



Prostate Cancer

What is cancer?

The body is made up of trillions of living cells. Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called *metastasis*. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

No matter where a cancer may spread, it is always named for the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is metastatic prostate cancer, not bone cancer.

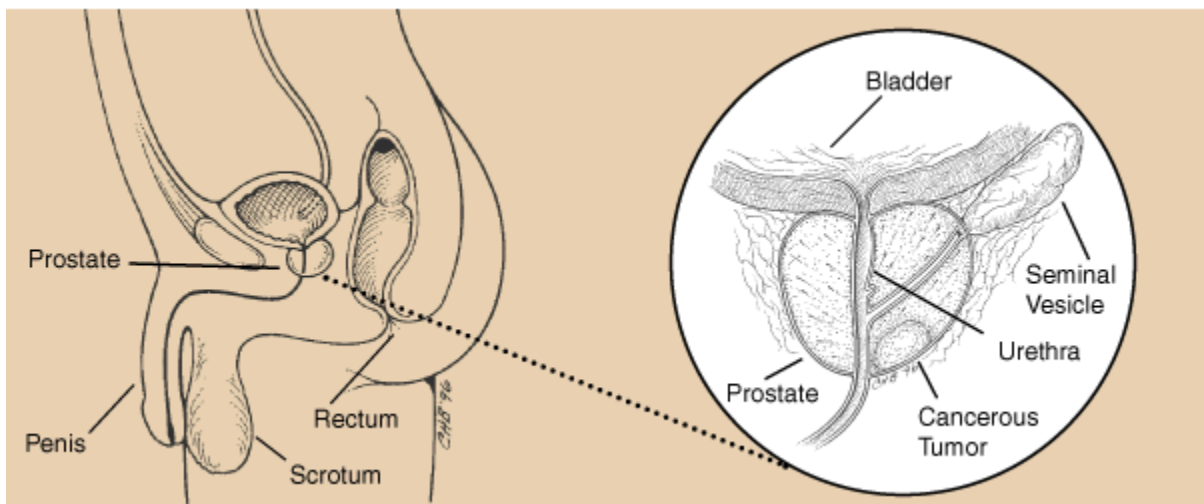
Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

Not all tumors are cancerous. Tumors that aren't cancer are called *benign*. Benign tumors can cause problems – they can grow very large and press on healthy organs and tissues. But they cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is prostate cancer?

About the prostate

The prostate is a gland located in front of the rectum and underneath the urinary bladder. It is found only in men. The size of the prostate varies with age. In younger men, it is the size of a walnut, but it can be much larger in older men. The prostate's job is to make some of the fluid that protects and nourishes sperm cells in semen, making semen more liquid. Just behind the prostate gland are the *seminal vesicles* that make most of the fluid for semen. The *urethra*, which is the tube that carries urine and semen out of the body through the penis, goes through the center of the prostate.



The prostate starts to develop before birth and continues to grow until a man reaches adulthood. This growth is fueled by male hormones (called androgens) in the body. The main androgen, *testosterone*, is made in the testicles. The enzyme *5 alpha-reductase* converts testosterone into *dihydrotestosterone* (DHT). DHT signals the prostate to grow.

The prostate stays at adult size in adults as long as male hormones are present. In older men, the inner part of the prostate (around the urethra) often keeps growing, leading to a common condition called *benign prostatic hyperplasia* (BPH). In BPH, the prostate tissue can press on the urethra, leading to problems passing urine. BPH can be a serious medical problem, but it is not cancer.

Prostate cancer

Several types of cells are found in the prostate, but almost all of prostate cancers develop from the gland cells. Gland cells make the prostate fluid that is added to the semen. The medical term for a cancer that starts in gland cells is *adenocarcinoma*.

Other types of cancer can also start in the prostate gland, including sarcomas, small cell carcinomas, and transitional cell carcinomas. These other types of prostate cancer are so rare that if you have prostate cancer it is almost certain to be an adenocarcinoma. **The rest of this document refers only to prostate adenocarcinoma.**

Some prostate cancers can grow and spread quickly, but most of them grow slowly. In fact, autopsy studies show that many older men (and even some younger men) who died of other diseases also had prostate cancer that never affected them during their lives. In these studies, 70% to 90% of the men had cancer in their prostate by age 80, but in many cases neither they nor their doctors even knew they had it.

Pre-cancerous conditions of the prostate

Some doctors believe that prostate cancer begins with a pre-cancerous condition called *prostatic intraepithelial neoplasia* (PIN). PIN begins to appear in the prostates of some men as early as their 20s. Almost half of all men have PIN by the time they reach 50. In this condition, there are changes in how the prostate gland cells look under the microscope, but the abnormal cells don't look like they are growing into other parts of the prostate (like cancer cells would). The cell changes are classified as either low-grade, meaning the patterns of prostate cells appear almost normal, or high-grade, meaning they look more abnormal.

If you have had high-grade PIN found on a prostate biopsy, there is about a 20% to 30% chance that you also have cancer in another area of your prostate. This is why doctors often watch men with high-grade PIN carefully and may advise a repeat prostate biopsy, especially if the original biopsy did not take samples from all parts of the prostate.

Another finding that may be reported on a prostate biopsy is *atypical small acinar proliferation* (ASAP), which is sometimes just called *atypia*. In ASAP, the cells look like they might be cancerous when viewed under the microscope, but there are too few of them on the slide to be sure. If ASAP is found, there's a high chance that cancer is also present in the prostate. This is why many doctors advise getting a repeat biopsy within a few months.

Another finding that may be reported on a prostate biopsy is *proliferative inflammatory atrophy* (PIA). In PIA, the cells look abnormal when viewed under the microscope. PIA

is not cancer, but researchers believe that some PIA cells can turn into prostate cancer directly or by first changing into high-grade PIN.

What are the key statistics about prostate cancer?

Other than skin cancer, prostate cancer is the most common cancer in American men. The latest American Cancer Society estimates for prostate cancer in the United States are for 2011:

- About 240,890 new cases of prostate cancer will be diagnosed
- About 33,720 men will die of prostate cancer

About 1 man in 6 will be diagnosed with prostate cancer during his lifetime. More than 2 million men in the United States who have been diagnosed with prostate cancer at some point are still alive today.

Prostate cancer is the second leading cause of cancer death in American men, behind only lung cancer. About 1 man in 36 will die of prostate cancer.

What are the risk factors for prostate cancer?

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for many cancers.

But risk factors don't tell us everything. Many people with one or more risk factors never get cancer, while others who get cancer may have had no known risk factors.

We don't yet completely understand the causes of prostate cancer, but researchers have found several factors that may change the risk of getting it. For some of these factors, the link to prostate cancer risk is not yet clear.

Age

Age is the strongest risk factor for prostate cancer. Prostate cancer is very rare before the age of 40, but the chance of having prostate cancer rises rapidly after age 50. Almost 2 out of 3 prostate cancers are found in men over the age of 65.

Race/ethnicity

Prostate cancer occurs more often in African-American men than in men of other races. African-American men are also more likely to be diagnosed at an advanced stage, and are more than twice as likely to die of prostate cancer as white men. Prostate cancer occurs

less often in Asian-American and Hispanic/Latino men than in non-Hispanic whites. The reasons for these racial and ethnic differences are not clear.

Nationality

Prostate cancer is most common in North America, northwestern Europe, Australia, and on Caribbean islands. It is less common in Asia, Africa, Central America, and South America. The reasons for this are not clear. More intensive screening in some developed countries likely accounts for at least part of this difference, but other factors are likely to be important as well. For example, lifestyle differences (diet, etc.) may be important: men of Asian descent living in the United States have a lower risk of prostate cancer than white Americans, but their risk is higher than that of men of similar backgrounds living in Asia.

Family history

Prostate cancer seems to run in some families, which suggests that in some cases there may be an inherited or genetic factor. Having a father or brother with prostate cancer more than doubles a man's risk of developing this disease. (The risk is higher for men with an affected brother than for those with an affected father.) The risk is much higher for men with several affected relatives, particularly if their relatives were young at the time the cancer was found.

Genes

Scientists have found several inherited genes that seem to raise prostate cancer risk, but they probably account for only a small number of cases overall. Genetic testing for most of these genes is not yet available. Recently, some common gene variations have been linked to the risk of prostate cancer. Studies to confirm these results are needed to see if testing for the gene variants will be useful in predicting prostate cancer risk.

Some inherited genes raise the risk for more than one type of cancer. For example, inherited mutations of the BRCA1 or BRCA2 genes are the reason that breast and ovarian cancers are much more common in some families. Mutations in these genes may also increase prostate cancer risk in some men, but they account for a very small percentage of prostate cancer cases.

Diet

The exact role of diet in prostate cancer is not clear, but several different factors have been studied.

Men who eat a lot of red meat or high-fat dairy products appear to have a slightly higher chance of getting prostate cancer. These men also tend to eat fewer fruits and vegetables. Doctors are not sure which of these factors is responsible for raising the risk.

Some studies have suggested that men who consume a lot of calcium (through food or supplements) may have a higher risk of developing advanced prostate cancer. Most studies have not found such a link with the levels of calcium found in the average diet, and it's important to note that calcium is known to have other important health benefits.

Obesity

Most studies have not found that being obese (having a high amount of extra body fat) is linked with a higher risk of getting prostate cancer. Some studies have found that obese men have a lower risk of getting a low-grade (less dangerous) form of the disease, but a higher risk of getting more aggressive prostate cancer. The reasons for this are not clear. Studies have also found that obese men may be at greater risk for having more advanced prostate cancer and of dying from prostate cancer, but this was not seen in other studies.

Exercise

Exercise has not been shown to reduce prostate cancer risk in most studies. But some studies have found that high levels of physical activity, particularly in older men, may lower the risk of advanced prostate cancer. More research in this area is needed.

Smoking

A recent study linked smoking to a small increase in the risk of death from prostate cancer. This is a new finding, and will need to be confirmed by other studies.

Inflammation of the prostate

Some studies have suggested that *prostatitis* (inflammation of the prostate gland) may be linked to an increased risk of prostate cancer, but other studies have not found such a link. Inflammation is often seen in samples of prostate tissue that also contain cancer. The link between the two is not yet clear, but this is an active area of research.

Infection

Researchers have also looked to see if sexually transmitted infections (like gonorrhea or chlamydia) might increase the risk of prostate cancer, possibly by leading to inflammation of the prostate. So far, studies have not agreed, and no firm conclusions have been reached.

Vasectomy

Some earlier studies had suggested that men who had a vasectomy (minor surgery to make men infertile) -- especially those younger than 35 at the time of the procedure -- may have a slightly increased risk for prostate cancer. But most recent studies have not found any increased risk among men who have had this operation. Fear of an increased risk of prostate cancer should not be a reason to avoid a vasectomy.

Do we know what causes prostate cancer?

We do not know exactly what causes prostate cancer. But researchers have found some risk factors and are trying to learn just how these factors cause prostate cells to become cancerous (see section, "What are the risk factors for prostate cancer?").

On a basic level, prostate cancer is caused by changes in the DNA of a prostate cancer cell. During the past few years, scientists have made great progress in understanding how certain changes in DNA can cause normal prostate cells to grow abnormally and form cancers. DNA is the chemical that carries the instructions for nearly everything our cells do. The reason that you might look like your parents is because they are the source of your DNA.

DNA affects more than the way you look. Some genes (parts of your DNA) contain instructions for controlling when cells grow and divide. Certain genes that promote cell growth and division are called *oncogenes*. Others that normally slow down cell division or cause cells to die at the right time are called *tumor suppressor genes*. Cancer can be caused by DNA changes (mutations) that turn on oncogenes or turn off tumor suppressor genes.

DNA changes can either be inherited from a parent or can be acquired during a person's lifetime.

Inherited DNA mutations

Researchers have found inherited DNA changes in certain genes may cause about 5% to 10% of prostate cancers.

Several mutated genes have been found that may be responsible for a man's inherited tendency to develop prostate cancer. One of these is called HPC1 (**H**ereditary **P**rostate **C**ancer **G**ene **1**). But there are many other gene mutations that may account for some cases of hereditary prostate cancer. None of these is a major cause, and more research on these genes is being done. Genetic tests are not yet available.

As mentioned above, men with BRCA1 or BRCA2 gene changes may have an increased prostate cancer risk. Mutations in these genes more commonly cause breast and ovarian cancer in women. But BRCA changes probably explain only a very small number of prostate cancers.

DNA mutations acquired during a man's lifetime

Most DNA mutations related to prostate cancer seem to develop during a man's life rather than having been inherited. Every time a cell prepares to divide into 2 new cells, it must copy its DNA. This process is not perfect, and sometimes errors occur, leaving the flawed DNA in the new cell.

It is not clear how many of these DNA mutations might be random events, and how many may be influenced by other factors (diet, hormone levels, etc.). In general, the more

quickly prostate cells grow and divide, the more chances there are for mutations to occur. Therefore, anything that speeds up this process may make prostate cancer more likely.

The development of prostate cancer may be linked to increased levels of certain hormones. High levels of androgens (male hormones, such as testosterone) promote prostate cell growth, and may contribute to prostate cancer risk in some men.

Some researchers have noted that men with high levels of another hormone, insulin-like growth factor-1 (IGF-1), are more likely to get prostate cancer. IGF-1 hormone is similar to insulin, but it works on cell growth, not sugar metabolism. However, other studies have not found a link between IGF-1 and prostate cancer. Further research is needed to make sense of these findings.

As mentioned in the "What are the risk factors for prostate cancer?" section, some recent studies have found that inflammation may contribute to prostate cancer. One theory is that inflammation may lead to cell DNA damage, which might in turn push a cell closer to becoming cancerous. More research in this area is needed.

Exposure to radiation or cancer-causing chemicals may cause DNA mutations in many organs of the body, but these factors have not been proven to be important causes of mutations in prostate cells.

Can prostate cancer be prevented?

The exact cause of prostate cancer is not known, so at this time it is not possible to prevent most cases of the disease. Many risk factors such as age, race, and family history cannot be controlled. But based on what we do know, some cases might be prevented.

Diet

You may be able to reduce your risk of prostate cancer by changing the way you eat, but the results of research studies are not yet clear.

The American Cancer Society recommends choosing foods and beverages in amounts that help achieve and maintain a healthy weight, eating a variety of healthful foods with an emphasis on plant sources, and limiting your intake of red meats, especially high-fat or processed meats. Eat 5 or more servings of fruits and vegetables each day. Whole-grain breads, cereals, rice, pasta, and beans are also recommended. These guidelines on nutrition may also lower the risk for some other types of cancer, as well as other health problems.

Tomatoes (raw, cooked, or in tomato products such as sauces or ketchup), pink grapefruit, and watermelon are rich in *lycopenes*. These vitamin-like substances are antioxidants that help prevent damage to DNA. Some earlier studies suggested lycopenes may help lower prostate cancer risk, but a more recent study found no link between blood levels of lycopene and risk of prostate cancer. Research in this area continues.

Vitamin and mineral supplements

There has been hope for some time that taking vitamin or mineral supplements might affect prostate cancer risk. Some studies have suggested that taking vitamin E daily might lower risk. But other studies have found that vitamin E supplements have no impact on cancer risk, and larger doses may increase risk for some kinds of heart diseases. Some studies have also suggested that selenium, a mineral, might lower the risk of prostate cancer.

To study the possible effects of selenium and vitamin E on prostate cancer risk, doctors conducted the Selenium and Vitamin E Cancer Prevention Trial (SELECT). In this clinical trial, about 35,000 men were randomized to take one or both of these supplements or to take an inactive placebo. After an average of about 5 years of daily use, neither vitamin E nor selenium lowered prostate cancer risk in this study.

After these results were published, the men in the study were told to stop taking the supplements, but the study continued to watch the men to look for any further effect on prostate cancer risk. A few years later, it was clear that the men taking vitamin E actually had a slightly higher risk of prostate cancer. The study showed that selenium might also increase the risk of prostate cancer, but the effect was smaller and may have been due to chance.

Taking any supplements can have both risks and benefits. Before starting vitamins or other supplements, you should talk with your doctor.

Several studies are now looking at the possible effects of soy proteins (called isoflavones) on prostate cancer risk. The results of these studies are not yet available.

Medicines

Some drugs may also help reduce the risk of prostate cancer.

5 alpha-reductase inhibitors

5 alpha-reductase is the enzyme that changes testosterone into dihydrotestosterone (DHT). DHT is the hormone which causes the prostate to grow. 5 alpha-reductase inhibitors are drugs that block that enzyme and prevent the formation of DHT.

Finasteride (Proscar®) is a 5 alpha-reductase inhibitor that is already used to treat benign prostatic hyperplasia (BPH). It is also available in a lower dose form (called Propecia®) to treat male pattern baldness.

The Prostate Cancer Prevention Trial (PCPT) was a large clinical trial designed to see if finasteride could lower the risk of prostate cancer. Half of the men in the study took finasteride each day for 7 years, and the other half took a placebo (sugar pill). At the end of the study, men taking finasteride were less likely to have prostate cancer than those getting the placebo. At first it looked like the men taking finasteride had slightly more cancers with high Gleason scores -- cancers that looked like they were more likely to grow and spread. It is now thought that this is not true and men who took finasteride are

not more likely to develop high-grade cancer. Researchers are still watching the men in the study to see if the men taking the drug lived longer. (More information about the Gleason score can be found in the section, "How is prostate cancer diagnosed?")

Finasteride was more likely to cause sexual side effects like lowered sexual desire and impotence. But it seemed to help with urinary problems such as trouble urinating and leaking urine (incontinence).

Dutasteride (Avodart®), another 5 alpha-reductase inhibitor, has also been studied to see if it can lower the risk of prostate cancer. This study, called *Reduction by Dutasteride of Prostate Cancer Events (or REDUCE)*, looked at the effect of the drug on prostate cancer risk over 4 years in men who had an increased risk of prostate cancer. Results from this study were recently published and were similar to those seen in the PCPT. Fewer cases of prostate cancer were found in the men who took dutasteride than in those who took the placebo. Still, more cases of prostate cancer with high Gleason scores were seen in men who took the drug. Also, men taking dutasteride had slightly more heart problems than those taking the placebo. As with finasteride, treatment with dutasteride was linked to lowered sexual desire and impotence, but men on the drug had fewer urinary problems.

At this time, not all doctors agree taking a 5 alpha-reductase inhibitor (like finasteride or dutasteride) to prevent prostate cancer is a good thing. Men who want to know more about this should discuss it with their doctors. The results of these studies may become clearer over the next few years.

Other drugs

In a small study, toremifene, an anti-estrogen, decreased the risk of prostate cancer in men with high grade prostatic intraepithelial neoplasia. A larger study to confirm this finding is going on now. Other drugs that may help prevent prostate cancer are now being tested in clinical trials. No other supplement or drug has been studied in trials large enough to allow experts to make recommendations on whether or not they should be given to men.

Can prostate cancer be found early?

Screening refers to testing to find a disease such as cancer in people who do not have symptoms of that disease. For some types of cancer, screening can help find cancers in an early stage when they are more easily cured.

Prostate cancer can often be found early by testing the amount of *prostate-specific antigen (PSA)* in the blood. Another way to find prostate cancer is the *digital rectal exam (DRE)*, in which your doctor puts a gloved finger into the rectum to feel the prostate gland. These 2 tests are described below in more detail. If the results of either one of these tests are abnormal, further testing is needed to see if there is a cancer.

If prostate cancer is found during screening with the PSA test or DRE, your cancer will likely be at an early, more treatable stage than if no screening were done.

Since the use of early detection tests for prostate cancer became fairly common (about 1990), the prostate cancer death rate has dropped. But it isn't yet clear if this drop is a direct result of screening or caused by something else, like improvements in treatment.

There are limits to the prostate cancer screening tests used today. Neither the PSA test nor the DRE is 100% accurate. These tests can have abnormal results even when cancer is not present (known as *false positive* results). In addition, normal results can occur even when cancer is present (known as *false negative* results). Unclear test results can cause confusion and anxiety. False positive results can lead some men to undergo a prostate biopsy (with small risks of pain, infection, and bleeding) when cancer is not present. And false negative results may give some men a false sense of security even though they actually have cancer.

There is no question that the PSA test can help spot many prostate cancers early, but another important issue is that it can't tell how dangerous the cancer is. Finding and treating all prostate cancers early may seem like a no-brainer. But some prostate cancers grow so slowly that they would likely never cause problems. Because of an elevated PSA level, some men may be diagnosed with a prostate cancer that they would have never even known about at all. It would never have led to their death or even caused any symptoms. But they may still be treated with either surgery or radiation, either because the doctor can't be sure how aggressive (fast growing and fast spreading) the cancer might be, or because the men are uncomfortable not having any treatment. Treatments like surgery and radiation can have side effects that may seriously affect a man's quality of life. These treatments can lead to urinary, bowel, and/or sexual problems. In some men these problems may be minimal and/or short-term, but for others these problems can be severe and long-lasting (or even permanent). Doctors and patients are still struggling to decide who should receive treatment and who might be able to be followed without being treated right away (an approach called *watchful waiting* or *active surveillance*). Even when patients are not treated right away, they still need regular blood tests and prostate biopsies to determine the need for future treatment. These tests are linked with risks of anxiety, pain, infection, and bleeding.

Studies are being done to try to figure out if early detection tests for prostate cancer in large groups of men will lower the prostate cancer death rate. The most recent results from 2 large studies were conflicting, and didn't offer clear answers.

Early results from a study done in the United States found that annual screening with PSA and DRE detected more prostate cancers, but it did not lower the death rate from prostate cancer. A European study did find a lower risk of death from prostate cancer with PSA screening (done about once every 4 years), but the researchers estimated that about 1,400 men would need to be screened (and 48 treated) in order to prevent one death from prostate cancer. Neither of these studies has shown that PSA screening helps men live longer (lowered the overall death rate).

Recently, early results of a Swedish study of prostate cancer screening were published. One group of men was offered PSA testing every other year, with follow-up tests including biopsy if the PSA was over a certain level. This study did not test elderly men - those over 71 years old were not tested. Cancer and death rates in the group offered

testing were compared to a group of men who were not offered testing. After 15 years, the group that was offered testing had lower risk of death from prostate cancer, but the overall death rate was the same in both groups.

Prostate cancer tends to be a slow growing cancer, so the effects of screening in these studies may become clearer in the coming years. Both of these studies are being continued to see if longer follow-up will give clearer results.

At this time, the American Cancer Society (ACS) recommends that men thinking about prostate cancer screening should make informed decisions based on available information, discussion with their doctor, and their own views on the benefits and side effects of screening and treatment (see below).

Until more information is available, you and your doctor can decide whether you should have tests to screen for prostate cancer. There are many factors to take into account, including your age and health. If you are young and develop prostate cancer, it may shorten your life if it is not caught early. Screening men who are older or in poor health in order to find early prostate cancer is less likely to help them live longer. This is because most prostate cancers are slow-growing and men who are older or sicker are likely to die from other causes before their prostate cancer grows enough to cause problems.

American Cancer Society recommendations for the early detection of prostate cancer

The American Cancer Society recommends that men have a chance to make an informed decision with their health care provider about whether to be screened for prostate cancer. The decision should be made after getting information about the uncertainties, risks, and potential benefits of prostate cancer screening. Men should not be screened unless they have received this information.

The discussion about screening should take place at age 50 for men who are at average risk of prostate cancer and are expected to live at least 10 more years.

This discussion should take place starting at age 45 for men at high risk of developing prostate cancer. This includes African American men and men who have a first-degree relative (father, brother, or son) diagnosed with prostate cancer at an early age (younger than age 65).

This discussion should take place at age 40 for men at even higher risk (those with several first-degree relatives who had prostate cancer at an early age).

After this discussion, those men who want to be screened should be tested with the prostate specific antigen (PSA) blood test. The digital rectal exam (DRE) may also be done as a part of screening.

If, after this discussion, a man is unable to decide if testing is right for him, the screening decision can be made by the health care provider, who should take into account the patient's general health preferences and values.

Men who choose to be tested who have a PSA of less than 2.5 ng/ml, may only need to be retested every 2 years.

Screening should be done yearly for men whose PSA level is 2.5 ng/ml or higher.

Because prostate cancer grows slowly, those men without symptoms of prostate cancer who do not have a 10-year life expectancy should not be offered testing since they are not likely to benefit. Overall health status, and not age alone, is important when making decisions about screening.

Even after a decision about testing has been made, the discussion about the pros and cons of testing should be repeated as new information about the benefits and risks of testing becomes available. Further discussions are also needed to take into account changes in the patient's health, values, and preferences.

Prostate-specific antigen (PSA) blood test

Prostate-specific antigen (PSA) is a substance made by cells in the prostate gland (it is made by normal cells and cancer cells). PSA is mostly found in semen, but a small amount is also found in the blood. Most healthy men have levels under 4 nanograms per milliliter (ng/mL) of blood. The chance of having prostate cancer goes up as the PSA level goes up.

When prostate cancer develops, the PSA level usually goes above 4. Still, a level below 4 does not mean that cancer isn't present -- about 15% of men with a PSA below 4 will have prostate cancer on biopsy. Men with a PSA level in the *borderline range* between 4 and 10, have about a 1 in 4 chance of having prostate cancer. If the PSA is more than 10, the chance of having prostate cancer is over 50%.

The PSA level can also be increased by things other than prostate cancer, such as:

- **An enlarged prostate**, such as with *benign prostatic hyperplasia* (BPH), a non-cancerous enlargement of the prostate that many men get as they grow older
- **Age**: PSA levels will also normally go up slowly as you get older, even if you have no prostate abnormality.
- **Infection or inflammation** of the prostate gland (*prostatitis*)
- **Ejaculation** can cause the PSA to go up for a short time, and then go down again. This is why some doctors will suggest that men abstain from ejaculation for 2 days before testing.
- **Riding a bicycle**
- **Certain urologic procedures**

Some things cause PSA levels to go down (even when cancer is present), including:

- **Certain medicines** used to treat BPH or urinary symptoms, such as finasteride (Proscar or Propecia) or dutasteride (Avodart). You should tell your doctor if you are

taking these medicines, because they will lower PSA levels and require the doctor to adjust the reading.

- **Some herbal mixtures** that are sold as dietary supplements may also mask a high PSA level. This is why it is important to let your doctor know if you are taking any type of supplement, even ones that are not necessarily meant for prostate health. Saw palmetto (an herb used by some men to treat BPH) does not seem to interfere with the measurement of PSA.
- Some steroids may also change PSA levels
- **Obesity:** Obese men tend to have lower PSA levels
- **Aspirin:** Men taking aspirin regularly tend to have lower PSA levels. This effect is most pronounced in non-smokers.

If your PSA level is high, your doctor may advise a prostate biopsy to find out if you have cancer (see the section, "How is prostate cancer diagnosed?"). Some doctors may consider using newer types of PSA tests (discussed below) to help determine if you need a prostate biopsy, but not all doctors agree on how to use these other PSA tests. If your PSA test result is not normal, ask your doctor to discuss your cancer risk and your need for further tests.

Percent-free PSA

PSA occurs in 2 major forms in the blood. One form is attached to blood proteins while the other circulates free (unattached). The percent-free PSA (fPSA) is the ratio of how much PSA circulates free compared to the total PSA level. The percentage of free PSA is lower in men who have prostate cancer than in men who do not.

This test is sometimes used to help decide if you should have a prostate biopsy if your PSA results are in the borderline range (between 4 and 10). A *lower* percent-free PSA means that your likelihood of having prostate cancer is higher and you should probably have a biopsy. Many doctors recommend biopsies for men whose percent-free PSA is 10% or less, and advise that men consider a biopsy if it is between 10% and 25%. Using these cutoffs detects most cancers while helping some men to avoid unnecessary prostate biopsies. This test is widely used, but not all doctors agree that 25% is the best cutoff point to decide on a biopsy, and the cutoff may change depending on PSA level.

A newer test, known as *complexed PSA*, measures the amount of PSA that is attached to other proteins. This test is described in more detail in the section, "What's new in prostate cancer research and treatment?"

PSA velocity

The PSA velocity is not a separate test. It is a measure of how fast the PSA rises over time. Normally, PSA levels go up slowly with age. Experts noticed that these levels can go up faster when cancer is present. When this issue was looked at further, though, studies showed that the PSA velocity was not more helpful than the PSA itself in finding

prostate cancer. For this reason, the most recent ACS guideline on early detection of prostate cancer does not recommend using the PSA velocity.

PSA density

PSA levels are higher in men with larger prostate glands. The PSA density (PSAD) is sometimes used for men with large prostate glands to try to adjust for this. The doctor measures the volume (size) of the prostate gland with transrectal ultrasound (discussed below) and divides the PSA number by the prostate volume. A higher PSA density (PSAD) indicates greater likelihood of cancer. PSA density has not been shown to be that useful. The percent-free PSA test has so far been shown to be more accurate.

Age-specific PSA ranges

PSA levels are normally higher in older men than in younger men, even when there is no cancer. A PSA result within the borderline range might be very worrisome in a 50-year-old man but cause less concern in an 80-year-old man. For this reason, some doctors have suggested comparing PSA results with results from other men of the same age.

But because the usefulness of age-specific PSA ranges is not well proven, most doctors and professional organizations (as well as the makers of the PSA tests) do not recommend their use at this time.

Using the PSA blood test after prostate cancer diagnosis

The PSA test is used mainly to detect prostate cancer early, but it is useful in other situations:

- In men diagnosed with prostate cancer, the PSA test can be used together with clinical exam results and tumor grade (from the biopsy) to help decide if further tests (such as CT scans or bone scans) are needed.
- It can help tell whether your cancer is still confined to the prostate gland. If your PSA level is very high, your cancer has likely spread beyond the prostate. This may affect your treatment options, since some forms of therapy (such as surgery and radiation) are not likely to be helpful if the cancer has spread to the lymph nodes, bones, or other organs.
- After surgery or radiation treatment, the PSA level can be watched to help determine if the treatment was successful. PSA levels normally fall to very low levels if the treatment removed or destroyed all of the prostate cells. A rising PSA level (especially after surgery) likely means that prostate cancer cells are present and your cancer has come back. Having a detectable PSA level does not always mean that you still have cancer. If you have a low PSA level that is not rising, it could mean that you just have some benign prostate cells still in your body.

- If you choose a "watchful waiting" approach to treatment, the PSA level can be used to help decide whether the cancer is growing and if active treatment should be considered.
- During hormonal therapy or chemotherapy, the PSA level can help indicate how well the treatment is working or when it may be time to try a different form of treatment.

If prostate cancer has come back (recurred) after treatment, or if it has spread outside of the prostate (metastatic disease), the actual PSA number is probably not as important as whether it changes, and how quickly it changes. The PSA number does not predict whether or not a person will have symptoms or how long he will live. Many people have very high PSA values and feel just fine. Other people have low values and have symptoms.

Digital rectal exam (DRE)

For a digital rectal exam (DRE), a doctor inserts a gloved, lubricated finger into the rectum to feel for any bumps or hard areas on the prostate that might be cancer. The prostate gland is found just in front of the rectum, and most cancers begin in the back part of the gland, which can be felt during a rectal exam. This exam is uncomfortable, but it isn't painful and only takes a short time. It is more uncomfortable in men who have hemorrhoids.

DRE is less effective than the PSA blood test in finding prostate cancer, but it can sometimes find cancers in men with normal PSA levels. For this reason, it may be included as a part of prostate cancer screening.

The DRE can also be used once a man is known to have prostate cancer to try to determine if it may have spread to nearby tissues and to detect cancer that has come back after treatment.

Transrectal ultrasound (TRUS)

Transrectal ultrasound (TRUS) uses sound waves to make an image of the prostate on a video screen. For this test, a small probe that gives off sound waves is placed into the rectum. The sound waves enter the prostate and create echoes that are picked up by the probe. A computer turns the pattern of echoes into a black and white image of the prostate.

The procedure often takes less than ten minutes and is done in a doctor's office or outpatient clinic. You will feel some pressure when the TRUS probe is placed in your rectum, but it is usually not painful. The area may be numbed before the procedure.

TRUS is not used as a screening test for prostate cancer because it doesn't often show early cancer. Instead, it is most commonly used during a prostate biopsy (described in the next section). TRUS is used to guide the biopsy needles into the right area of the prostate.

TRUS is useful in other situations as well. It can be used to measure the size of the prostate gland, which can help determine the PSA density and may also affect which

treatment options a man has. It is also used as a guide during some forms of treatment such as cryosurgery (discussed in the Treatment section).

How is prostate cancer diagnosed?

Signs and symptoms of prostate cancer

Early prostate cancer usually causes no symptoms and is most often found by a PSA test and/or DRE. Some advanced prostate cancers can slow or weaken your urinary stream or make you need to urinate more often. In some cases kidney blockage can occur. But non-cancerous diseases of the prostate, such as BPH (benign prostatic hyperplasia) cause these symptoms more often.

If the prostate cancer is advanced, you might have blood in your urine (*hematuria*) or trouble getting an erection (*impotence*). Advanced prostate cancer commonly spreads to the bones, which can cause pain in the hips, back (spine), chest (ribs), or other areas. Cancer that has spread to the spine can also press on the spinal nerves, which can result in weakness or numbness in the legs or feet, or even loss of bladder or bowel control.

Other diseases can also cause many of these same symptoms. It is important to tell your doctor if you have any of these problems so that the cause can be found and treated.

Medical history and physical exam

If your doctor suspects prostate cancer, he or she will perform a physical exam, including a digital rectal exam (DRE). The DRE can sometimes tell whether the cancer is only on one side of the prostate, whether it is present on both sides, or whether it is likely to have spread beyond the prostate gland to nearby tissues. The DRE is also sometimes used together with the PSA blood test to detect prostate cancer early and is discussed in the section, "Can prostate cancer be found early?" Your doctor may also examine other areas of your body to see if the cancer has spread.

Your doctor will also ask you about symptoms such as urinary problems or bone pain, which could suggest that the cancer may have spread to your bones.

If certain symptoms or the results of early detection tests -- the prostate-specific antigen (PSA) blood test and/or digital rectal exam (DRE) -- suggest that you might have prostate cancer, your doctor will do a prostate biopsy to find out if the disease is present. Imaging tests may be ordered if it is likely that the cancer is advanced.

The prostate biopsy

A biopsy is a procedure in which a sample of body tissue is removed and then looked at under a microscope. A *core needle biopsy* is the main method used to diagnose prostate cancer. It is usually done by an urologist, a surgeon who treats cancers of the genital and urinary tract, which includes the prostate gland. Using transrectal ultrasound (described in the section, "Can prostate cancer be found early?") to "see" the prostate gland, the

doctor quickly inserts a needle through the wall of the rectum into the prostate gland. When the needle is pulled out it removes a small cylinder (core) of tissue, usually about 1/2-inch long and 1/16-inch across. This is repeated from 8 to 18 times, but most urologists will take about 12 samples. These are sent to the lab to see if cancer is present.

Though the procedure sounds painful, it may only cause a very brief, uncomfortable sensation because it is done with a special spring-loaded biopsy instrument. The device inserts and removes the needles in a fraction of a second. Most doctors who do the biopsy will numb the area first by injecting a local anesthetic alongside the prostate. You might want to ask your doctor if he or she plans to do this.

Some doctors will do the biopsy through the perineum, the skin between the rectum and the scrotum. The doctor will place his or her finger in your rectum to feel the prostate and then insert the biopsy needle through a small incision (cut) in the skin of the perineum. The doctor will also use a local anesthetic to numb the area.

The biopsy itself takes about 10 minutes and is usually done in the doctor's office. You will likely be given antibiotics to take before the biopsy and for a day or 2 after to reduce the risk of infection.

For a few days after the procedure, you may feel some soreness in the area and will likely notice blood in your urine. You may also have some light bleeding from your rectum, especially if you have hemorrhoids. Many men also see some blood in their semen or have rust colored semen, which can last for several weeks after the biopsy, depending on how frequently you ejaculate.

Your biopsy samples will be sent to a pathology lab. There, a *pathologist* (a doctor who specializes in diagnosing disease in tissue samples) will see if there are cancer cells in your biopsy by looking at the samples under the microscope. If cancer is present, the pathologist will also assign it a *grade* (see below). Getting the results usually takes at least 1 to 3 days, but it can take longer.

Even with many samples, biopsies can still sometimes miss a cancer if none of the biopsy needles pass through it. This is known as a "false negative" result. If your doctor still strongly suspects prostate cancer (due to a very high PSA level, for example) a repeat biopsy may be needed to help be sure.

Grading the prostate cancer

Almost all pathologists grade prostate cancers according to the Gleason system. This system assigns a Gleason grade, using numbers from 1 to 5 based on how much the cells in the cancerous tissue look like normal prostate tissue.

- If the cancerous tissue looks much like normal prostate tissue, a grade of 1 is assigned.
- If the cancer lacks these normal features and its cells seem to be spread haphazardly through the prostate, it is called a grade 5 tumor.

- Grades 2 through 4 have features in between these extremes.

Today, most biopsies are grades of 3 or higher, and the other grades are not often used.

Since prostate cancers often have areas with different grades, a grade is assigned to the 2 areas that make up most of the cancer. These 2 grades are added together to yield the *Gleason score* (also called the Gleason sum) between 2 and 10. There are some exceptions to this rule. If the highest grade takes up most (95% or higher) of the biopsy, the grade for that area is counted twice in the Gleason score. Also, if 3 grades are present in a biopsy core, the highest grade is always included in the Gleason score, even if most of the core is taken up by areas of cancer with lower grades.

- Cancers with Gleason scores of 6 or less are called low-grade or well-differentiated
- Cancers with Gleason scores of 7 may be called moderately-differentiated or *intermediate-grade*.
- Cancers with Gleason scores of 8 to 10 may be called poorly-differentiated or *high-grade*.

The higher your Gleason score, the more likely it is that your cancer will grow and spread quickly.

Other elements of a biopsy report

The pathologist's report contains the grade of the cancer (if it is present) but it also often contains other pieces of information that may give a better idea of the scope of the cancer. These can include:

- The number of biopsy core samples that contain cancer (for example, "7 out of 12")
- The percentage of cancer in each of the cores
- Whether the cancer is on one side (left or right) of the prostate or both sides (bilateral)

Suspicious results

Sometimes when the pathologist looks at the prostate cells under the microscope, they don't look cancerous, but they're not quite normal, either. These results are often reported as *suspicious*. They generally fall into 2 categories -- either prostatic intraepithelial neoplasia (PIN) or atypical small acinar proliferation (ASAP).

In PIN, there are changes in how the prostate cells look under the microscope, but the abnormal cells don't look like they've grown into other parts of the prostate (like cancer cells would). PIN is often divided into low-grade and high grade. Many men begin to develop low-grade PIN at an early age but do not necessarily develop prostate cancer. The importance of low-grade PIN in relation to prostate cancer is still unclear.

If high-grade PIN is found on a biopsy, there is about a 20% to 30% chance that cancer may already be present somewhere else in the prostate gland. This is why doctors often

watch men with high-grade PIN carefully and may advise a repeat prostate biopsy, especially if the original biopsy did not take samples from all parts of the prostate.

Another finding that is sometimes reported on a prostate biopsy is atypical small acinar proliferation (ASAP), which is sometimes just called *atypia*. In ASAP, the cells look like they might be cancerous when viewed under the microscope, but there are too few of them to be sure. If ASAP is found, there's a high chance that cancer is also present in the prostate, which is why many doctors recommend getting a repeat biopsy within a few months.

Imaging tests to look for prostate cancer spread

Your doctor will use your digital rectal exam (DRE) results, prostate-specific antigen (PSA) level, and Gleason score to figure out how likely it is that your cancer has spread outside of the prostate. This information is used to decide which other tests (if any) need to be done before deciding on a treatment. Men with a normal DRE result, a low PSA, and a low Gleason score may not need imaging or other tests because the chance that the cancer has spread is so low. The imaging tests used most often include:

Radionuclide bone scan

When prostate cancer spreads to distant sites, it often goes to the bones first. (Even when prostate cancer spreads to the bone, it is still called prostate cancer, not bone cancer.) A bone scan can help show whether cancer has reached the bones.

For this test, a small amount of low-level radioactive material is injected into a vein (intravenously, or IV). The substance settles in damaged bone tissue throughout the entire skeleton over the course of a couple of hours. You then lie on a table for about 30 minutes while a special camera detects the radioactivity and creates a picture of your skeleton.

Areas of bone damage appear as "hot spots" on your skeleton -- that is, they attract the radioactivity. Hot spots may suggest the presence of metastatic cancer, but arthritis or other bone diseases can also cause the same pattern. To tell the difference between these conditions, your cancer care team may use other imaging tests such as simple x-rays or CT or MRI scans to get a better look at the areas that light up, or they may even take biopsy samples of the bone.

The injection is the only uncomfortable part of the scanning procedure. The radioactive material is passed out of the body in the urine over the next few days. The amount of radioactivity used is very low, so it carries very little risk to you or others. But you still may want to ask your doctor if you should take any special precautions after having this test.

Computed tomography (CT)

The CT scan (also known as a CAT scan) is a special kind of x-ray that gives detailed, cross-sectional images of your body. Instead of taking one picture, like a standard x-ray,

a CT scanner takes many pictures of the part of your body being studied as it rotates around you. A computer then combines these pictures into images of slices of the part of your body being studied.

For some scans, you may be asked to drink 1 or 2 pints of oral contrast before the first set of pictures is taken. This helps outline the intestine so that it looks different from any tumors. This is rarely needed in scans done for prostate cancer. You may receive an IV (intravenous) line through which a different kind of contrast is injected. This helps better outline structures in your body. You will also need to drink enough liquid to have a full bladder. This will keep the bowel away from the area of the prostate gland.

The IV contrast can cause your body to feel flushed (a feeling of warmth with some redness of the skin). A few people are allergic and get hives. Rarely, more serious reactions, like trouble breathing or low blood pressure, can occur. Medication can be given to prevent and treat allergic reactions, so be sure to tell your doctor if you have ever had a reaction to any contrast material used for x-rays. It is also important to let your doctor know about any other allergies.

CT scans take longer than regular x-rays. You need to lie still on a table while they are being done. During the test, the table moves in and out of the scanner, a ring-shaped machine that completely surrounds the table. You might feel a bit confined by the ring you have to lie in while the pictures are being taken.

This test can help tell whether prostate cancer has spread into nearby lymph nodes. If your prostate cancer has come back after treatment, the CT scan can often tell whether it is growing into other organs or structures in your pelvis. On the other hand, CT scans rarely provide useful information about newly diagnosed prostate cancers that are likely to be confined to the prostate based on other findings (DRE result, PSA level, and Gleason score). CT scans are not as useful as magnetic resonance imaging (MRI) for looking at the prostate gland itself.

Magnetic resonance imaging (MRI)

MRI scans use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed by the body and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. This produces cross-sectional slices of the body like a CT scanner, but it can also show slices (views) from several angles. Like a CT scan, a contrast material might be injected, but this is done less often. Because the scanners use magnets, people with pacemakers, certain heart valves, or other medical implants may not be able to get an MRI.

MRI scans can be helpful in looking at prostate cancer. They can produce a very clear picture of the prostate and show whether the cancer has spread outside the prostate into the seminal vesicles or the bladder. This information can be very important for your doctors in planning your treatment. But like CT scans, they may not provide useful information about newly diagnosed prostate cancers that are likely to be localized (confined to the prostate) based on other factors.

MRI scans take longer than CT scans -- often up to an hour. During the scan, you need to lie still inside a narrow tube, which is confining and can upset people who don't like enclosed spaces. The machine also makes clicking and buzzing noises. Some places provide headphones with music to block this out. To improve the accuracy of the MRI, many doctors will place a probe, called an endorectal coil, inside your rectum. This must stay in place for 30 to 45 minutes and can be uncomfortable.

ProstaScint™ scan

Like the bone scan, the ProstaScint scan uses an injection of low-level radioactive material to find cancer that has spread beyond the prostate. Both tests look for areas of the body where the radioactive material collects, but they work in different ways.

While the radioactive material used for the bone scan is attracted to bone, the material for the ProstaScint scan is attracted to prostate cells in the body. It is attached to a monoclonal antibody, a type of man-made protein that recognizes and sticks to a particular substance. In this case, the antibody sticks to prostate-specific membrane antigen (PSMA), a substance found at high levels in normal and cancerous prostate cells.

After the material is injected, you will be asked to lie on a table while a special camera creates an image of the body. This is usually done about half an hour after the injection and again 3 to 5 days later.

The advantage of this test is that it can find prostate cancer cells in lymph nodes and other soft (non-bone) organs. Because the antibody only sticks to prostate cancer cells, other cancers or benign problems should not cause abnormal results. But the test is not always accurate, and the results can sometimes be confusing.

Most doctors do not recommend this test for men who have just been diagnosed with prostate cancer. But it may be useful after treatment if your blood PSA level begins to rise and other tests are not able to find the exact location of your cancer. Doctors may not order this test if they believe it will not be helpful for a given patient.

Lymph node biopsy

In a lymph node biopsy, one or more lymph nodes are removed to see if they contain cancer cells. These procedures, known as *lymph node dissection*, *lymphadenectomy*, or *lymph node biopsy*, are sometimes done to find out whether the cancer has spread from the prostate to nearby lymph nodes. If cancer cells are found in a lymph node, surgery is not likely to cure the cancer, so other treatment options are considered. Lymph node biopsies are rarely done unless your doctor is concerned that the cancer has spread. There are several ways to biopsy lymph nodes.

Surgical biopsy

The surgeon may remove lymph nodes through an incision in the lower part of your abdomen. This is often done in the same operation as the radical prostatectomy. (See the section, "How is prostate cancer treated?" for information about radical prostatectomy.)

If the surgeon has a reason to suspect that the cancer may have spread (such as a PSA level over 20 or a Gleason score over 7), he or she may remove some lymph nodes before attempting to remove the prostate gland. A pathologist then looks at the nodes while you are still under anesthesia to help the surgeon decide whether to continue with the radical prostatectomy. This is called a *frozen section* exam because the tissue sample is frozen before thin slices are taken to check under a microscope. If the nodes contain cancer, the operation may be stopped (leaving the prostate in place). This would happen if the surgeon felt that removing the prostate would be unlikely to cure the cancer, but would still result in serious complications or side effects.

More often now, the prostate is removed even if the lymph nodes contain cancer. In that case, surgeons do not often request a frozen section exam and instead the lymph nodes are sent to be looked at along with the removed prostate gland. The test results are usually available 3 to 7 days after surgery.

Laparoscopic biopsy

A laparoscope is a long, slender tube with a small video camera on the end that is inserted into the abdomen to let the surgeon see making a cut about the size of width of a finger. Other small incisions are made to insert long instruments to remove the lymph nodes. The surgeon removes all of the lymph nodes around the prostate gland and sends them to the pathologist. Because there are no large incisions, most people recover fully in only 1 or 2 days, and the operation leaves very small scars. This procedure is not common, but it is sometimes used when it's important to know the lymph node status and radical prostatectomy is not planned (such as for certain men who choose treatment with radiation therapy).

Fine needle aspiration (FNA)

If your lymph nodes appear enlarged on an imaging study (CT or MRI) a specially trained radiologist may take a sample of cells from an enlarged lymph node by using a technique called fine needle aspiration (FNA). To do this, the doctor uses the CT scan image to guide a long, thin needle through the skin in the lower abdomen and into an enlarged lymph node. A syringe attached to the needle allows the doctor to take a small tissue sample from the node. Before the needle is placed, your skin will be numbed with local anesthesia. You will be able to return home a few hours after the procedure.

How is prostate cancer staged?

The stage (extent) of a cancer is one of the most important factors in choosing treatment options and predicting a patient's outlook. If your prostate biopsy confirms that you have cancer, more tests may be done to find out how far it has spread within the prostate, to nearby tissues, or to other parts of the body. This process is called staging.

The AJCC TNM staging system

A staging system is a standard way in which the cancer care team describes the extent to which a cancer has spread. While there are several different staging systems for prostate cancer, the most widely used system is the American Joint Committee on Cancer (AJCC) TNM System.

The TNM System describes:

- The extent of the primary **tumor** (T category)
- Whether the cancer has spread to nearby lymph **nodes** (N category)
- The absence or presence of distant **metastasis** (M category)

The overall stage takes all 3 categories into account, along with the Gleason score and the PSA level (described in the section, "How is prostate cancer diagnosed?").

There are actually 2 types of staging for prostate cancer. The *clinical stage* is your doctor's best estimate of the extent of your disease, based on the results of the physical exam (including DRE), lab tests, prostate biopsy, and any imaging tests you have had.

If you have surgery, your doctors can also determine the *pathologic stage*, which is based on the surgery and examination of the removed tissue. This means that if you have surgery, the stage of your cancer might actually change afterward (if cancer was found in a place it wasn't suspected, for example). Pathologic staging is likely to be more accurate than clinical staging, as it allows your doctor to get a firsthand impression of the extent of your disease. This is one possible advantage of having surgery (radical prostatectomy) as opposed to radiation therapy or watchful waiting (expectant management).

Both types of staging use the same categories (but the T1 category is not used in the AJCC system for pathologic staging).

T categories (clinical)

There are 4 categories for describing the local extent of the prostate tumor, ranging from T1 to T4. Most of these have subcategories as well.

T1: Your doctor can't feel the tumor or see it with imaging such as transrectal ultrasound.

- **T1a:** The cancer is found incidentally (by accident) during a transurethral resection of the prostate (often abbreviated as TURP) that was done for benign prostatic hyperplasia (BPH). Cancer is present in less than 5% of the tissue removed.
- **T1b:** The cancer is found during a TURP but is present in more than 5% of the tissue removed.
- **T1c:** The cancer is found by needle biopsy that was done because of an increased PSA.

T2: Your doctor can feel the cancer when a digital rectal exam (DRE) is done, but it still appears to be confined to the prostate gland.

- **T2a:** The cancer is in one half or less of only one side (left or right) of your prostate.
- **T2b:** The cancer is in more than half of only one side (left or right) of your prostate.
- **T2c:** The cancer is in both sides of your prostate.

T3: The cancer has begun to grow and spread outside your prostate and may involve the seminal vesicles.

- **T3a:** The cancer extends outside the prostate but not to the seminal vesicles.
- **T3b:** The cancer has spread to the seminal vesicles.

T4: The cancer has grown into tissues next to your prostate (other than the seminal vesicles), such as the urethral sphincter (muscle that helps control urination), the rectum, and/or the wall of the pelvis.

N categories

N0: The cancer has not spread to any lymph nodes.

N1: The cancer has spread to one or more regional (nearby) lymph nodes in the pelvis.

M categories

M0: The cancer has not spread beyond the regional lymph nodes.

M1: The cancer has spread beyond the regional nodes.

- **M1a:** The cancer has spread to distant (outside of the pelvis) lymph nodes.
- **M1b:** The cancer has spread to the bones.
- **M1c:** The cancer has spread to other organs such as lungs, liver, or brain (with or without spread to the bones).

Stage groupings

Once the T, N, and M categories have been determined, this information is combined, along with the Gleason score and PSA, in a process called stage grouping. If the Gleason score or PSA results are not available, the stage can be based on the T, N, and M categories. The overall stage is expressed in Roman numerals from I (the least advanced) to IV (the most advanced). This is done to help determine treatment options and the outlook for survival or cure.

Stage I: One of the following applies:

T1, N0, M0, Gleason score 6 or less, PSA less than 10: The doctor can't feel the tumor or see it with imaging such as transrectal ultrasound (it was either found during a transurethral resection or was diagnosed by needle biopsy done for a high PSA) [T1]. The

cancer is still within the prostate and has not spread to lymph nodes [N0] or elsewhere in the body [M0]. The Gleason score is 6 or less and the PSA level is less than 10.

OR

T2a, N0, M0, Gleason score 6 or less, PSA less than 10: The tumor can be felt on digital rectal exam or seen on transrectal ultrasound and is in one half or less of only one side (left or right) of your prostate [T2a]. The cancer is still within the prostate and has not spread to lymph nodes [N0] or elsewhere in the body [M0]. The Gleason score is 6 or less and the PSA level is less than 10.

Stage IIA: One of the following applies:

T1, N0, M0, Gleason score of 7, PSA less than 20: The doctor can't feel the tumor or see it with imaging such as transrectal ultrasound (it was either found during a transurethral resection or was diagnosed by needle biopsy done for a high PSA level) [T1]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The tumor has a Gleason score of 7. The PSA level is less than 20.

OR

T1, N0, M0, Gleason score of 6 or less, PSA at least 10 but less than 20: The doctor can't feel the tumor or see it with imaging such as transrectal ultrasound (it was either found during a transurethral resection or was diagnosed by needle biopsy done for a high PSA [T1]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The tumor has a Gleason score of 6 or less. The PSA level is at least 10 but less than 20.

OR

T2a or T2b, N0, M0, Gleason score of 7 or less, PSA less than 20: The tumor can be felt on digital rectal exam or seen on transrectal ultrasound and is in only one side of the prostate [T2a or T2b]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. It has a Gleason score of 7 or less. The PSA level is less than 20.

Stage IIB: One of the following applies:

T2c, N0, M0, any Gleason score, any PSA: The tumor can be felt on digital rectal exam or seen on transrectal ultrasound and is in both sides of the prostate [T2c]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The tumor can have any Gleason score and the PSA can be any value.

OR

T1 or T2, N0, M0, any Gleason score, PSA of 20 or more: The cancer has not yet begun to spread outside the prostate. It may (or may not) be felt by digital rectal exam or seen on transrectal ultrasound [T1 or T2]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The tumor can have any Gleason score. The PSA level is at least 20.

OR

T1 or T2, N0, M0, Gleason score of 8 or higher, any PSA: The cancer has not yet begun to spread outside the prostate. It may (or may not) be felt by digital rectal exam or seen on transrectal ultrasound [T1 or T2]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The Gleason score is 8 or higher. The PSA can be any value.

Stage III:

T3, N0, M0, any Gleason score, any PSA: The cancer has begun to spread outside the prostate and may have spread to the seminal vesicles [T3], but it has not spread to the lymph nodes [N0] or elsewhere in the body [M0]. The tumor can have any Gleason score and the PSA can be any value.

Stage IV: One of the following applies:

T4, N0, M0, any Gleason score, any PSA: The cancer has spread to tissues next to the prostate (other than the seminal vesicles), such as the urethral sphincter (muscle that helps control urination), rectum, and/or the wall of the pelvis [T4]. The cancer has not spread to nearby lymph nodes [N0] or elsewhere in the body [M0]. The tumor can have any Gleason score and the PSA can be any value.

OR

Any T, N1, M0, any Gleason score, any PSA: The tumor may be growing into tissues near the prostate [any T]. The cancer has spread to the lymph nodes (N1) but has not spread elsewhere in the body [M0]. The tumor can have any Gleason score and the PSA can be any value.

OR

Any T, any N, M1, any Gleason score, any PSA: The cancer may be growing into tissues near the prostate [any T] and may have spread to nearby lymph nodes [any N]. It has spread to other, more distant sites in the body [M1]. The tumor can have any Gleason score and the PSA can be any value.

Other staging systems

In addition to the TNM system, other systems have been used to stage prostate cancer. The Whitmore-Jewett system, which stages prostate cancer as A, B, C, or D, was commonly used in the past, but most prostate specialists now use the TNM system. If your doctors use the Whitmore-Jewett system, ask them to translate it into the TNM system or to explain how their staging will determine your treatment options.

Survival rates

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with cancer may want to know the survival statistics

for people in similar situations, while others may not find the numbers helpful, or may even not want to know them. Whether or not you want to read about the survival statistics below for prostate cancer is up to you.

The 5-year survival rate refers to the percentage of patients who live *at least 5 years* after their cancer is diagnosed. Of course, many people live much longer than 5 years (and many are cured).

Five-year *relative* survival rates assume that some people will die of other causes and compare the observed survival with that expected for people without the cancer. This is a better way to see the impact of the cancer on survival.

In order to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for people now being diagnosed with prostate cancer.

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many other factors may affect a person's outlook, such as the Gleason Score, the PSA, and the patient's overall health. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with the aspects of your particular situation.

According to the most recent data, for all men with prostate cancer, the relative 5-year survival rate is nearly 100% and the relative 10-year survival rate is 91%. The 15-year relative survival rate is 76%. Keep in mind that 5-year survival rates are based on patients diagnosed and first treated more than 5 years ago, and 10-year survival rates are based on patients diagnosed more than 10 years ago. Modern methods of detection and treatment mean that many prostate cancers are now found earlier and can be treated more effectively. If you are diagnosed this year, your outlook may be better than the numbers reported above.

Survival by stage

The National Cancer Institute (NCI) maintains a large national database on survival statistics for different types of cancer. This database does not group cancers by AJCC stage, but instead groups cancers into local, regional and distant stages.

Local stage means that there is no sign that the cancer has spread outside of the prostate. This corresponds to AJCC stages I and II. Almost 9 out of 10 prostate cancers are found in this early stage. If the cancer has spread from the prostate to nearby areas, it is called *regional disease*. This includes stage III and the stage IV cancers that haven't spread to distant parts of the body, such as T4 tumors and cancers that have spread to nearby lymph nodes (N1). Distant stage includes the rest of the stage IV cancers -- all cancers that have spread to distant lymph nodes, bone, or other organs (M1).

5-year relative survival by stage at the time of diagnosis

Stage	5-year relative survival
local	100%
regional	100%
distant	31%

How is prostate cancer treated?

This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.

The treatment information in this document is not official policy of the Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor.

Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Some general comments about treatment

This section starts with general comments about the types of treatments used for prostate cancer. This is followed by a discussion of the typical treatment options based on the stage of the cancer.

Once your prostate cancer has been diagnosed, graded, and staged, you have a lot to think about before you and your doctor choose a treatment plan. You may feel that you must make a decision quickly, but it is important to give yourself time to absorb the information you have just learned. Ask questions of your cancer care team. Read the section, "What should you ask your doctor about prostate cancer?"

The treatment you choose for prostate cancer should take into account:

- Your age and expected life span
- Any other serious health conditions you may have
- The stage and grade of your cancer
- Your feelings (and your doctor's opinion) about the need to treat the cancer
- The likelihood that each type of treatment will cure your cancer (or provide some other measure of benefit)
- Your feelings about the side effects common with each treatment

You may want to get a second opinion about the best treatment option for your situation, especially if there are several choices available to you. Prostate cancer is a complex disease, and doctors may differ in their opinions regarding the best treatment options. Speaking with doctors who specialize in different kinds of treatment may be helpful. You will want to weigh the benefits of each treatment against its possible outcomes, side effects, and risks.

Expectant management (watchful waiting) and active surveillance

Because prostate cancer often grows very slowly, some men (especially those who are older or have other serious health problems) may never need treatment for their prostate cancer. Instead, their doctors may recommend approaches known as expectant management, "watchful waiting," or, active surveillance. Until recently, watchful waiting usually meant waiting until the cancer was causing symptoms before starting any treatment. Now, it is more common to watch the patient closely with regular PSA tests, rectal exams, and ultrasounds to see if the cancer is growing. If the cancer does seem to be growing or getting worse, treatment may be recommended. Some doctors still consider this to be watchful waiting, while others consider this different from watchful waiting and call it *active surveillance*. Not every doctor means the same thing when they say "watchful waiting," so it is important to ask your doctor what he or she means if they use this term. An approach such as this may be recommended if your cancer is not causing any symptoms, is expected to grow very slowly, and is small and contained within one area of the prostate.

This type of approach is not likely to be a good option if you are young, healthy, and/or have a fast-growing cancer (for example, a high Gleason score).

At this time, active surveillance is a reasonable option for some men with slow-growing cancers because it is not known whether treating the cancer with surgery or radiation will actually help them live longer. These treatments have definite risks and side effects that may outweigh the possible benefits for some men. Some men are not comfortable with this approach, and are willing to accept the possible side effects of active treatments in order to try to remove or destroy the cancer.

With active surveillance, your cancer will be carefully monitored. Usually this approach includes a doctor visit with a PSA blood test and digital rectal examination (DRE) about every 3 to 6 months. Transrectal ultrasound-guided prostate biopsies may be done every year as well. Treatment is started if the cancer seems to be growing or getting worse, based on either a rising PSA, a change in the rectal exam, ultrasound findings, or biopsy results. On biopsies, an increase in the Gleason score or extent of tumor (based on the number of biopsies containing tumor) are both signals to start treatment. This treatment usually involves surgery or radiation therapy. Active surveillance allows the patient to be observed for a time, only treating those men who have a serious form of the cancer. This allows men with a less serious cancer avoid the side effects of treatment that may not have helped them live longer. A possible downside of this approach is that there's a chance it could allow the cancer to spread. This could limit your treatment options such as surgery.

Right now, not all experts agree how often testing should occur for active surveillance. There is also debate about when is the best time to start therapy. Still, several early studies have shown that men who choose active surveillance and go on to be treated do just as well as those who decide to start treatment right away. Hopefully we will have a better idea of the pros and cons of active surveillance versus active treatment in the near future. A large study sponsored by the National Cancer Institute and the Veterans Affairs Cooperative Studies Program is now looking into how active treatment affects survival and quality of life of prostate cancer patients of different ages. The PIVOT (short for Prostatic Intervention Versus Observation Trial) is still in progress. There are also studies underway to determine the best approach for monitoring patients on active surveillance which should shed more light on this issue.

Surgery

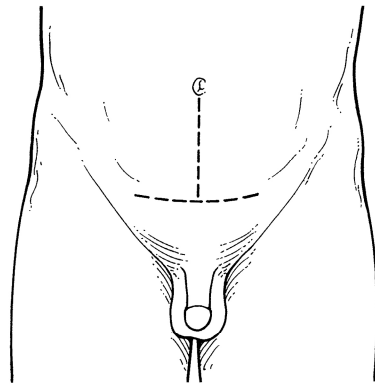
Radical prostatectomy is surgery that attempts to cure prostate cancer. It is used most often if the cancer is not thought to have spread outside of the gland (stage T1 or T2 cancers). In this operation, your surgeon is trying to cure you by removing the entire prostate gland plus some of the tissue around it, including the seminal vesicles.

Radical retropubic prostatectomy

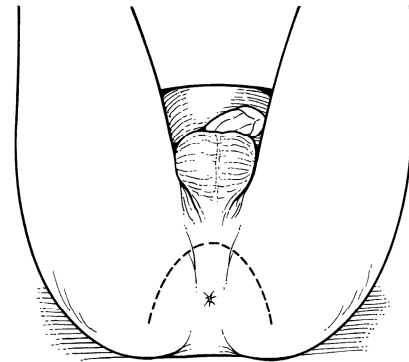
This is the operation used by most urologic surgeons (urologists). You will be either under general anesthesia (asleep) or be given spinal or epidural anesthesia (numbing the lower half of the body) along with sedation during the surgery.

For this operation, the surgeon makes a skin incision in your lower abdomen, from the belly button down to the pubic bone. If there is a reasonable chance the cancer may have spread to the lymph nodes (based on your PSA level, DRE, and biopsy results), the surgeon may remove lymph nodes from around the prostate at this time. If any of the nodes contain cancer cells, which means the cancer has spread, they may not continue with the surgery because it is unlikely that the cancer can be cured.

The surgeon will pay close attention to the 2 tiny bundles of nerves that run on either side of the prostate. These nerves control erections. If you are able to have erections before surgery, the surgeon will try not to injure these nerves (known as a *nerve-sparing* approach). If the cancer is growing into or very close to the nerves the surgeon will need to remove them. If they are both removed, you will be impotent (unable to have a spontaneous erection). This means that you will need help (such as medications or pumps) to have erections. If the nerves on one side are removed, you still have a chance of keeping your ability to have an erection, but the chance is lower than if neither were removed. If neither nerve bundle is removed you may be able to function normally. Usually it takes at least a few months to a year after surgery to have an erection because the nerves have been handled during the operation and won't work properly for a while.



Retropubic Approach



Perineal Approach

Radical perineal prostatectomy

In this operation, the surgeon makes the incision in the skin between the anus and scrotum (the perineum), as shown in the picture above. This approach is used less often because the nerves cannot easily be spared and lymph nodes can't be removed. But it is often a shorter operation and might be an option if you don't want the nerve-sparing procedure and you don't require lymph node removal, and is often easier to recover from. It also might be used if you have other medical conditions that make retropubic surgery difficult for you. It can be just as curative as the retropubic operation if done correctly.

These operations usually last from 1 1/2 to 4 hours. The perineal operation usually takes less time than the retropubic operation, and may result in less pain afterward. After surgery you will stay in the hospital for about 1-3 days and will probably be away from work for about 3 to 5 weeks.

In most cases, you will be able to donate your own blood before surgery. This blood can be given back to you during the operation only if it's needed.

After the surgery, while you are still under anesthesia, a catheter will be put in your penis to help drain your bladder. The catheter usually stays in place for 1 to 2 weeks while you are healing. You will be able to urinate on your own after the catheter is removed.

Laparoscopic radical prostatectomy (LRP)

Both of the surgical approaches above use an "open" technique, in which the surgeon makes a long incision to remove the prostate. Another technique, known as *laparoscopic radical prostatectomy* (LRP), uses several smaller incisions, through which special long instruments are inserted to remove the prostate. One of the instruments has a small video camera on the end, which allows the surgeon to see inside the abdomen.

Laparoscopic prostatectomy has some advantages over the usual open radical prostatectomy, including less blood loss and pain, shorter hospital stays (usually no more than a day), and faster recovery times (although the catheter will be needed for about the same amount of time). LRP offers very good lighting and magnification, which can help the surgeon better decide which areas need to be removed.

Still, LRP is a challenging operation for surgeons to learn, and usually requires a bit more time on the operating table (and under anesthesia). Another possible drawback is that it does not allow the surgeon to use the sense of touch while operating or to have the same freedom of motion that his or her hands would have.

LRP has been used in the United States since 1999 and is often being done both in community and university centers. In experienced hands, LRP appears to be as good as open radical prostatectomy, although we do not yet have long-term results from procedures done in the United States. Early studies report that the rates of side effects from LRP seem to be about the same as for open prostatectomy. Recovery of bladder control may be slightly delayed with this approach. A nerve-sparing approach is possible with LRP, increasing the chance of normal erections after the operation.

Robotic-assisted laparoscopic radical prostatectomy

An even newer approach is to do LRP remotely using a robotic interface (called the da Vinci system). The surgeon sits at a panel near the operating table and controls robotic arms to perform the operation through several small incisions in the patient's abdomen. Like direct LRP, the robotic approach has advantages over the open approach in terms of pain, blood loss, and recovery time. So far though, there seems to be little difference between robotic and "traditional" LRP for the patient, in terms of these factors or other side effects. But because it is still a relatively new way of doing the surgery, reports of long-term outcomes are not yet available.

For the surgeon, the robotic system may provide more maneuverability and more precision when moving the instruments than standard LRP. The robot itself does not do the operation; the most important factor in the success of either type of LRP is the surgeon's experience, commitment, and skill.

Robotic LRP has been in use since 2003 in the United States. The machines themselves are expensive, and are available in only a limited number of medical centers across the country. Still, this approach has become more popular in recent years.

If you are thinking about treatment with either type of LRP, it's important to understand what is known and what is not yet known about this approach. Again, the most important factors are likely to be the skill and experience of your surgeon. If you decide that LRP is the treatment for you, be sure to find a surgeon with a lot of experience doing LRP.

Transurethral resection of the prostate (TURP)

This operation is more commonly used to treat men with non-cancerous enlargement of the prostate called benign prostatic hyperplasia (BPH). When it is used for prostate

cancer it is palliative, which means it is done to relieve symptoms, not to cure. This surgery may be used if you are having trouble urinating because of the cancer.

During this operation, the surgeon removes the inner part of the prostate gland that surrounds the urethra (the tube through which urine exits the bladder). The skin is not cut with this surgery. An instrument called a resectoscope is passed through the end of the penis into the urethra to the level of the prostate. Once it is in place, electricity is passed through a wire to heat it and cut or vaporize the tissue. Either spinal anesthesia (which numbs the lower half of your body) or general anesthesia (where you are asleep) is used.

The operation usually takes about an hour. After surgery, a catheter is inserted through the penis into the bladder. It remains in place for about a day to help urine drain while the prostate heals. You can usually leave the hospital after 1 to 2 days and return to work in 1 to 2 weeks. You will likely have some blood in your urine after surgery. Other side effects from TURP include infection and any risks that come with the type of anesthesia that was used.

Surgical risks and possible side effects of radical prostatectomy (Including LRP)

There are possible risks and side effects with any type of surgery for prostate cancer.

Surgical risks: The risks with any type of radical prostatectomy are much like those of any major surgery, including risks from anesthesia. Among the most serious, there is a small risk of heart attack, stroke, blood clots in the legs that may travel to your lungs, and infection at the incision site. If lymph nodes are removed, a collection of lymph fluid can form (called a *lymphocele*) which may need to be drained. Because there are many blood vessels near the prostate gland, another risk is bleeding during and after the surgery. You may need blood transfusions, which carry their own small risk. In extremely rare cases, people die because of complications of this operation. Your risk depends, in part, on your overall health, your age, and the skill of your surgical team.

Side effects: The major possible side effects of radical prostatectomy are urinary incontinence (being unable to control urine) and impotence (being unable to have erections). It should be noted that these side effects are also possible with other forms of therapy, although they are described here in more detail.

Urinary incontinence is not being able to control your urine or have leakage or dribbling. There are different degrees of incontinence. Being incontinent can affect you not only physically but emotionally and socially as well. There are 3 major types of incontinence: stress incontinence, overflow incontinence, and urge incontinence.

- *Stress incontinence* is the most common type of incontinence after prostate surgery. Men with stress incontinence leak urine when they cough, laugh, sneeze, or exercise. It is usually caused by problems with the muscular valve that keeps urine in the bladder (the bladder sphincter). Prostate cancer treatments may damage the muscles that form this valve or the nerves that keep the muscles working.

- Men with *overflow incontinence* cannot empty the bladder well. They take a long time to urinate and have a dribbling stream with little force. Overflow incontinence is usually caused by blockage or narrowing of the bladder outlet by cancer or scar tissue.
- Men with *urge incontinence* have a sudden need to go to the bathroom and pass urine. This problem occurs when the bladder becomes too sensitive to stretching as urine fills it.

Rarely after surgery, men lose all ability to control their urine. This is called *continuous incontinence*.

For men who have had surgery for prostate cancer, normal bladder control usually returns within several weeks or months after radical prostatectomy. This recovery usually occurs gradually, in stages.

Doctors can't predict how any man will function after surgery. In general older men tend to have more incontinence problems than younger men. In one study of 901 men aged 55 to 74 who were treated in all different types of hospitals, researchers found that 5 years after radical prostatectomy:

- 15% of the 901 men had no bladder control or had frequent leaks or dripping of urine
- 16% leaked at least twice a day
- 29% wore pads to keep dry (Some of the men were in 2 or 3 of these groups, so adding these percentages together overstates the likelihood of urinary problems.)

Most large cancer centers, where prostate surgery is done more often and surgeons have more experience, report many fewer problems with incontinence.

Treatment of incontinence depends on its type, cause, and severity. If you have problems with incontinence, let your doctors know. You might feel embarrassed about discussing this issue, but remember that you are not alone. This is a common problem. Doctors who treat men with prostate cancer should know about incontinence and be able to suggest ways to improve it, such as:

- **Special exercises**, called *Kegel exercises*, can help strengthen your bladder muscles. These exercises involve tensing and relaxing certain pelvic muscles. Not all doctors agree about their usefulness or the best way to do them, so ask your doctor about doing Kegels before you try them.
- **Medication** to help the muscles of the bladder or sphincter. Most of these medicines affect either the muscles or the nerves that control them. These medicines are more effective for some forms of incontinence such as urge incontinence, than for others.
- **Surgery** may also be used to correct long-term incontinence. Material such as collagen can be injected to tighten the bladder sphincter. If your incontinence is severe and not getting better on its own, an artificial sphincter can be implanted, or a small device called a urethral sling may be implanted to keep the bladder neck where it belongs. Ask your doctor if these treatments might help you.

Even if your incontinence cannot be completely corrected, it can still be helped. You can learn how to manage and live with your incontinence. Incontinence is more than a physical problem. It can disrupt your quality of life if it is not managed well.

There is no one right way to cope with incontinence. The challenge is to find what works for you so that you can return to your normal daily activities. There are many *incontinence products* to help keep you mobile and comfortable, such as pads that are worn under your clothing. Adult briefs and undergarments are bulkier than pads but provide more protection. Bed pads or absorbent mattress covers can also be used to protect the bed linens and mattress.

When choosing incontinence products, keep in mind the checklist below. Some of these questions may not be important to you, or you may have others to add.

Absorbency: How much does the product provide? How long will it protect?

Bulk: Can it be seen under normal clothing? Is it disposable? Reusable?

Comfort: How does it feel when you move or sit down?

Availability: Which stores carry the product? Are they easy to get to?

Cost: Does your insurance pay for these products?

Another option is a rubber sheath called a condom catheter that can be put over the penis to collect urine in a bag. There are also compression (pressure) devices that can be placed on the penis for short periods of time to keep urine from coming out.

For some types of incontinence, self-catheterization may be an option. In this approach, you insert a thin tube into your urethra to drain and empty the bladder. Most people can learn this safe and usually painless technique.

You can also follow some simple precautions that may make incontinence less of a problem. For example, empty your bladder before bedtime or before strenuous activity. Avoid drinking too much fluid, particularly if the drinks contain caffeine or alcohol, which can make you have to go more often. Because fat in the abdomen can push on the bladder, losing weight sometimes helps improve bladder control.

Fear, anxiety, and anger are common feelings for people dealing with incontinence. Fear of having an accident may keep you from doing the things you enjoy most -- taking your grandchild to the park, going to the movies, or playing a round of golf. You may feel isolated and embarrassed. You may even avoid sex because you are afraid of leakage. Be sure and talk to your doctor so you can begin to manage this problem, as many solutions, described above, exist.

Impotence, also known as erectile dysfunction, means you cannot get an erection sufficient for sexual penetration. The nerves that allow men to get erections may be damaged or removed by radical prostatectomy. Other treatments (besides surgery) may also damage these nerves or the blood vessels that supply blood to the penis to cause an erection.

Recovering sexual function can take up to 2 years after surgery. During the first several months, you will probably not be able to have a spontaneous erection, so you may need to use medicines or other treatments. Your ability to have an erection after surgery depends on your age, your ability to get an erection before the operation, and whether the nerves were cut. Everyone can expect some decrease in the ability to have an erection, but the younger you are, the more likely it is that you will keep this ability.

There is a wide range of impotency rates reported in the medical literature. Some cancer centers that perform many radical *nerve-sparing* prostatectomies report impotence rates as low as 25% to 30% for men under 60, and as low as 10% for men under 50. However, other doctors have reported higher rates of impotence in similar patients. Impotence occurs in about 70% to 80% of men over 70, even if nerves on both sides are not removed.

If potency remains after surgery, the sensation of orgasm should continue to be pleasurable, but there is no ejaculation of semen -- the orgasm is "dry." This is because during the prostatectomy, the glands that made most of the fluid for semen (the seminal vesicles and prostate) were removed, and the pathways used by sperm (the vas deferens) were cut.

Most doctors feel that regaining potency is helped along by attempting to get an erection as soon as possible once the body has had a chance to heal (usually about 6 weeks after the operation, or even sooner). Some doctors call this "penile rehabilitation." Medicines (see below) may be helpful at this time. Be sure to talk to your doctor about your situation.

Several options may help you if you have erectile dysfunction:

- *Phosphodiesterase inhibitors* such as sildenafil (Viagra), vardenafil (Levitra), and tadalafil (Cialis) are pills that can promote erections. These drugs will not work if both nerves have been damaged or removed. The most common side effects are headache, flushing (skin becomes red and feels warm), upset stomach, light sensitivity, and runny or stuffy nose. Nitrates, which are drugs used to treat heart disease, can interact with these drugs to cause very low blood pressure, which can be dangerous. Some other drugs may also cause problems, so be sure your doctor knows which medicines you are taking.

Some studies have found that these drugs may, in very rare cases, block blood flow to the optic nerve in the back of the eye. This could lead to blindness. Men who developed this complication often had a history of smoking or problems with high blood pressure, diabetes, or high levels of cholesterol or fat in their blood.

- *Prostaglandin E1* is a substance naturally made in the body that can produce erections. A manmade version of this substance (alprostadil) can be injected almost painlessly into the base of the penis 5 to 10 minutes before intercourse or introduced into the tip of the penis as a suppository. You can even increase the dosage to prolong the erection. You may have side effects, such as pain, dizziness, and prolonged erection, but they are usually minimal.

- *Vacuum devices* are another option that may create an erection. These mechanical pumps are placed around the entire penis before intercourse to produce an erection.
- *Penile implants* might restore your ability to have erections if other methods do not help. An operation is needed to put them in place. There are several types of penile implants, including those using silicone rods or inflatable devices.

For more detailed information on coping with erection problems and other sexuality issues, see our document, *Sexuality and Cancer: For the Man Who Has Cancer and His Partner*.

Changes in orgasm can be a side effect of prostatectomy. In some men, orgasm becomes less intense or goes away completely. A few men report pain with orgasm (*dysorgasmia*). Even if you have problems with impotence, you may still be able to have an orgasm.

Sterility: Radical prostatectomy cuts the connection between the testicles (where sperm are produced) and the urethra. Your testicles will still produce sperm, but it can't get out as a part of the ejaculate. This means that a man can no longer father a child by natural means. Often, this is not an issue, as men with prostate cancer tend to be older. But if it is a concern for you, you may want to speak with your doctor about "banking" your sperm before the operation. .

Lymphedema: An extremely rare but possible complication of removing many of the lymph nodes around the prostate is a condition called lymphedema. Lymph nodes normally provide a way for fluid to return from all areas of the body to the heart. When nodes are removed, fluid may collect in the legs or genital region over time, causing swelling and pain. Lymphedema can usually be treated with physical therapy, although it may not disappear completely.

Change in penis length: A possible minor effect of surgery is a decrease in penis length. In one study, about 1 out of 5 men had a 15% or greater decrease in the length of their penis.

Inguinal hernia: A prostatectomy also increases the chance of needing an inguinal (groin) hernia repair in the future. In one study, the risk was about 1 in 6 within 10 years of having the surgery.

Radiation therapy

Radiation therapy uses high-energy rays or particles to kill cancer cells. Radiation is sometimes used as the initial treatment for low-grade cancer that is still confined within the prostate gland or that has only spread to nearby tissue. Cure rates for men with these types of cancers are much like those for men getting radical prostatectomy. Radiation is also sometimes used if the cancer is not completely removed or comes back (recurs) in the area of the prostate after surgery. If the disease is more advanced, radiation may be used to reduce the size of the tumor and to provide relief from present and possible future symptoms.

Two main types of radiation therapy are used: external beam radiation and brachytherapy (internal radiation). Both appear to be good methods of treating prostate cancer, although there is more long-term information about the results of treatment with external beam radiation.

External beam radiation therapy (EBRT)

In EBRT the radiation is focused on the prostate gland from a source outside your body. It is much like getting an x-ray but for a longer time. Before treatments start, imaging studies such as MRIs, CT scans, or plain x-rays of the pelvis are done to find the exact location of your prostate gland. The radiation team may then make some ink marks on your skin that they will use later as a guide to focus the radiation in the right area. You will usually be treated 5 days per week in an outpatient center over a period of 7 to 9 weeks. Each treatment lasts only a few minutes and is painless.

Aside from being used as a treatment for early stage cancer, external beam radiation can also be used to help relieve bone pain when the cancer has spread to a specific area of bone.

Standard (conventional) EBRT is used much less often than in the past. Newer techniques allow doctors to give higher doses of radiation to the prostate gland while reducing the radiation exposure to nearby healthy tissues. These techniques have fewer side effects than standard EBRT. They may also have a better chance of curing the cancer, but this has not yet been proven in studies.

Three-dimensional conformal radiation therapy (3D-CRT): 3D-CRT uses special computers to precisely map the location of your prostate. You will likely be fitted with a plastic mold resembling a body cast to keep you in the same position so that the radiation can be aimed more accurately. Radiation beams are then shaped and aimed at the prostate from several directions, which makes it less likely to damage normal tissues.

This method seems to be at least as effective as standard radiation therapy with lower side effects. Many doctors now recommend using it when it is available. In theory, by aiming the radiation more accurately, doctors can reduce radiation damage to tissues near the prostate and cure more cancers by increasing the radiation dose to the prostate. Long-term study results are still needed to confirm this.

Intensity modulated radiation therapy (IMRT): IMRT is an advanced form of 3D therapy. It uses a computer-driven machine that actually moves around the patient as it delivers radiation. In addition to shaping the beams and aiming them at the prostate from several angles, the intensity (strength) of the beams can be adjusted to minimize the dose reaching the most sensitive normal tissues. This allows doctors to deliver an even higher dose to the cancer areas. Many major hospitals and cancer centers are now able to provide IMRT. The RapidArc™ is a form of IMRT that allows each treatment to be given over just a few minutes. It is more convenient for the patient, but is similar to regular IMRT in terms of effectiveness

Conformal proton beam radiation therapy: Proton beam therapy is related to 3D-CRT and uses a similar approach. But instead of using x-rays, this technique focuses proton beams on the cancer. Protons are positive parts of atoms. Unlike x-rays, which release energy both before and after they hit their target, protons cause little damage to tissues they pass through and then release their energy after traveling a certain distance. This means that proton beam radiation may be able to deliver more radiation to the prostate and do less damage to nearby normal tissues. Although early results are promising, studies are needed to see if proton beam therapy is better in the long-run than other types of external beam radiation. Right now, proton beam therapy is not widely available. The machines needed to make protons are expensive, and there are only a handful of them in use in the United States. Proton beam radiation may not be covered by all insurance companies at this time.

Stereotactic radiosurgery: This method is a form of IMRT that is most commonly used to treat cancer that spreads to the brain. It involves holding the head in a metal frame or cage to prevent any movement, while the machine delivers radiation precisely to the tumor. When only a single treatment is given, it is called stereotactic radiosurgery, but when many treatments are given it is called stereotactic radiotherapy. This treatment often goes by the names of the machines used to give it, such as Gamma Knife™, Novalis Tx™, and CyberKnife™.

Possible side effects of external beam radiation therapy: The numbers used to describe the possible side effects below relate to standard external radiation therapy, which is now used much less often than in the past. The risks of the newer treatment methods described above are likely to be lower.

Bowel problems: During and after treatment with external beam radiation therapy, you may have diarrhea, sometimes with blood in the stool, rectal leakage, and an irritated large intestine. Most of these problems go away over time, but in rare cases normal bowel function does not return after treatment ends. In the past, about 10% to 20% of men reported bowel problems after external beam radiation therapy, but the newer conformal radiation techniques may be less likely to cause these problems.

Bladder problems: You might find yourself needing to urinate more often, having a burning sensation while you urinate, and finding blood in your urine. Bladder problems usually improve over time, but in some patients they never go away. About 1 patient out of 3 continues to have problems with needing to urinate more often.

Urinary incontinence: This side effect is less common than after surgery overall, but the chance of incontinence goes up each year for several years after treatment.

Impotence: After a few years, the impotence rate after radiation is about the same as that of surgery. It usually does not occur right after radiation therapy but slowly develops over a year or more. This is different from surgery, where impotence occurs immediately and may improve over time. In older studies, about 3 out of 4 men were impotent within 5 years of having external beam radiation therapy (some of these men had erection problems before treatment). In men who had

normal erections before treatment, about half became impotent at 5 years. It's not clear if these numbers will apply to newer forms of radiation as well. As with surgery, the older you are, the more likely it is you will become impotent. Impotence may be helped by treatments such as those listed in the section above, including erectile dysfunction medicines.

Feeling tired: Radiation therapy may also cause fatigue that may not disappear until a few months after treatment stops.

Lymphedema: Fluid buildup in the legs or genitals (described in the surgery section of this document) is possible if the lymph nodes receive radiation.

Urethral Stricture: The tube that transmits urine from the bladder out of the body may, rarely, be scarred and narrowed by radiation, and require further treatments to open it up again.

Brachytherapy (internal radiation therapy)

Brachytherapy (also called *seed implantation* or *interstitial radiation therapy*) uses small radioactive pellets, or "seeds," each about the size of a grain of rice. These pellets are placed directly into your prostate. Brachytherapy is generally used only in men with early stage prostate cancer that is relatively slow growing (such as low-grade tumors).

Its use may also be limited by other factors. For men who have had a transurethral resection of the prostate (TURP) or for those who already have urinary problems, the risk of urinary side effects may be higher. Brachytherapy may not be as effective in men with large prostate glands because it may not be possible to place the seeds into all of the correct locations. Doctors are now looking at ways to get around this, such as giving men a short course of hormone therapy beforehand to shrink the prostate.

Imaging tests such as transrectal ultrasound, CT scans, or MRI help guide the placement of the radioactive pellets. Special computer programs calculate the exact dose of radiation needed. Without these, the cancer might get too little radiation or the normal tissues around it could get too much.

There are 2 types of prostate brachytherapy. Both are done in an operating room and require some type of anesthesia.

Permanent (low dose rate, or LDR) brachytherapy: In this approach, pellets (seeds) of radioactive material (such as iodine-125 or palladium-103) are placed inside thin needles, which are inserted through the skin in the area between the scrotum and anus (perineum) and into the prostate. The pellets are left in place as the needles are removed and give off low doses of radiation for weeks or months. Radiation from the seeds travels a very short distance, so the seeds can put out a very large amount of radiation to a very small area. This decreases the amount of damage done to the healthy tissues that are close to the prostate.

Usually, anywhere from 40 to 100 seeds are placed. Because they are so small, their presence causes little discomfort, and they are simply left in place after their radioactive

material is used up. This type of radiation therapy requires spinal anesthesia (where the lower half of your body is numbed) or general anesthesia (where you are asleep) and may require 1 day in the hospital.

You may also receive external beam radiation along with brachytherapy, especially if there is a risk that your cancer has spread outside of the prostate (for example, if you have a high Gleason score).

Temporary (high dose rate, or HDR) brachytherapy: This is a newer technique. Hollow needles are placed through the perineum into the prostate. Soft nylon tubes (catheters) are placed in these needles. The needles are then removed but the catheters stay in place. Radioactive iridium-192 or cesium-137 is then placed in the catheters, usually for 5 to 15 minutes. Generally, about 3 brief treatments are given, and the radioactive substance is removed each time. The treatments are usually given over 2 days. After the last treatment the catheters are removed. For about a week following placement of the catheters, you may have some pain or swelling in the area between your scrotum and rectum, and your urine may be reddish-brown.

These treatments are usually combined with external beam radiation given at a lower dose than if used by itself. The total dose of radiation is computed so that it is high enough to kill all the cancer cells. The advantage of this approach is that most of the radiation is concentrated in the prostate gland itself, sparing the urethra and the tissues around the prostate such as the nerves, bladder, and rectum.

Possible risks and side effects of brachytherapy: If you receive permanent brachytherapy seeds, they will give off small amounts of radiation for several weeks. Even though the radiation doesn't travel far, your doctor may advise you to stay away from pregnant women and small children during this time. You may be asked to take other precautions as well, such as wearing a condom during sex.

There is also a small risk that some of the seeds may move (migrate). You may be asked to strain your urine for the first week or so to catch any seeds that might come out. Be sure to carefully follow any instructions your doctor gives you. There have also been reports of the seeds moving through the bloodstream to other parts of the body, such as the lungs. As far as doctors can tell, this doesn't seem to cause any ill effects and happens very rarely.

Like external beam radiation, brachytherapy can also cause impotence, urinary problems, and bowel problems.

Bowel problems: Significant long-term bowel problems (including burning and rectal pain and/or diarrhea) occur in less than 5% of patients.

Urinary problems: Severe urinary incontinence is not a common side effect. But frequent urination may persist in about 1 out of 3 patients who have brachytherapy. This is perhaps caused by irritation of the urethra, the tube that drains urine from the bladder. Rarely, this tube may actually close off (known as urethral stricture) and need to be opened with surgery.

Impotence: Problems with erections may be less likely to develop after brachytherapy than after other common forms of treatment, but this is unclear. Some studies have found rates of sexual dysfunction to be lower after brachytherapy, but other studies have found that the impotence rates were no lower than with external beam radiation or surgery. Again, the younger you are and the better your sexual function before treatment, the more likely you will be to regain function after treatment.

Cryosurgery

Cryosurgery (also called cryotherapy or cryoablation) is sometimes used to treat localized prostate cancer by freezing it. As with brachytherapy, this may not be a good option for men with large prostate glands.

In this approach, several hollow probes (needles) are placed through the skin between the anus and scrotum (the perineum). The doctor guides them into the prostate using transrectal ultrasound (TRUS). Very cold gases are passed through the needles, creating ice balls that destroy the prostate gland. To be sure prostate tissue is destroyed without too much damage to nearby tissues, the doctor carefully watches the ultrasound images during the procedure. Warm saltwater is circulated through a catheter in the urethra to keep it from freezing. The catheter is kept in place for about 3 weeks after the procedure to allow the bladder to empty while the patient recovers. Spinal, epidural, or general anesthesia is used during the procedure.

After the procedure, there will be some bruising and soreness in the perineum where the probes were inserted. You may need to stay in the hospital for a day, but many patients leave the same day.

Cryosurgery is less invasive than radical prostatectomy, so there is usually less blood loss, a shorter hospital stay, shorter recovery period, and less pain than with surgery. But compared with surgery or radiation therapy, doctors know much less about the long-term effectiveness of cryosurgery. Current techniques using ultrasound guidance and precise temperature monitoring have only been available for a few years. Outcomes of long-term (10- to 15-year) follow-up must still be collected and reviewed. For this reason, most doctors do not often use cryotherapy as the first treatment of prostate cancer. It is sometimes recommended if the cancer has come back after other treatments.

Possible side effects of cryosurgery

Side effects from cryosurgery tend to be worse if it is done in men who have already had radiation therapy, as opposed to men who have it as the first form of treatment.

Most men have blood in their urine for a day or two after the procedure, as well as soreness in the area where the needles were placed. Swelling of the penis or scrotum is also common. The freezing may also affect the bladder and intestines, which can lead to pain, burning sensations, and the need to empty the bladder and bowels often. Most men recover normal bowel and bladder function over time.

Freezing damages nerves near the prostate and causes impotence in up to 80% of men who have cryosurgery. Erectile dysfunction is more common after cryosurgery than after radical prostatectomy (see above).

Urinary incontinence is rare in men who have cryosurgery as their first treatment for prostate cancer, but it is more common in men who have already had radiation therapy.

A fistula (an abnormal connection) between the rectum and bladder develops in less than 1% of men after cryosurgery. This rare but serious problem can allow urine to leak into the rectum and often requires surgery to repair.

Hormone (androgen deprivation) therapy

Hormone therapy is also called androgen deprivation therapy (ADT) or androgen suppression therapy. The goal is to reduce levels of the male hormones, called androgens, in the body. The main androgens are testosterone and dihydrotestosterone (DHT). Androgens, produced mainly in the testicles, stimulate prostate cancer cells to grow. Lowering androgen levels often makes prostate cancers shrink or grow more slowly. However, hormone therapy does not cure prostate cancer.

Hormone therapy may be used in several situations:

- If you are not able to have surgery or radiation or can't be cured by these treatments because the cancer has already spread beyond the prostate gland
- If your cancer remains or comes back after treatment with surgery or radiation therapy
- As an addition to radiation therapy as initial treatment if you are at high risk for cancer recurrence
- Before surgery or radiation to try and shrink the cancer to make other treatments more effective

Types of hormone therapy

There are several types of hormone therapy used to treat prostate cancer.

Orchiectomy (surgical castration): Even though this is a type of surgery, its main effect is as a form of hormone therapy. In this operation, the surgeon removes the testicles, where more than 90% of the androgens, mostly testosterone, are made. With this source removed, most prostate cancers stop growing or shrink for a time.

This is done as a simple outpatient procedure. It is probably the least expensive and simplest way to reduce androgen levels in the body. But unlike some of the other methods of lowering androgen levels, it is permanent, and many men have trouble accepting the removal of their testicles. Some men having the procedure are concerned about how it will look. If wanted, artificial silicone sacs can be inserted into the scrotum. These look much like testicles.

Luteinizing hormone-releasing hormone (LHRH) analogs: Even though LHRH analogs (also called LHRH agonists) cost more and require more frequent doctor visits, most men choose this method over orchiectomy. These drugs allow the testicles to remain in place, but the testicles will shrink over time, and they may even become too small to feel. These drugs lower the amount of testosterone made by the testicles. Treatment with these drugs is sometimes called *chemical castration* because they lower androgen levels just as well as orchiectomy.

LHRH analogs are injected or placed as small implants under the skin. Depending on the drug used, they are given anywhere from once a month up to once a year. The LHRH analogs available in the United States include leuprolide (Lupron[®], Viadur[®], Eligard[®]), goserelin (Zoladex[®]), triptorelin (Trelstar[®]), and histrelin (Vantas[®]).

When LHRH analogs are first given, testosterone production increases briefly before falling to very low levels. This effect is called *flare* and results from the complex way in which LHRH analogs work. Men whose cancer has spread to the bones may experience bone pain. If the cancer has spread to the spine, even a short-term increase in growth could compress the spinal cord and cause pain or paralysis. Flare can be avoided by giving drugs called anti-androgens for a few weeks when starting treatment with LHRH analogs. (For more on anti-androgens, see below.)

Luteinizing hormone-releasing hormone (LHRH) antagonists: Abarelix (Plenaxis[®]) was a newer type of drug known as an LHRH antagonist. It is thought to work like LHRH agonists, but it appears to reduce testosterone levels more quickly and does not cause tumor flare like the LHRH agonists do.

In 2005, the company making abarelix decided to take it off the market. Men already taking abarelix could continue on this drug, but no new patients could be started on it. It is no longer available.

Degarelix (Firmagon[®]) is a new LHRH antagonist that was approved for use by the FDA in 2008 to treat advanced prostate cancer. It is given as a monthly injection under the skin. Like abarelix, degarelix quickly reduces testosterone levels. The most common side effects were problems at the injection site (pain, redness, and swelling) and increased levels of liver enzymes on lab tests. Other side effects are discussed in detail in the next section.

Anti-androgens: Anti-androgens block the body's ability to use any androgens. Even after orchiectomy or during treatment with LHRH analogs, a small amount of androgens is still made by the adrenal glands.

Drugs of this type, such as flutamide (Eulexin[®]), bicalutamide (Casodex[®]), and nilutamide (Nilandron[®]), are taken daily as pills.

Anti-androgens are not often used by themselves (see below). An anti-androgen may be added if treatment with orchiectomy or an LHRH analog is no longer working by itself. An anti-androgen is sometimes given for a few weeks when an LHRH analog is first started to prevent a tumor flare (see above).

Anti-androgen treatment may be combined with orchiectomy or LHRH analogs as first-line hormone therapy. This is called combined androgen blockade (CAB). There is still some debate as to whether CAB is more effective in this setting than using orchiectomy or an LHRH analog alone. If there is a benefit, it appears to be small.

Some doctors are testing the use of anti-androgens *instead of* orchiectomy or LHRH analogs. Several recent studies have compared the effectiveness of anti-androgens alone with that of LHRH agonists. Most found no difference in survival rates, but a few found anti-androgens to be slightly less effective.

If hormone therapy, including an anti-androgen stops working, some men seem to benefit for a short time from simply stopping the anti-androgen. Doctors call this the "anti-androgen withdrawal" effect, although they are not sure why it happens.

Other androgen-suppressing drugs: Estrogens were once the main alternative to orchiectomy for men with advanced prostate cancer. Because of their possible side effects (including blood clots and breast enlargement), estrogens have been largely replaced by LHRH analogs and anti-androgens. Still, estrogens may be tried if androgen deprivation is no longer working.

Ketoconazole (Nizoral[®]), first used for treating fungal infections, blocks production of androgens. It is most often used to treat patients with recently diagnosed disease and a large amount of cancer, as it is the quickest way to lower testosterone levels. It can also block the production of cortisol in the body. People treated with ketoconazole often need to take a corticosteroid (like hydrocortisone) along with it in order to prevent the side effects caused by low cortisol levels.

Side effects of hormone therapy

Orchiectomy, LHRH analogs, and LHRH antagonists all cause side effects due to changes in the levels of hormones such as testosterone and estrogen. These side effects can include:

- Reduced or absent libido (sexual desire)
- Impotence
- Hot flashes (these may get better or even go away with time)
- Breast tenderness and growth of breast tissue
- Osteoporosis (bone thinning), which can lead to broken bones
- Anemia (low red blood cell counts)
- Decreased mental acuity (sharpness)
- Loss of muscle mass
- Weight gain

- Fatigue
- Increased cholesterol
- Depression

The risk of hypertension (high blood pressure), diabetes, and heart attacks (myocardial infarctions) is also higher in men treated with hormone therapy.

Anti-androgens have similar side effects. The major difference from LHRH agonists and orchiectomy is that anti-androgens may have fewer sexual side effects. When these drugs are used alone, libido and potency can often be maintained. When these drugs are given to patients already being treated with LHRH agonists, diarrhea is the major side effect. Nausea, liver problems, and tiredness can also occur.

Many side effects can be prevented or treated. For example, hot flashes can be helped by treatment with certain antidepressants. Brief radiation treatment to the breasts can help prevent their enlargement, but are not effective once breast enlargement has occurred. There are several different drugs available to prevent and treat osteoporosis. Depression can be treated by antidepressants and/or counseling. Exercise can help reduce many side effects, including fatigue, weight gain, and the chance of loss of bone and muscle mass. If anemia occurs, it is often very mild and usually doesn't cause symptoms.

There is growing concern that hormone therapy for prostate cancer may have a negative affect on cognition -- it may lead to problems with thinking, concentration, and/or memory. A number of studies have looked at the link between testosterone levels and brain function, first in animals, then in healthy men. But this link has not been studied well in men getting hormone therapy for prostate cancer. The studies that have been done are small and often had conflicting results. Different studies have shown changes in different types of memory. Some have even found that while some types of memory get worse, another type got better. Other studies found no effect at all.

Studying hormone therapy's effect on brain function is hard, because other factors may also change the way the brain works. A study has to take all of these factors into account. For example, age is an issue. Both prostate cancer and memory problems become more common as people get older. Also, hormone therapy can lead to anemia, fatigue, and depression -- all of which can affect brain function. Still, hormone therapy does seem to lead to memory problems in some patients. These problems are rarely severe, and most often affect only some types of memory. And more studies are being done to look at this issue.

Current controversies in hormone therapy

There are many issues around hormone therapy that not all doctors agree on, such as the best time to start and stop it and the best way to give it. Studies looking at these issues are now under way. A few of the issues are discussed here.

Treating early stage cancer: Some men with early (stage I or II) prostate cancer have been treated with hormone therapy instead of surgery or radiation. A recent study found

that these men do not live any longer than those who did not receive any treatment at first, but instead waited until the cancer progressed or symptoms developed, and so hormone treatment is no longer used for early cancer.

Early versus delayed treatment: Some doctors think that hormone therapy works better if it is started as soon as possible, even though the patient feels well. This applies to cancer in an advanced stage (for example, when it has spread to lymph nodes), a tumor that is large (T3) or has a high Gleason score, or when the PSA has started rising after initial therapy. Some studies have shown that hormone treatment may slow down the disease and perhaps even lengthen patient survival. But not all doctors agree with this approach. Some are waiting for more evidence of benefit. They feel that because of the likely side effects and the chance that the cancer could become resistant to therapy sooner, treatment should not be started until symptoms from the disease appear. Studies addressing these questions are now under way.

Intermittent versus continuous hormone therapy: Nearly all prostate cancers treated with hormone therapy become resistant to this treatment over a period of months or years. Some doctors believe that constant androgen suppression may not be needed, so they advise intermittent (on-again, off-again) treatment.

In one form of intermittent therapy, androgen suppression is stopped once the blood PSA level drops to a very low level. If the PSA level begins to rise, the drugs are started again. Another form of intermittent therapy involves using androgen suppression for fixed periods of time -- for example, 6 months on followed by 6 months off.

Clinical trials of intermittent hormonal therapy are still in progress. It is too early to say whether this new approach is better or worse than continuous hormonal therapy. However, one advantage of intermittent treatment is that for a while some men are able to avoid the side effects of hormonal therapy such as decreased energy, impotence, hot flashes, and loss of sex drive.

Combined androgen blockade (CAB): Some doctors treat patients with both androgen deprivation (orchiectomy or an LHRH agonist) and an anti-androgen. A recent study found that men who used CAB in addition to radiation treatments were less likely to die from prostate cancer than those who used a LHRH agonist with their radiation. Another study that looked at men with metastatic prostate cancer, found that those treated with CAB lived longer than those treated with an LHRH agonist alone. But most doctors are not convinced there's enough evidence that this combined therapy is better than one drug alone when treating metastatic prostate cancer.

Triple androgen blockade (TAB): Some doctors have suggested taking combined therapy one step further, by adding a drug called a 5-alpha reductase inhibitor -- either finasteride (Proscar, Propecia) or dutasteride (Avodart) -- to the combined androgen blockade. There is very little evidence to support the use of this "triple androgen blockade" at this time.

Chemotherapy

Chemotherapy is sometimes used if prostate cancer has spread outside of the prostate gland and hormone therapy isn't working. It is not a standard treatment for early prostate cancer, but some studies are looking to see if chemotherapy could be helpful if given for a short time after surgery.

Chemotherapy uses anti-cancer drugs injected into a vein or given by mouth. These drugs enter the bloodstream and go throughout the body, making this treatment potentially useful for cancers that have spread (metastasized) to distant organs.

At one time, chemotherapy was not thought to be very effective in treating prostate cancer, but this has changed in recent years. A combination of the chemotherapy drug docetaxel (Taxotere[®]) and the steroid drug prednisone has been shown to reduce symptoms and prolong life for an average of about 3 months (when compared with other chemotherapy drugs) in patients with advanced prostate cancer. Most doctors now consider this to be the first-line chemotherapy option in men whose cancer is no longer responding to hormonal treatments. Recently, a new drug called cabazitaxel (Jevtana[®]) was approved for use in men with advanced prostate cancer. When given to men whose cancers stopped responding to docetaxel, it helped them live longer.

Some of the other chemotherapy drugs used to treat prostate cancer include:

- Mitoxantrone (Novantrone[®])
- Estramustine (Emcyt[®])
- Doxorubicin (Adriamycin[®])
- Etoposide (VP-16)
- Vinblastine (Velban[®])
- Paclitaxel (Taxol[®])
- Carboplatin (Paraplatin[®])
- Vinorelbine (Navelbine[®])

Like hormone therapy, chemotherapy is unlikely to result in a cure. This treatment is not expected to destroy all the cancer cells, but it may slow the cancer's growth and reduce symptoms, resulting in a better quality of life.

Possible side effects of chemotherapy

Chemotherapy drugs work by attacking cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemotherapy, which can lead to side effects.

The side effects of chemotherapy depend on the type and dose of drugs given and the length of time they are taken. These side effects may include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Lowered resistance to infection (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelets)
- Fatigue (due to low red blood cells)

In addition, each chemotherapy drug may have its own unique side effects. For example, estramustine, a drug sometimes used to treat prostate cancer, also carries the risk of blood clots. Docetaxel can cause severe allergic reactions. Medication is given before docetaxel treatments to prevent this problem. Doxorubicin can weaken the heart muscle over time, so doctors must limit the amount of this drug that is used. Mitoxantrone can rarely cause leukemia, so it is no longer being studied for use in early prostate cancer.

The side effects of chemotherapy are usually short-term and go away once treatment is finished. There is help for many of these side effects. For example, drugs can be given to prevent or reduce nausea and vomiting. Other drugs can be given to boost blood cell counts.

Vaccine treatment

A prostate cancer vaccine, sipuleucel-T (Provenge[®]), has recently been approved by the FDA to treat advanced prostate cancer. Unlike most vaccines, this vaccine is aimed at treating prostate cancer, not preventing it. Also, this vaccine is unique to each person that gets it - it is not mass produced.

For this vaccine, white blood cells (cells of the immune system) are removed from the patient's blood and exposed to a protein from prostate cancer cells called *prostatic acid phosphatase* (PAP). These cells are then given back to the patient by infusion into a vein (IV). This process is repeated 2 more times, 2 weeks apart, so that the patient gets 3 doses of cells. In the body, the cells induce other immune system cells to attack the patient's prostate cancer. Common side effects included fever, chills, fatigue, back and joint pain, nausea, and headache. These most often started during the cell infusions and lasted no more than a day or 2. A few men had more severe symptoms, including problems breathing and high blood pressure, which improved with treatment. When used in men with metastatic prostate cancer that no longer responded to hormone therapy, the vaccine helped them live more than 4 months longer on average (than the men who didn't get the vaccine). Studies to see if this vaccine can help men with less advanced prostate cancer are continuing.

Treating pain

Most of this document talks about ways to remove or to destroy prostate cancer cells or to slow their growth. But maintaining your quality of life is another important goal. Don't hesitate to discuss pain, other symptoms, or any quality of life concerns with your cancer care team. Pain and most other symptoms of prostate cancer can often be treated effectively. If the treatments listed above don't help with symptoms, there are several other options.

Pain medicines

When properly prescribed, pain medicines (ranging from aspirin to opioids) are very effective. You may worry about addiction with opioids, but this is almost never a problem if the drug is being used as directed to treat cancer pain. Symptoms such as drowsiness and constipation are likely but can usually be treated by changing the dose or by adding other medicines.

Bisphosphonates

Bisphosphonates are a group of drugs that can help relieve bone pain caused by cancer that has spread (metastasized). These drugs may also slow the growth of the metastases and prevent fractures. Bisphosphonates also help to strengthen bones in men who are also receiving hormone therapy. The most commonly used bisphosphonate is zoledronic acid (Zometa[®]), which is approved for use in bone metastases from prostate cancer. It is given as an intravenous (IV) injection. Other bisphosphonates have been approved for other uses, and some doctors use these "off label" (to treat a condition for which they have not been approved by the Food and Drug Administration) to treat prostate cancer.

Bisphosphonates can have their own side effects, including flu-like symptoms and bone pain. They can also lead to kidney problems, so patients with poor kidney function may not be able to be treated with these medications. A rare but very distressing side effect of bisphosphonates is something called osteonecrosis of the jaw (ONJ). With this condition, the blood supply to an area in the bone stops, and that part of the bone dies. This can lead to tooth loss and infections or open sores of the jaw bone that won't heal. There is no really good way to treat this, other than to stop the drug and give supportive care. Doctors don't know why some people develop ONJ while on bisphosphonates, but it seems to come up more often after dental work (such as having a tooth pulled) is done while on this medicine. That is why many cancer doctors recommend that a patient who will be starting a bisphosphonate have a dental checkup and have any tooth or jaw problems treated before they start taking the drug. Maintaining good oral hygiene by flossing and brushing, making sure that dentures fit properly, and having regular dental checkups may also help prevent this condition.

Denosumab

Denosumab (Xgeva[™]) is another drug that can help when prostate cancer spreads to bone. When prostate cancer cells spread to the bones, they can turn on the cause cells that

the body uses to break down bone (called osteoclasts). Denosumab blocks the osteoclasts from being turned on by blocking a substance called RANK ligand. Studies have shown that it can help prevent problems like fractures in men with bone metastases better than zoledronic acid. It also can be helpful when zoledronic acid is no longer working.

This drug is given as an injection under the skin every 4 weeks. Men given this drug are often urged to take a supplement containing calcium and vitamin D to prevent problems with low calcium levels. Like the bisphosphonates, denosumab can cause ONJ, so doctors recommend taking the same precautions (such as having tooth and jaw problems treated before starting the drug).

Steroids

Some studies suggest that corticosteroids (such as prednisone and dexamethasone) can help relieve bone pain in some men.

External radiation therapy

Radiation therapy can help reduce bone pain, especially if the pain is limited to one or only a few areas of bone. Radiation can be aimed at tumors on the spine, which can help relieve pressure on the spinal cord in some cases. Radiation therapy may also help relieve other symptoms by shrinking tumors in other parts of the body.

Radiopharmaceuticals: Strontium-89 (Metastron[®]) and Samarium-153 (Quadramet[®]) are drugs that contain radioactive elements. They are injected into a vein and collect in bones. Once there, the radiation they give off kills the cancer cells and relieves some of the pain caused by bone metastases. About 80% of prostate cancer patients with painful bone metastases are helped by this treatment at least for a while.

These drugs are used to treat bone pain caused by metastatic prostate cancer -- they are not for early stage prostate cancer. These drugs are especially helpful when prostate cancer has spread to many bones, since external beam radiation would need to be aimed at each affected bone. In some cases, one of these drugs will be used together with external beam radiation aimed at the most painful bone metastases.

The major side effect of this treatment is a lowering of blood cell counts, which could place you at increased risk for infections or bleeding, especially if your counts are already low.

It is very important that your pain be treated effectively. This will help you feel better and allow you to focus on the people and activities that are most important to you. There are many ways to treat your pain, so be sure and tell members of your entire prostate cancer care team about your symptoms.

Clinical trials

You may have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is choosing which treatment is best

for you. You may have heard about clinical trials being done for your type of cancer. Or maybe someone on your health care team has mentioned a clinical trial to you.

Clinical trials are carefully controlled research studies that are done with patients who volunteer for them. They are done to get a closer look at promising new treatments or procedures.

If you would like to take part in a clinical trial, you should start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service for a list of clinical trials that meet your medical needs. You can reach this service at 1-800-303-5691 or on our Web site at <http://clinicaltrials.cancer.org>. You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service toll-free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at www.cancer.gov/clinicaltrials.

There are requirements you must meet to take part in any clinical trial. If you do qualify for a clinical trial, it is up to you whether or not to enter (enroll in) it.

Clinical trials are one way to get state-of-the art cancer treatment. They are the only way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

You can get a lot more information on clinical trials in our document called *Clinical Trials: What You Need to Know*. You can read it on our Web site or call our toll-free number (1-800-227-2345) and have it sent to you.

Complementary and alternative therapies

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that your doctor hasn't mentioned. Everyone from friends and family to Internet groups and Web sites offer ideas for what might help you. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

What exactly are complementary and alternative therapies?

Not everyone uses these terms the same way, and they are used to refer to many different methods, so it can be confusing. We use *complementary* to refer to treatments that are used *along with* your regular medical care. *Alternative* treatments are used *instead of* a doctor's medical treatment.

Complementary methods: Most complementary treatment methods are not offered as cures for cancer. Mainly, they are used to help you feel better. Some methods that are used along with regular treatment are meditation to reduce stress, acupuncture to help relieve pain, or peppermint tea to relieve nausea. Some complementary methods are known to help, while others have not been tested. Some have been proven not to be helpful, and a few have even been found harmful.

Alternative treatments: Alternative treatments may be offered as cancer cures. These treatments have not been proven safe and effective in clinical trials. Some of these

methods may pose danger, or have life-threatening side effects. But the biggest danger in most cases is that you may lose the chance to be helped by standard medical treatment. Delays or interruptions in your medical treatments may give the cancer more time to grow and make it less likely that treatment will help.

Finding out more

It is easy to see why people with cancer think about alternative methods. You want to do all you can to fight the cancer, and the idea of a treatment with no side effects sounds great. Sometimes medical treatments like chemotherapy can be hard to take, or they may no longer be working. But the truth is that most of these alternative methods have not been tested and proven to work in treating cancer.

As you consider your options, here are 3 important steps you can take:

- Look for "red flags" that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a "secret" that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking about using.
- Contact us at 1-800-227-2345 to learn more about complementary and alternative methods in general and to find out about the specific methods you are looking at.

The choice is yours

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

Considering prostate cancer treatment options

If you have prostate cancer, there are many important factors to take into account before deciding on a treatment option, such as your age and general health, and the likelihood that the cancer will cause problems for you. You should also think about which side effects you can live with. Some men, for example, can't imagine living with side effects such as incontinence or impotence. Other men are less concerned about these and more concerned about removing or destroying the cancer.

If you are older or have other serious health problems and your cancer is slow growing (low-grade), you might find it helpful to think of prostate cancer as a chronic disease that will probably not lead to your death but may cause symptoms you want to avoid. You may be more inclined to consider active surveillance (careful follow-up with your doctor) or hormone therapy, and less inclined to consider treatments that are likely to cause major side effects, such as radiation and surgery. Of course, age itself is not necessarily the best

basis on which to make your choice. Many men are in good mental and physical shape at age 70, while some younger men may not be as healthy.

If you are younger and otherwise healthy, you might be more willing to put up with the side effects of treatment if they offer you the best chance for cure. Most doctors now believe that external radiation, radical prostatectomy, and brachytherapy (radioactive implants) have about the same cure rates for the earliest stage prostate cancers. However, there are pros and cons to each type of treatment that should be considered, including possible risks and side effects (described above).

This is complicated even further by the explosion of newer types of surgery (laparoscopic prostatectomy and robotic-assisted prostatectomy) and newer types of radiation therapy (conformal radiation therapy, intensity-modulated radiation therapy, proton beam radiation, etc.) in recent years. Many of these appear very promising, but there is very little long-term data on them, which means comparing them to each other is very difficult, if not impossible.

Such a complex decision is often hard to make by yourself. You may find it helpful to talk with your family and friends before making a decision. It's important to note that prostate cancer is not a uniform disease, and each man's experience with it is different. Just because someone you know had a good (or bad) experience with a certain type of treatment doesn't necessarily mean the same will be true for you.

You may also want to consider getting more than one medical opinion, perhaps even from different types of doctors. For early stage cancers, it is natural for surgical specialists, such as urologists, to favor surgery and for radiation oncologists to lean more toward radiation. Doctors specializing in newer types of treatment may be more likely to recommend their therapies. Talking to each of them may give you a better perspective on your options. Your primary care doctor may also be helpful in sorting out which treatment might be right for you.

You might find that speaking with others who have faced or are currently facing the same issues is useful. The American Cancer Society's program, Man to Man, and similar programs sponsored by other organizations provide a forum for you to meet and discuss these and other cancer-related issues. For more information about our programs, call us toll-free at 1-800- 227-2345 or visit our Web site at www.cancer.org.

The information in the following sections describes the main treatment options available for prostate cancer in different situations. Before deciding on treatment, here are some further questions you may want to ask yourself:

- Are you the type of person who needs to do something about your cancer, even if it might result in serious side effects? Or would you be comfortable with watchful waiting/active surveillance, even if it means you might have more anxiety (and need more frequent follow-up) in the future?
- Do you feel the need to know right away whether your doctor thinks he or she was able to get all of the cancer out (a reason some men choose surgery)? Or are you

comfortable with not knowing the results of treatment for a while (as is the case in radiation therapy) if it means not having to have surgery?

- Do you prefer to go with the newest technology, which may have some theoretical advantages? Or do you prefer to go with treatment methods that are better proven and with which doctors may have more experience?
- Which potential treatment side effects (incontinence, impotence, bowel problems) might be most distressing to you?
- How important for you are issues like the amount of time spent in treatment or recovery?
- If your initial treatment is not successful, what would your options be at that point?

Many men find it very stressful to have to choose between treatment options, and are very fearful they will choose the "wrong" one. In many cases, there is no single best option. It's important to take your time and decide which option is right for you.

Initial treatment of prostate cancer by stage

The "How is prostate cancer staged?" section of this document explains how the T, N, and M classifications are used to stage your cancer. The stage of your cancer is one of the most important factors in choosing the best way to treat it.

What follows is a description of the treatments that may be options for men with prostate cancer diagnosed at a specific stage. But keep in mind that other factors, such as age, life expectancy, and risk of cancer recurrence after treatment must also be taken into account when looking at treatment options.

Stage I

These prostate cancers are small (T1 or T2a) and have not grown out of the prostate. They have low Gleason scores (6 or less) and low PSA levels (less than 10). They usually grow very slowly and may never cause any symptoms or other health problems.

For men without any prostate cancer symptoms who are elderly and/or have other serious health problems that may limit their lifespan, active surveillance is often recommended. For men who wish to start treatment, radiation therapy (external beam or brachytherapy) or androgen deprivation may be options.

Men who are younger and healthy may consider active surveillance (knowing that they may later need to be treated), radical prostatectomy, or radiation therapy (external beam or brachytherapy).

Stage II

Stage II cancers have not yet grown outside of the prostate gland, but are larger (T2), have higher Gleason scores, and/or have higher PSA levels than stage I tumors.

Compared with stage I prostate cancers, stage II cancers that are not treated with surgery or radiation are more likely to eventually spread beyond the prostate and cause symptoms.

As with stage I cancers, active surveillance by following PSA levels is often a good option for men whose cancer is not causing any symptoms and who are elderly and/or have other serious health problems. Radical prostatectomy and radiation therapy (external beam or brachytherapy) may also be appropriate options.

Treatment options for men who are younger and otherwise healthy may include:

- Radical prostatectomy (often with removal of the pelvic lymph nodes). This may be followed by external beam radiation if your cancer is found to have spread beyond the prostate at the time of surgery, or if the PSA level is still detectable after surgery.
- External beam radiation only*
- Brachytherapy only*
- Brachytherapy and external beam radiation combined*
- Taking part in a clinical trial of newer treatments

*All the radiation options may be combined with several months of hormone therapy if there is a greater chance of recurrence based on PSA level and/or Gleason score.

Stage III

Stage III cancers have grown outside of the prostate capsule but have not reached the bladder or rectum (T3). They have not spread to lymph nodes (N0) or distant organs (M0). These cancers are more likely to come back (recur) after treatment than earlier stage tumors.

Treatment options at this stage may include:

- External beam radiation plus hormone therapy
- Hormone therapy only
- Radical prostatectomy in selected cases (often with removal of the pelvic lymph nodes). This may be followed by radiation therapy.
- Active surveillance for those who have another more serious illness
- Taking part in a clinical trial of newer treatments

Stage IV

Stage IV cancers have already spread to the bladder or rectum (T4), lymph nodes (N1), or distant organs such as the bones (M1). A few T4 cancers may be curable, but most stage IV cancers cannot be cured with standard treatment.

Treatment options may include:

- Hormone therapy
- External beam radiation plus hormone therapy (in selected cases)
- Surgery (TURP) to relieve symptoms such as bleeding or urinary obstruction
- Active surveillance for those who have another serious illness
- Taking part in a clinical trial of newer treatments

If symptoms are not relieved by standard treatments and the cancer continues to grow and spread, chemotherapy may be an option. You may also want to think about taking part in a clinical trial. Treatment of stage IV prostate cancer may also include treatments for relief of symptoms such as bone pain.

Following PSA levels after treatment meant to cure prostate cancer

The PSA level is often a good indicator of whether or not initial treatment was successful. Generally speaking, your PSA level should get very low after treatment. But PSA results aren't always cut and dry, and sometimes doctors aren't sure what they mean.

After surgery

The PSA should fall to an undetectable level within a couple of months after radical prostatectomy. Because some PSA may remain in the blood for several weeks after surgery, even if all of the prostate cells were removed, doctors often advise waiting at least 6 to 8 weeks after surgery before getting the test.

Blood tests have become much more sensitive in recent years -- so sensitive that they can detect very small amounts of PSA. This would seem to be a good thing, but it has made it more difficult to define exactly what an "undetectable" PSA level is. For example, a PSA of 0.5 (ng/mL) after surgery might be concerning, but doctors aren't sure whether this is also true of levels of 0.01 or 0.02. Some doctors would advise following such PSA levels over time to get a better idea of what may be going on, possibly with repeat tests every few months. Others might be more inclined to recommend further treatment. Of course, this uncertainty can be very stressful for patients and their families.

After radiation therapy

The different types of radiation therapy don't kill all of the cells in the prostate gland, so they're not expected to cause the PSA to drop to an undetectable level. The remaining normal prostate cells will continue to make some PSA.

The pattern of the drop in PSA is also different than with surgery. PSA levels after radiation tend to drop gradually, and may not reach their lowest level until 2 years or more after treatment.

Doctors tend to follow the PSA levels every few months to look for trends. A one-time, small rise in PSA might be a cause for closer monitoring, but it may not necessarily mean that the cancer has returned, as PSA levels may fluctuate slightly from time to time. However, a PSA that is rising on consecutive tests after treatment might indicate that cancer is still present. Some medical groups have proposed that a PSA rise of more than 2 above the lowest level it reached should be used as the cutoff point, but it's not clear if all doctors agree with this.

There is also a phenomenon called a "PSA bounce" that sometimes happens after brachytherapy. The PSA rises slightly for a short time within the first couple of years after treatment, but then falls back down. Doctors aren't sure why this happens, but it doesn't seem to have an effect on a patient's prognosis.

Prostate cancer that remains or recurs after treatment

If the PSA level shows that the prostate cancer has not been cured or has come back (recurred) after an initial attempt to cure it, further treatment may be an option. Follow-up therapy will depend on where the cancer is thought to be located and what treatment(s) you have already had. Usually, the same type of treatment is not an option because of the increased potential for serious side effects. For example, men who have already had radiation therapy to the prostate cannot have that area treated with radiation again. Imaging tests such as CT, MRI, or bone scans may be done to get a better idea about where the cancer may be.

If the cancer is still thought to be localized to the area of the prostate, a second attempt at curative treatment may be possible. If you've had a radical prostatectomy, radiation therapy may be an option. If your first treatment was radiation, treatment options include cryosurgery or radical prostatectomy, but when radical prostatectomy is done after radiation, it does carry a higher risk for potential side effects including incontinence.

If the cancer has spread outside the prostate gland, it will most likely go first to nearby lymph nodes, and then to the bones. Much less often the cancer will spread to the liver or other organs.

When prostate cancer has spread to other parts of the body (including the bones), hormone therapy is probably the most effective treatment, but it is very unlikely to cure the cancer. Usually the first treatment is an LHRH analog. If this stops working, an anti-androgen may be added. Other hormonal agents such as ketoconazole or estrogens (female hormones) may be helpful and can sometimes slow or stop the cancer from growing. Hormone therapy will be given as long as the cancer is responding (based on the PSA level and whether or not symptoms develop).

Remember that prostate cancer is usually slow growing, so even if it does come back, it may not cause problems for many years. In a Johns Hopkins University study of men whose PSA level began to rise after surgery for low-grade prostate cancer, there was an average of about 8 years before there were signs the cancer had spread to distant parts of the body. Of course, these signs appeared earlier in some men and later in others.

Hormone-refractory prostate cancer (HRPC)

Cancer that no longer responds to hormone therapy such as LHRH analogs or anti-androgens is considered hormone-refractory, and can be hard to treat. At one time it was thought that chemotherapy was not effective against prostate cancer, but in recent years this notion has been challenged. Several chemotherapy drugs have been shown to reduce PSA levels and improve quality of life. Studies have shown that the drug docetaxel (Taxotere) can improve help men with HRPC live longer, as well as reduce their cancer pain. If docetaxel stops working, the new drug cabazitaxel (Jevtana) can also help. The cancer vaccine sipuleucel-T (Provenge) may also help prolong life for men with HRPC.

Bisphosphonates appear to be helpful for many men whose cancer has spread to the bones. These drugs can reduce pain and even slow cancer growth in many cases. There are also other medicines and methods to keep pain and other symptoms under control. External radiation therapy can help treat bone pain if it is only in a few spots. Radioactive strontium or samarium may reduce pain if it is more widespread, and may also slow the growth of the cancer.

If you are having pain from your prostate cancer, make sure your doctor and entire care team is aware of this. There are many very effective drugs that can relieve pain. But for this to happen, you must make it clear to your doctor that you have pain. For more information, see our document, *Advanced Cancer*.

There are several promising new agents now being tested against prostate cancer, including vaccines, monoclonal antibodies, and differentiating agents. Because our ability to treat hormone-refractory prostate cancer is still not good enough, men are encouraged to explore new options by taking part in clinical trials.

More treatment information

For more details on treatment options -- including some that may not be addressed in this document -- the National Comprehensive Cancer Network (NCCN) and the National Cancer Institute (NCI) are good sources of information.

The NCCN, made up of experts from many of the nation's leading cancer centers, develops cancer treatment guidelines for doctors. These are available on the NCCN Web site (www.nccn.org).

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site (www.cancer.gov). Detailed guidelines intended for use by cancer care professionals are also available on www.cancer.gov.

What should you ask your doctor about prostate cancer?

It is important for you to have honest, open discussions with your cancer care team. They want to answer all of your questions, no matter how minor you might think they are. For instance, consider asking these questions:

- What are the chances that the cancer has spread beyond my prostate? If so, is it still curable?
- What further tests (if any) do you recommend, and why?
- What is the clinical stage and Gleason score (grade) of my cancer? What do those mean in my case? Does this make me a low risk, intermediate risk or high risk patient?
- What is my expected survival rate based on clinical stage, grade, and various treatment options?
- Should I consider active surveillance as an option? Why or why not?
- Do you recommend a radical prostatectomy or radiation? Why or why not?
- If you recommend radical prostatectomy, will it be nerve sparing?
- Should I consider laparoscopic or robot-assisted prostatectomy?
- What types of radiation therapy might work best for me?
- What other treatment(s) might be right for me? Why?
- Among those treatments, what are the risks or side effects that I should expect?
- What are the chances that I will have problems with incontinence or impotence?
- What are the chances that I will have other urinary or rectal problems?
- What are the chances of recurrence of my cancer with the treatment programs we have discussed? What would be our next step if this happened?
- Should I follow a special diet?
- Is there another kind of doctor I should see?

In addition to these sample questions, be sure to write down some of your own. For instance, you might want to ask about recovery time so that you can plan your work schedule. If you are younger, you may want to discuss your plans for children if there is a possibility you could become impotent or sterile. You also may want to ask about second opinions or about clinical trials for which you may qualify.

What happens after treatment for prostate cancer?

Completing treatment can be both stressful and exciting. You may be relieved to finish treatment, but find it hard not to worry about cancer coming back. (When cancer comes back after treatment, it is called *recurrence*.) This is a very common concern in people who have had cancer.

It may take a while before your fears lessen. But it may help to know that many cancer survivors have learned to live with this uncertainty and are living full lives. Our document, *Living With Uncertainty: The Fear of Cancer Recurrence*, gives more detailed information on this.

Follow-up care

When treatment ends, your doctors will still want to watch you closely. It is very important to go to all of your follow-up appointments. During these visits, your doctors will ask questions about any problems you may have and may do exams and lab tests or x-rays and scans to look for signs of cancer or treatment side effects.

Your doctor should give you a follow-up plan. This plan usually includes regular doctor visits, PSA blood tests, and digital rectal exams, which will likely begin within a few months of finishing treatment. Most doctors recommend PSA tests about every 3-6 months for the first 5 years after treatment, and at least yearly after that. Bone scans or other imaging tests may also be done, depending on your medical situation.

Almost any cancer treatment can have side effects. Some may last for a few weeks to months, but others can last the rest of your life. This is the time for you to talk to your cancer care team about any changes or problems you notice and any questions or concerns you have.

It is important to keep health insurance. Tests and doctor visits cost a lot, and even though no one wants to think of their cancer coming back, this could happen.

Prostate cancer can recur many years after initial treatment, which is why it is important to keep regular doctor visits and report any new symptoms (such as bone pain or problems with urination). Should your prostate cancer come back, your treatment options will depend on where it is thought to be located and what types of treatment you've already had. For more information, see the section, "How is prostate cancer treated?"

Should your cancer come back, our document, *When Your Cancer Comes Back: Cancer Recurrence* can give you information on how to manage and cope with this phase of your treatment.

Seeing a new doctor

At some point after your cancer diagnosis and treatment, you may find yourself seeing a new doctor who does not know anything about your medical history. It is important that you be able to give your new doctor the details of your diagnosis and treatment. Make sure you have this information handy:

- A copy of your pathology report(s) from any biopsies or surgeries
- If you had surgery, a copy of your operative report(s)
- If you had radiation therapy, a copy of your treatment summary
- If you were hospitalized, a copy of the discharge summary that every doctor must prepare when patients are sent home from the hospital
- Finally, since some drugs can have long-term side effects, a list of your drugs (including chemotherapy, hormone therapy, and vaccine therapy), drug doses, and when you took them

The doctor may want copies of this information for his records, but always keep copies for yourself.

Lifestyle changes

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life -- making choices to help you stay healthy and feel as well as you can. This can be a time to look at your life in new ways. Maybe you are thinking about how to improve your health over the long term. Some people even start during cancer treatment.

Making healthier choices

For many people, a diagnosis of cancer helps them focus on their health in ways they may not have thought much about in the past. Are there things you could do that might make you healthier? Maybe you could try to eat better or get more exercise. Maybe you could cut down on the alcohol, or give up tobacco. Even things like keeping your stress level under control may help. Now is a good time to think about making changes that can have positive effects for the rest of your life. You will feel better and you will also be healthier.

You can start by working on those things that worry you most. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society for information and support. This tobacco cessation and coaching service can help increase your chances of quitting for good.

Eating better

Eating right can be hard for anyone, but it can get even tougher during and after cancer treatment. Treatment may change your sense of taste. Nausea can be a problem. You may not feel like eating and lose weight when you don't want to. Or you may have gained weight that you can't seem to lose. All of these things can be very frustrating.

If treatment caused weight changes or eating or taste problems, do the best you can and keep in mind that these problems usually get better over time. You may find it helps to eat small portions every 2 to 3 hours until you feel better. You may also want to ask your cancer team about seeing a dietitian, an expert in nutrition who can give you ideas on how to deal with these treatment side effects.

One of the best things you can do after cancer treatment is put healthy eating habits into place. You may be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Try to eat 5 or more servings of vegetables and fruits each day. Choose whole grain foods instead of those made with white flour and sugars. Try to limit meats that are high in fat. Cut back on processed meats like hot dogs, bologna, and bacon. Better yet, don't eat any of these, if you can. If you drink alcohol, limit yourself to 1 or 2 drinks a day at the most.

Rest, fatigue, work, and exercise

Extreme tiredness, called *fatigue*, is very common in people treated for cancer. This is not a normal tiredness, but a "bone-weary" exhaustion that doesn't get better with rest. For some people, fatigue lasts a long time after treatment, and can make it hard for them to exercise and do other things they want to do. But exercise can help reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel better physically and emotionally and can cope better, too.

If you were sick and not very active during treatment, it is normal for your fitness, endurance, and muscle strength to decline. Any plan for physical activity should fit your own situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old who plays tennis twice a week. If you haven't exercised in a few years, you will have to start slowly -- maybe just by taking short walks.

Talk with your health care team before starting anything. Get their opinion about your exercise plans. Then, try to find an exercise buddy so you're not doing it alone. Having family or friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, you will need to balance activity with rest. It is OK to rest when you need to. Sometimes it's really hard for people to allow themselves to rest when they are used to working all day or taking care of a household, but this is not the time to push yourself too hard. Listen to your body and rest when you need to. (For more information on dealing with fatigue, please see *Fatigue in People With Cancer* and *Anemia in People With Cancer*.)

Keep in mind exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- Along with a good diet, it will help you get to and stay at a healthy weight.
- It makes your muscles stronger.
- It reduces fatigue and helps you have more energy.
- It can help lower anxiety and depression.
- It makes you feel happier.
- It helps you feel better about yourself.

And long term, we know that exercise plays a role in helping to lower the risk of some cancers. In the American Cancer Society guidelines on physical activity for cancer prevention, we recommend that adults take part in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity are even better.

How about your emotional health?

When treatment ends, you may find yourself overcome with many different emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through each day. Now it may feel like a lot of other issues are catching up with you.

You may find yourself thinking about death and dying. Or maybe you're more aware of the effect the cancer has on your family, friends, and career. You may take a new look at your relationship with those around you. Unexpected issues may also cause concern. For instance, as you feel better and have fewer doctor visits, you will see your health care team less often and have more time on your hands. These changes can make some people anxious.

Almost everyone who has been through cancer can benefit from getting some type of support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or one-on-one counselors. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

The cancer journey can feel very lonely. It is not necessary or good for you to try to deal with everything on your own. And your friends and family may feel shut out if you do not include them. Let them in, and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with a group or resource that may work for you.

If treatment stops working

If cancer keeps growing or comes back after one kind of treatment, it is possible that another treatment plan might still cure the cancer, or at least shrink it enough to help you live longer and feel better. But when a person has tried many different treatments and the cancer has not gotten any better, the cancer tends to become resistant to all treatment. If this happens, it's important to weigh the possible limited benefits of a new treatment against the possible downsides. Everyone has their own way of looking at this.

This is likely to be the hardest part of your battle with cancer -- when you have been through many medical treatments and nothing's working anymore. Your doctor may offer you new options, but at some point you may need to consider that treatment is not likely to improve your health or change your outcome or survival.

If you want to continue to get treatment for as long as you can, you need to think about the odds of treatment having any benefit and how this compares to the possible risks and side effects. In many cases, your doctor can estimate how likely it is the cancer will respond to treatment you are considering. For instance, the doctor may say that more chemo or radiation might have about a 1% chance of working. Some people are still tempted to try this. But it is important to think about and understand your reasons for choosing this plan.

No matter what you decide to do, you need to feel as good as you can. Make sure you are asking for and getting treatment for any symptoms you might have, such as nausea or pain. This type of treatment is called *palliative care*.

Palliative care helps relieve symptoms, but is not expected to cure the disease. It can be given along with cancer treatment, or can even be cancer treatment. The difference is its purpose - the main purpose of palliative care is to improve the quality of your life, or help you feel as good as you can for as long as you can. Sometimes this means using drugs to help with symptoms like pain or nausea. Sometimes, though, the treatments used to control your symptoms are the same as those used to treat cancer. For instance, radiation might be used to help relieve bone pain caused by cancer that has spread to the bones. Or chemo might be used to help shrink a tumor and keep it from blocking the bowels. But this is not the same as treatment to try to cure the cancer.

At some point, you may benefit from hospice care. This is special care that treats the person rather than the disease; it focuses on quality rather than length of life. Most of the time, it is given at home. Your cancer may be causing problems that need to be managed, and hospice focuses on your comfort. You should know that while getting hospice care often means the end of treatments such as chemo and radiation, it doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. In hospice the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult time. You can learn more about hospice in our document called *Hospice Care*.

Staying hopeful is important, too. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends -- times that are filled with happiness

and meaning. Pausing at this time in your cancer treatment gives you a chance to refocus on the most important things in your life. Now is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do. Though the cancer may be beyond your control, there are still choices you can make.

What's new in prostate cancer research and treatment?

Research into the causes, prevention, and treatment of prostate is under way in many medical centers throughout the world.

Genetics

New research on genes linked to prostate cancer is helping scientists better understand how prostate cancer develops. These studies are expected to provide answers about the genetic changes that lead to prostate cancer. This could make it possible to design medicines to reverse those changes. Tests to find abnormal prostate cancer genes could also help identify men at high risk who would benefit from more intensive screening or from chemoprevention trials, which use drugs to try to keep them from getting cancer.

Most of the genes that have been studied so far are from chromosomes that are inherited from both parents. One recent study found that a certain variant of mitochondrial DNA, which is inherited only from a person's mother, might double or even triple a man's risk of developing prostate cancer.

An exciting new development in genetics research is the use of *DNA microarray* technology which allows scientists to study thousands of genes at the same time. Using this method, researchers have identified several genes now thought to play a role in prostate cancer. This may eventually provide more sensitive screening test for prostate cancer than the PSA blood test currently in use.

One of the biggest problems now facing men with prostate cancer and their doctors is figuring out which cancers are likely to stay within the gland and which are more likely to grow and spread (and definitely need treatment). New discoveries may help with this some time in the near future. For example, the product of one gene identified by DNA microarray, known as EZH2, seems to appear more often in advanced prostate cancers than in those at an early stage. Researchers are now trying to decide whether the presence of this gene product, or others, indicates that a cancer is more aggressive. This could eventually help tell which men need treatment and which might be better served by watchful waiting.

Prevention

Researchers continue to look for foods that increase or decrease prostate cancer risk. Scientists have found some substances in tomatoes (lycopenes) and soybeans (isoflavones) that may help prevent prostate cancer. Studies are now looking at the

possible effects of these compounds more closely. Scientists are also trying to develop related compounds that are even more potent and might be used as dietary supplements. So far, most research suggests that a balanced diet including these foods as well as other fruits and vegetables is of greater benefit than taking these substances as dietary supplements.

Some studies have suggested that certain vitamin and mineral supplements (such as vitamin E and selenium) might lower prostate cancer risk. But a large study of this issue, called the Selenium and Vitamin E Cancer Prevention Trial (SELECT), found that neither vitamin E nor selenium supplements lowered prostate cancer risk after daily use for about 5 years.

Another vitamin that may be important is vitamin D. Recent studies have found that men with high levels of vitamin D seem to have a lower risk of developing the more lethal forms of prostate cancer. Overall though, studies have not found that vitamin D is protective for prostate cancer.

Many people assume that vitamins are natural substances that cause no harm, but recent research has shown that high doses may be harmful, including those supplements marketed specifically for prostate cancer. One study found that men who take more than 7 multivitamin tablets per week may have an increased risk of developing advanced prostate cancer.

Scientists have also tested certain hormonal medicines called 5 alpha-reductase inhibitors as a way of reducing prostate cancer risk. The results of these studies were discussed above in the section, "Can prostate cancer be prevented?"

Early detection

Doctors agree that the PSA blood test is not a perfect test for finding prostate cancer early. It misses some cancers, and in other cases it is elevated when cancer isn't present. Researchers are working on two strategies to address this problem.

One approach is to try to improve on the test that measures the total PSA level, as described in the section, "Can prostate cancer be found early?" The percent-free PSA is one way to do this, although it requires two separate tests. Another option might be to measure only the "complexed" PSA (the portion of PSA that is not "free") to begin with, instead of the total and free PSA. This one test could give the same amount of information as the other two done separately. Studies are now under way to see if this test provides the same level of accuracy.

The other approach is to develop new tests based on other tumor markers. Several newer blood tests seem to be more accurate than the PSA test, based on early studies. Another approach is to look for signs of the body's own immune reaction to substances made by prostate cancer cells. While early results have been promising, these and other new tests are not yet available outside of research labs and will require more study before they are widely used to test for prostate cancer.

Other new tests under study are urine tests. One test looks at the level of something called prostate cancer gene 3 (PCA3) in the urine. The higher the level, the more likely that prostate cancer is present. In studies, it was used along with the PSA test. Another test looks for an abnormal gene called TMPRSS2:ERG in prostate cells. The cells to be tested are found in urine given after a rectal exam. This gene is found in about half of all localized prostate cancers. It is rarely found in the cells of men without prostate cancer. Studies are underway to develop this into a test for early detection of prostate cancer.

Diagnosis

Doctors performing prostate biopsies often rely on transrectal ultrasound (TRUS), which creates black and white images of the prostate using sound waves, to know where to take samples from. But standard ultrasound may not detect some areas containing cancer. A newer approach is to measure blood flow within the gland using a technique called *color Doppler ultrasound*. (Tumors often have more blood vessels around them than normal tissue.) It may make prostate biopsies more accurate by helping to ensure the right part of the gland is sampled. An even newer technique may enhance color Doppler further. It involves first injecting the patient with a contrast agent containing microbubbles. Promising results have been reported, but more studies will be needed before its use becomes common. This test is currently only available as a part of a clinical trial.

Staging

Staging plays a key role in deciding which treatment options a man may be eligible for. But imaging tests for prostate cancer such as CT and MRI scans can't detect all cancers, especially small areas of cancer in lymph nodes. A newer method, called *enhanced MRI*, may help find lymph nodes that contain cancer. Patients first have a standard MRI. They are then injected with tiny magnetic particles and have another scan done the next day. Differences between the 2 scans point to possible cancer cells in the lymph nodes. Early results of this technique are promising, but it needs more research before it becomes widely used.

Treatment

This is a very active area of research. Newer treatments are being developed, and improvements are being made among many standard prostate cancer treatment methods.

Surgery

If the nerves that control erections (which run along either side of the prostate) must be removed during the operation, a man will become impotent. Some doctors are now exploring the use of nerve *grafts to replace cut nerves and restore potency*. *These grafts could be nerves removed from other parts of the body or something artificial*. This is still considered an experimental technique, and not all doctors agree as to its usefulness. Further study is under way.

Radiation therapy

As described in the section, "How is prostate cancer treated?" advances in technology are making it possible to aim radiation more precisely than in the past. Currently used methods such as conformal radiation therapy (CRT), intensity modulated radiation therapy (IMRT), and proton beam radiation allow doctors to treat only the prostate gland and avoid radiation to normal tissues as much as possible. These methods are expected to increase the effectiveness of radiation therapy while reducing the side effects. Studies are being done to find out which radiation techniques are best suited for specific groups of patients with prostate cancer.

Technology is making other forms of radiation therapy more effective as well. New computer programs allow doctors to better plan the radiation doses and approaches for both external radiation therapy and brachytherapy. Planning for brachytherapy can now even be done during the procedure (intraoperatively).

Newer treatments for localized disease

Researchers are looking at newer forms of treatment for early stage prostate cancer. These new treatments could be used either as the first type of treatment or be used after radiation therapy in cases where it was not successful.

One promising treatment, known as *high-intensity focused ultrasound (HIFU)*, destroys cancer cells by heating them with highly focused ultrasonic beams. This treatment has been used more in Europe, but it is not commonly employed in the United States at this time. Studies are now under way to determine its safety and effectiveness.

Nutrition and lifestyle changes

A recent study found that in men with a rising PSA after surgery or radiation therapy, drinking pomegranate juice seemed to slow the time it took the PSA level to double. Larger studies are now under way to try to confirm these results.

Some encouraging early results have also been reported with flaxseed supplements. One small study in men with early prostate cancer found that daily flaxseed seemed to slow the rate at which prostate cancer cells multiplied. More research is needed to confirm this finding.

A recent report found that men who chose not to have treatment for their localized prostate cancer may be able to slow its growth with intensive lifestyle changes. The men ate a vegan (no meat, fish, eggs, or dairy products) diet and exercised frequently. They also took part in support groups and yoga. After one year the men saw, on average, a slight drop in their PSA level. It isn't known whether this effect will last since the report only followed the men for 1 year. The regimen may also be hard to follow for some men.

Hormone therapy

Even though LHRH agonists stop the testicles from making testosterone, the body can still make a small amount of androgens. A new drug, abiraterone (Zytiga™), blocks an enzyme called CYP17, which is needed for the body to make many hormones, including androgens (like testosterone). This drug has been studied in men whose cancers were growing despite low testosterone levels (from LHRH agonists or orchiectomy) and who had already been treated with the chemotherapy drug docetaxel (Taxotere). Abiraterone drug lowered levels of androgens even more. It also shrank tumors, lowered PSA levels, and helped the men live longer. There were few side effects. Because of these results, the FDA recently approved abiraterone for use in the US. This drug is taken as a pill every day. Because abiraterone lowers the level of certain other hormones in the body, prednisone (a cortisone-like drug) needs to be taken as well during treatment.

Chemotherapy

Studies in recent years have shown that many chemotherapy drugs can affect prostate cancer. Some, such as docetaxel and cabazitaxel (Jevtana) have been shown to help men live longer. Other new chemotherapy drugs and combinations of drugs are now being studied.

One drug that has been studied is satraplatin, which is taken as a pill. It was given to men with advanced, hormone-refractory prostate cancer whose cancer had already been treated with at least one chemo drug. It did help keep the cancers from growing, but it didn't seem to help the men live longer.

Prostate cancer vaccines

Several types of vaccines for boosting the body's immune response to prostate cancer cells are being tested in clinical trials. Unlike vaccines against infections like measles or mumps, these vaccines are designed to help treat, not prevent, prostate cancer. One possible advantage of these types of treatments is that they seem to have very limited side effects. One example of this type of vaccine which has received FDA approval is sipuleucel-T (Provenge).

Another prostate cancer vaccine (PROSTVAC-VF) uses a virus that has been genetically modified to contain prostate-specific antigen (PSA). The patient's immune system should respond to the virus and begin to recognize and destroy cancer cells containing PSA. This vaccine is still in early-stage clinical trials.

Several other prostate cancer vaccines are also in development.

Angiogenesis inhibitors

Growth of prostate cancer tumors depends on growth of blood vessels (angiogenesis) to nourish the cancer cells. Looking at angiogenesis in prostate cancer specimens may help

predict treatment outcomes. Cancers that stimulate many new vessels to grow are harder to treat and have a poorer outlook.

New drugs are being studied that may be useful in stopping prostate cancer growth by keeping new blood vessels from forming. Several anti-angiogenic drugs are already being tested in clinical trials. One of these is thalidomide, which has been approved by the FDA to treat patients with multiple myeloma. It is being combined with chemotherapy in clinical trials to treat men with advanced prostate cancer. While promising, this drug can cause major side effects, including constipation, drowsiness, and nerve damage.

Another drug, bevacizumab (Avastin[®]), is FDA-approved to treat patients with other cancers. It is now being tested in combination with hormone therapy and chemotherapy in men with advanced prostate cancer.

Treating bone pain

Doctors are now studying the use of *radiofrequency ablation (RFA)* to help control pain in men whose prostate cancer has spread to one or more areas in the bones. During RFA, the doctor uses computed tomography (CT) or ultrasound to guide a small metal probe into the area of the tumor. A high frequency current passed through the probe heats and destroys the tumor. RFA has been used for many years to treat tumors in other organs such as the liver, but its use in treating bone pain is still fairly new. Still, early results are promising.

Additional resources

More information from your American Cancer Society

The following information may also be helpful to you. These materials may be viewed on our Web site or ordered from our toll-free number, 1-800-227-2345.

Caring for the Person With Cancer at Home: A Guide for Patients and Families (also available in Spanish)

Guidelines for the Early Detection of Cancer (also available in Spanish)

Managing Incontinence After Treatment For Prostate Cancer

Sexuality and Cancer: For the Man Who Has Cancer and His Partner (also available in Spanish)

Understanding Chemotherapy: A Guide for Patients and Families (also available in Spanish)

Understanding Radiation Therapy: A Guide for Patients and Families (also available in Spanish)

The following books are available from the American Cancer Society. Call us at 1-800-227-2345 to ask about costs or to place your order.

American Cancer Society's Complete Guide to Prostate Cancer

American Cancer Society's Guide to Pain Control: Understanding and Managing Cancer Pain

Cancer in the Family: Helping Children Cope With a Parent's Illness

Caregiving: A Step-By-Step Resource for Caring for the Person With Cancer at Home

National organizations and Web sites*

In addition to the American Cancer Society, other sources of patient information and support include:

American Urological Association Foundation

Toll-free number: 1-866-746-4282 (1-866-RING-AUA)

Web site: www.urologyhealth.org

National Association for Continence

Toll-free number: 1-800-252-3337 (1-800-BLADDER)

Web site: www.nafc.org

National Cancer Institute

Toll-free number: 1-800-422-6237 (1-800-4-CANCER); TYY: 1-800-332-8615

Web site: www.cancer.gov

National Coalition for Cancer Survivorship

Toll-free number: 1-888-650-9127

1-877-622-7937 (1-877-NCCS-YES) for some publications and Cancer Survivor Toolbox® orders

Web site: www.canceradvocacy.org

ZERO - The Project to End Prostate Cancer (formerly National Prostate Cancer Coalition)

Toll-free number: 1-888-245-9455

Web site: www.zerocancer.org

Prostate Cancer Foundation (formerly "CaPCURE")

Toll-free number: 1-800-757-2873 (1-800-757-CURE) or 1-310-570-4700

Web site: www.pcf.org

US Too International, Inc.

Toll-free number: 1-800-808-7866 (1-800-80US TOO) or 1-630-795-1002 (Chicago area)

Web site: www.ustoo.com

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345** or visit www.cancer.org.

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