCI information by fax, dial 301-402-5874 from the telephone on a fax machine and listen to the recorded instructions.