



Treating Prostate Cancer

Once your prostate cancer has been [diagnosed](#) and [staged](#), you have a lot to think about before you and your doctor choose a treatment plan. It's important that you think carefully about each of your choices. You will want to weigh the benefits of each treatment option against the possible risks and side effects.

Which treatments are used for prostate cancer?

Depending on each case, treatment options for men with prostate cancer might include:

- [Watchful waiting or active surveillance](#)
- [Surgery](#)
- [Radiation therapy](#)
- [Cryotherapy \(cryosurgery\)](#)
- [Hormone therapy](#)
- [Chemotherapy](#)
- [Vaccine treatment](#)
- [Bone-directed treatment](#)

These treatments are generally used one at a time, although in some cases they may be combined.

To learn about the most common approaches to treating prostate cancer, see these topics:

- [Things to think about when considering treatment options](#)
- [Typical treatment options based on the stage of the cancer](#)
- [Following PSA levels during and after treatment](#)
- [Dealing with prostate cancer that doesn't go away or recurs \(comes back\) after treatment](#)

Which doctors treat prostate cancer?

The main types of doctors who treat prostate cancer include:

- **Urologists:** surgeons who treat diseases of the urinary system and male reproductive system (including the prostate)
- **Radiation oncologists:** doctors who treat cancer with radiation therapy
- **Medical oncologists:** doctors who treat cancer with medicines such as chemotherapy or hormone therapy

Many other specialists might be part of your treatment team as well, including physician assistants (PAs), nurse practitioners (NPs), nurses, nutrition specialists, social workers, and other health care providers. See [Health Professionals Associated With Cancer Care](#) for more on this.

Making treatment decisions

It's important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. Some important things to consider include:

- The [stage](#) and [grade](#) of your cancer
- Your age and expected life span
- Any other serious health conditions you have
- Your feelings (and your doctor's opinion) about the need to treat the cancer right away
- The likelihood that treatment will cure your cancer (or help in some other way)
- Your feelings about the possible side effects from each treatment

You may feel that you must make a decision quickly, but it's important to give yourself time to absorb the information you have just learned. It's also very important to ask questions if there is anything you're not sure about. For a list of some questions to ask, see [What should you ask your health care team about prostate cancer?](#)

Getting a second opinion

You may also want to get a [second opinion](#). This can give you more information and help you feel more certain about the treatment plan you choose. Many men find it helpful to get a second opinion about the best treatment options based on their situation, especially if they have several choices.

Prostate cancer is a complex disease, and doctors can differ in their opinions regarding the best treatment options. Speaking with doctors who specialize in different kinds of treatment may help you sort through your options. If you aren't sure where to go for a second opinion, ask your doctor for help.

Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. Sometimes they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials. See [Clinical Trials](#) to learn more.

Considering complementary and alternative methods

You may hear about [alternative or complementary treatment methods](#) that your doctor hasn't mentioned. These methods can include vitamins, herbs, special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used *along with* your regular medical care. *Alternative treatments* are used *instead of* a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be dangerous.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

Choosing to stop treatment or choosing no treatment at all

For some men, when treatments have been tried and are no longer controlling the cancer, it is often helpful to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life. Learn more in [If Cancer Treatments Stop Working](#).

Some men, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk this through with your doctors before you make this decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

Help getting through treatment

Your cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services are an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab services, or spiritual help.

The American Cancer Society also has [programs and services](#) – including rides to treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

The treatment information here is not official policy of the American Cancer 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.

Watchful Waiting or Active Surveillance for Prostate Cancer

Because prostate cancer often grows very slowly, some men (especially those who are older or have other serious health problems) might never need treatment for their prostate cancer. Instead, their doctors may recommend approaches known as *watchful waiting* or *active surveillance*. (Other terms sometimes used include *observation* or *expectant management*.)

Some doctors use the terms active surveillance and watchful waiting to mean the same thing. For other doctors these terms mean something slightly different:

- **Active surveillance** is often used to mean monitoring the cancer closely. Usually

this approach includes a doctor visit with a [prostate-specific antigen \(PSA\) blood test](#) and [digital rectal exam \(DRE\)](#) about every 6 months. [Prostate biopsies](#) may be done every year as well. If your test results change, your doctor would then talk to you about treatment options.

- **Watchful waiting (observation)** is sometimes used to describe a less intensive type of follow-up that may mean fewer tests and relying more on changes in a man's [symptoms](#) to decide if treatment is needed.

Not all doctors agree with these definitions or use them exactly this way. In fact, some doctors prefer to no longer use the term watchful waiting. They feel it implies that nothing is being done, when in fact a man is still being closely monitored.

No matter which term your doctor uses, it's very important for you to understand exactly what he or she means when they refer to it.

When might these approaches be an option?

One of these approaches might be recommended if your cancer:

- Isn't causing any symptoms
- Is expected to grow slowly (based on [Gleason score](#))
- Is small
- Is just in the prostate

These approaches are not likely to be a good option if you have a fast-growing cancer (for example, a high Gleason score) or if the cancer is likely to have spread outside the prostate (based on PSA levels). Men who are young and healthy are less likely to be offered active surveillance, out of concern that the cancer might become a problem over the next 20 or 30 years.

Watchful waiting and active surveillance are reasonable options 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 to try to remove or destroy the cancer.

In active surveillance, only men whose cancer is growing (and therefore have a more serious form of cancer) are treated. This lets men with less serious cancer avoid the side effects of a treatment that might not have helped them live longer. A possible downside of this approach is that it might give the cancer a chance to grow and spread.

This might limit your treatment options, and could possibly affect the chances of the cancer being treated successfully.

Not all experts agree how often testing should be done during active surveillance. There is also debate about when is the best time to start treatment if things change.

Comparing watchful waiting or active surveillance with active treatment

A few large studies have compared **watchful waiting** (where men were treated only if they developed symptoms from their cancer) and surgery for early stage prostate cancer, but the evidence from these studies has been mixed. Some have found that men who have surgery might live longer, while others have not found a difference in survival.

So far, no large studies have compared **active surveillance** to treatments such as surgery or radiation therapy. Some early studies of men who are good candidates for active surveillance have shown that only about a third of the men need to go on to treatment with radiation or surgery.

- [References](#)

[See all references for Prostate Cancer](#)

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Surgery for Prostate Cancer

Surgery is a common choice to try to cure prostate cancer if it is not thought to have spread outside the prostate gland.

The main type of surgery for prostate cancer is a *radical prostatectomy*. In this operation, the surgeon removes the entire prostate gland plus some of the tissue around it, including the [seminal vesicles](#). A radical prostatectomy can be done in different ways.

Open approaches to radical prostatectomy

In the more traditional approach to doing a prostatectomy, the surgeon operates through a single long skin incision (cut) to remove the prostate and nearby tissues. This type of surgery, sometimes referred to as an *open* approach, is now done less often than in the past.

There are 2 main ways to do this operation.

Radical retropubic prostatectomy

For this operation, the surgeon makes an incision (cut) in your lower abdomen, from the belly button down to the pubic bone. You will either be under general anesthesia (asleep) or be given spinal or epidural anesthesia (numbing the lower half of the body) along with sedation during the surgery.

If there is a reasonable chance the cancer might have spread to nearby [lymph nodes](#) (based on your [PSA level](#), [prostate biopsy](#) results, and other factors), the surgeon may also remove some of these lymph nodes at this time (known as a *lymph node biopsy*). The nodes are usually sent to the lab to see if they have cancer cells in them (it can take a few days to get results), but in some cases the nodes may be looked at during the surgery. If this is done and cancer cells are found in any of the nodes, the surgeon might not continue with the surgery. This is because it's unlikely that the cancer can be cured with surgery, and removing the prostate could lead to serious side effects.

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

You will probably stay in the hospital for a few days after the surgery, and your activities will be limited for several weeks. The possible side effects of prostatectomy are described below.

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

Laparoscopic radical prostatectomy

For a laparoscopic radical prostatectomy(LRP), the surgeon inserts special long instruments through several small incisions to remove the prostate. One of the instruments has a small video camera on the end, which lets the surgeon see inside the body.

Laparoscopic prostatectomy has some advantages over 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 need to remain in the bladder for about the same amount of time).

In experienced hands, LRP appears to be as good as open radical prostatectomy, but we do not yet have long-term results from procedures done in the United States.

The rates of major side effects from LRP, such as erection problems and trouble holding urine (incontinence) seem to be about the same as for open prostatectomy. (These side effects are described below.) Recovery of bladder control may be delayed slightly with this approach.

Robotic-assisted laparoscopic radical prostatectomy

In this approach, also known as *robotic prostatectomy*, the laparoscopic surgery is done using a robotic system. The surgeon sits at a control panel in the operating room and moves robotic arms to operate through several small incisions in the patient's abdomen.

Robotic prostatectomy has advantages over the open approach in terms of less pain, blood loss, and recovery time. But in terms of the side effects men are most concerned about, such as urinary or erection problems (described below), there doesn't seem to be a difference between robotic prostatectomy and other approaches.

For the surgeon, the robotic system may provide more maneuverability and more precision when moving the instruments than standard LRP. Still, the most important factor in the success of either type of laparoscopic surgery is the surgeon's experience and skill.

Risks and side effects of any type of radical prostatectomy

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

Risks of prostate surgery

The risks with any type of radical prostatectomy are much like those with any major surgery. Problems during or shortly after the operation can include:

- Reactions to anesthesia
- Bleeding from the surgery
- Blood clots in the legs or lungs
- Damage to nearby organs
- Infections at the surgery site.

Rarely, part of the intestine might be injured during surgery, which could lead to infections in the abdomen and might require more surgery to correct. Injuries to the intestines are more common with laparoscopic and robotic surgeries than with the open approach.

If lymph nodes are removed, a collection of lymph fluid (called a *lymphocele*) can form and may need to be drained.

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 of prostate surgery

The major possible side effects of radical prostatectomy are **urinary incontinence** (being unable to control urine) and **erectile dysfunction** (impotence; problems getting or keeping erections). These side effects can also occur with other forms of prostate cancer treatment.

Urinary incontinence: You may not be able to control your urine or have leakage or dribbling. There are different levels of incontinence. Being incontinent can affect you not only physically but emotionally and socially as well. There are 3 major types of incontinence:

- Men with **stress incontinence** might leak urine when they cough, laugh, sneeze, or

exercise. Stress incontinence is the most common type after prostate surgery. It's usually caused by problems with the valve that keeps urine in the bladder (the bladder sphincter). Prostate cancer treatments can damage the muscles that form this valve or the nerves that keep the muscles working.

- Men with **overflow incontinence** have trouble emptying their bladder. 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 scar tissue.
- Men with **urge incontinence** have a sudden need to urinate. This happens when the bladder becomes too sensitive to stretching as it fills with urine.

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

After surgery for prostate cancer, normal bladder control usually returns within several weeks or months. This recovery usually occurs slowly over time.

Doctors can't predict for sure how any man will be affected after surgery. In general, older men tend to have more incontinence problems than younger men. Large cancer centers, where prostate surgery is done often and surgeons have a lot of experience, generally report fewer problems with incontinence.

Incontinence can be treated. Even if your incontinence can't be corrected completely, it can still be helped. To learn about managing and living with incontinence, see [Managing Incontinence for Men With Cancer](#).

Erectile dysfunction (impotence): This means you can't get an erection sufficient for sexual penetration.

Erections are controlled by 2 tiny bundles of nerves that run on either side of the prostate. If you can have erections before surgery, the surgeon will try not to injure these nerves during the prostatectomy. This is known as a *nerve-sparing* approach. But if the cancer is growing into or very close to the nerves, the surgeon will need to remove them.

If both nerves are removed, you won't be able to have spontaneous erections, but you might still be able to have erections using some of the aids described below. If the nerves on only one side are removed, you might still have erections, but the chance is lower than if neither were removed. If neither nerve bundle is removed you might have normal erections at some point after surgery.

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. All men 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.

Surgeons who do many radical prostatectomies tend to report lower impotence rates than doctors who do the surgery less often. A wide range of impotency rates have been reported in the medical literature, but each man's situation is different, so the best way to get an idea of your chances for recovering erections is to ask your doctor about his or her success rates and what the outcome is likely to be in your case.

If your ability to have erections does return after surgery, it often occurs slowly. In fact, it can take from a few months up to 2 years. During the first few months, you will probably not be able to have a spontaneous erection, so you may need to use medicines or other treatments.

Most doctors feel that regaining potency is helped along by trying to get an erection as soon as possible once the body has had a chance to heal (usually several weeks after the operation). 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.

There are several options for treating erectile dysfunction:

- **Phosphodiesterase-5 (PDE5) inhibitors** such as sildenafil (Viagra), vardenafil (Levitra), and tadalafil (Cialis) are pills that can help with erections. These drugs won't work if both nerves that control erections have been damaged or removed. Common side effects of these drugs are headache, flushing (skin becomes red and feels warm), upset stomach, light sensitivity, and runny or stuffy nose. Rarely, these drugs can cause vision problems, possibly even blindness. Some other drugs such as nitrates, which are drugs used to treat heart disease, can cause problems if you are taking a PDE5 inhibitor, so be sure your doctor knows what medicines you take.
- **Alprostadil** is a man-made version of prostaglandin E1, a substance naturally made in the body that can produce erections. It can be injected almost painlessly into the base of the penis 5 to 10 minutes before intercourse or placed into the tip of the penis as a suppository. You can even increase the dosage to prolong the erection. You might have side effects, such as pain, dizziness, and prolonged erection, but they are not usually serious.
- **Vacuum devices** are another option to create an erection. These mechanical pumps are placed over the penis. The air is sucked out of the pump, which draws blood into the penis to produce an erection. The erection is maintained after the pump is removed by a strong rubber band placed at the base of the penis. The

band is removed after sex.

- **Penile implants** might restore your ability to have erections if other methods don't help. An operation is needed to put them inside the penis. There are several types of penile implants, including those using silicone rods or inflatable devices.

For more on coping with erection problems and other sexuality issues, see [Sexuality for the Man With Cancer](#).

Changes in orgasm: After surgery, the sensation of orgasm should still be pleasurable, but there is no ejaculation of semen – the orgasm is “dry.” This is because the glands that made most of the fluid for semen (the seminal vesicles and prostate) were removed during the prostatectomy, and the pathways used by sperm (the vas deferens) were cut. In some men, orgasm becomes less intense or goes away completely. Less often, men report pain with orgasm.

Loss of fertility: Radical prostatectomy cuts the vas deferens, which are the pathways between the testicles (where sperm are made) and the urethra (through which sperm leave the body). Your testicles will still make sperm, but they can't leave the body as a part of the ejaculate. This means that a man can no longer father a child the natural way. Often, this is not an issue, as men with prostate cancer tend to be older. But if it is a concern for you, you might want to ask your doctor about “banking” your sperm before the operation. To learn more, see [Fertility and Men With Cancer](#).

Lymphedema: This is a rare but possible complication of removing many of the lymph nodes around the prostate. Lymph nodes normally provide a way for fluid to return to the heart from all areas of the body. When nodes are removed, fluid can 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 go away completely. You can learn more on our [lymphedema](#) page.

Change in penis length: A possible effect of surgery is a small decrease in penis length. This is probably due to a shortening of the urethra when a portion of it is removed along with the prostate.

Inguinal hernia: A prostatectomy increases a man's chances of developing an inguinal (groin) hernia in the future.

Transurethral resection of the prostate (TURP)

This operation is more often used to treat men with non-cancerous enlargement of the prostate called benign prostatic hyperplasia (BPH). But it is also sometimes used in

men with advanced prostate cancer to help relieve symptoms, such as urination problems. (It is not used to try to cure 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 tip of the penis into the urethra to the level of the prostate. Once it is in place, either electricity is passed through a wire to heat it or a laser is used to cut or vaporize the tissue. 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 (thin, flexible tube) is inserted through the penis and 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 normal activities in 1 to 2 weeks.

You will probably have some blood in your urine after surgery. Other possible side effects from TURP include infection and any risks that come with the type of anesthesia used.

- [References](#)

[See all references for Prostate Cancer](#)

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Radiation Therapy for Prostate Cancer

Radiation therapy uses high-energy rays or particles to kill cancer cells.

When is radiation therapy used?

Radiation may be used:

- As the first treatment for cancer that is still just in the prostate gland and is low

[grade](#). Cure rates for men with these types of cancers are about the same as those for men treated with [radical prostatectomy](#).

- As part of the first treatment (along with hormone therapy) for cancers that have grown outside the prostate gland and into nearby tissues.
- If the cancer is not removed completely or comes back (recurs) in the area of the prostate after surgery.
- If the cancer is advanced, to help keep the cancer under control for as long as possible and to help prevent or relieve symptoms.

Types of radiation therapy

The 2 main types of radiation therapy used for prostate cancer are:

- External beam radiation
- Brachytherapy (internal radiation)

(Another type of radiation therapy, in which a medicine containing radiation is injected into the body, is described in [Preventing and Treating Prostate Cancer Spread to the Bone](#).)

External beam radiation therapy (EBRT)

In EBRT, beams of radiation are focused on the prostate gland from a machine outside the body. This type of radiation can be used to try to cure earlier stage cancers, or to help relieve symptoms such as bone pain if the cancer has spread to a specific area of bone.

Before treatments start, your radiation team will take careful measurements to find the correct angles for aiming the radiation beams and the proper dose of radiation. This planning session, called *simulation*, usually includes getting imaging tests such as [CT](#) or [MRI](#) scans. You might be fitted with a plastic mold resembling a body cast to keep you in the same position for each treatment so that the radiation can be aimed more accurately.

You will usually be treated 5 days a week in an outpatient center for at least several weeks, depending on why the radiation is being given. Each treatment is much like getting an x-ray. The radiation is stronger than that used for an x-ray, but the procedure is painless. Each treatment lasts only a few minutes, although the setup time — getting you into place for treatment — takes longer.

Newer EBRT techniques focus the radiation more precisely on the tumor. This lets doctors give higher doses of radiation to the tumor while reducing the radiation exposure to nearby healthy tissues.

Three-dimensional conformal radiation therapy (3D-CRT)

3D-CRT uses special computers to precisely map the location of your prostate. Radiation beams are then shaped and aimed at the prostate from several directions, which makes it less likely to damage normal tissues.

Intensity modulated radiation therapy (IMRT)

IMRT, an advanced form of 3D therapy, is the most common type of EBRT for prostate cancer. It uses a computer-driven machine that moves around the patient as it delivers radiation. Along with shaping the beams and aiming them at the prostate from several angles, the intensity (strength) of the beams can be adjusted to limit the doses reaching nearby normal tissues. This lets doctors deliver an even higher dose to the cancer.

Some newer radiation machines have imaging scanners built into them. This advance, known as **image guided radiation therapy (IGRT)**, lets the doctor take pictures of the prostate and make minor adjustments in aiming just before giving the radiation. This may help deliver the radiation even more precisely, which might result in fewer side effects, although more research is needed to prove this.

Another approach is to place tiny implants into the prostate that send out radio waves to tell the radiation therapy machines where to aim. This lets the machine adjust for movement (like during breathing) and may allow less radiation to go to normal tissues. In theory, this could lower side effects. So far, though, no study has shown side effects to be lower with this approach than with other forms of IMRT. The machines that use this are known as Calypso[®].

A variation of IMRT is called **volumetric modulated arc therapy (VMAT)**. It uses a machine that delivers radiation quickly as it rotates once around the body. This allows each treatment to be given over just a few minutes. Although this can be more convenient for the patient, it hasn't yet been shown to be more effective than regular IMRT.

Stereotactic body radiation therapy (SBRT)

This technique uses advanced image guided techniques to deliver large doses of

radiation to a certain precise area, such as the prostate. Because there are large doses of radiation in each dose, the entire course of treatment is given over just a few days.

SBRT is often known by the names of the machines that deliver the radiation, such as Gamma Knife[®], X-Knife[®], CyberKnife[®], and Clinac[®].

The main advantage of SBRT over IMRT is that the treatment takes less time (days instead of weeks). The side effects, though, are not better. In fact, some research has shown that some side effects might actually be worse with SBRT than with IMRT.

Proton beam radiation therapy

Proton beam therapy focuses beams of protons instead of x-rays on the cancer. Unlike x-rays, which release energy both before and after they hit their target, protons cause little damage to tissues they pass through and release their energy only after traveling a certain distance. This means that proton beam radiation can, in theory, deliver more radiation to the prostate while doing less damage to nearby normal tissues. Proton beam radiation can be aimed with techniques similar to 3D-CRT and IMRT.

Although in theory proton beam therapy might be more effective than using x-rays, so far studies have not shown if this is true. Right now, proton beam therapy is not widely available. The machines needed to make protons are very expensive, and they aren't available in many centers in the United States. Proton beam radiation might not be covered by all insurance companies at this time.

Possible side effects of EBRT

Some of the side effects from EBRT are the same as those from [surgery](#), while others are different.

Bowel problems: Radiation can irritate the rectum and cause a condition called *radiation proctitis*. This can lead to diarrhea, sometimes with blood in the stool, and rectal leakage. Most of these problems go away over time, but in rare cases normal bowel function does not return. To help lessen bowel problems, you may be told to follow a special diet during radiation therapy to help limit bowel movement during treatment. Sometimes a balloon-like device is put in the rectum during each treatment to keep the bowel as still as possible while treatment is given.

Urinary problems: Radiation can irritate the bladder and lead to a condition called *radiation cystitis*. You might need to urinate more often, have a burning sensation while you urinate, and/or find blood in your urine. Urinary problems usually improve over time,

but in some men they never go away.

Some men develop urinary incontinence after treatment, which means they can't control their urine or have leakage or dribbling. As described in the [surgery](#) section, there are different levels and types of incontinence. Overall, this side effect occurs less often than after surgery. The risk is low at first, but it goes up each year for several years after treatment.

Rarely, the tube that carries urine from the bladder out of the body (the urethra) may become very narrow or even close off, which is known as a *urethral stricture*. This might require further treatment to open it up again.

Erection problems, including impotence:After a few years, the impotence rate after radiation is about the same as that after surgery. Problems with erections usually do not occur right after radiation therapy but slowly develop over time. This is different from surgery, where impotence occurs immediately and may get better over time.

As with surgery, the older you are, the more likely it is you will have problems with erections. Erection problems can often be helped by treatments such as those listed in the [surgery](#) section, including medicines.

For more about coping with erection problems and other sexuality issues, see [Sexuality for the Man With Cancer](#).

Feeling tired: Radiation therapy can cause [fatigue](#) that might not go away until a few weeks or months after treatment stops.

Lymphedema: The lymph nodes normally provide a way for fluid to return to the heart from all areas of the body. If the lymph nodes around the prostate are damaged by radiation, 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 go away completely. See our [lymphedema](#) page to learn more.

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 alone is generally used only in men with early-stage prostate cancer that is relatively slow growing (low-grade).

- Brachytherapy combined with external radiation is sometimes an option for men who have a higher risk of the cancer growing outside the prostate.

The use of brachytherapy is also limited by some 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 might not work as well in men with large prostate glands because it might not be possible to place the seeds into all of the correct locations. One way to get around this may be to get a few months of [hormone therapy](#) beforehand to shrink the prostate.

Imaging tests such as transrectal [ultrasound](#), [CT scans](#), or [MRI](#) are used to help guide the placement of the radioactive pellets. Special computer programs calculate the exact dose of radiation needed.

There are 2 types of prostate brachytherapy. Both are done in an operating room. You will get either spinal anesthesia (where the lower half of your body is numbed) or general anesthesia (where you are asleep), and you might need to stay in the hospital overnight.

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 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 give off a large amount of radiation in a very small area. This limits the amount of damage to nearby healthy tissues.

Usually, around 100 seeds are placed, but this depends on the size of the prostate. Because the seeds are so small, they seldom cause discomfort, and are simply left in place after their radioactive material is used up.

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

Temporary (high dose rate, or HDR) brachytherapy

This technique is done less often. It uses higher doses of radiation that are left in place for a short time. Hollow needles are placed through the skin between the scrotum and anus and 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 over 2 days, and the radioactive substance is removed each time. After the last treatment the catheters are removed. For about a week after treatment, 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 advantage of this approach is that most of the radiation is concentrated in the prostate itself, sparing nearby normal tissues.

Possible risks and side effects of brachytherapy

Radiation precautions: If you get permanent (LDR) brachytherapy, the seeds will give off small amounts of radiation for several weeks or months. 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. If you plan on traveling, you might want to get a doctor's note regarding your treatment, as low levels of radiation can sometimes be picked up by detection systems at airports.

There's also a small risk that some of the seeds might move (migrate). You may be asked to strain your urine for the first week or so to catch any seeds that might come out. You may be asked to take other precautions as well, such as wearing a condom during sex. Be sure to 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 is uncommon and doesn't seem to cause any ill effects.

These precautions aren't needed after HDR brachytherapy, because the radiation doesn't stay in the body after treatment.

Bowel problems: Brachytherapy can sometimes irritate the rectum and cause a condition called *radiation proctitis*. Bowel problems such as rectal pain, burning, and/or diarrhea (sometimes with bleeding) can occur, but serious long-term problems are uncommon.

Urinary problems: Severe urinary incontinence (trouble controlling urine) is not a common side effect. But some men have problems with frequent urination or other symptoms due to irritation of the urethra, the tube that drains urine from the bladder. This tends to be worse in the weeks after treatment and gets better over time. Rarely, the urethra may actually close off (known as a urethral stricture) and need to be opened

with a catheter or surgery.

Erection problems: Some studies have found rates of erection problems to be lower after brachytherapy, but other studies have found that the rates were no lower than with external beam radiation or surgery. The younger you are and the better your sexual function before treatment, the more likely you will be to regain function after treatment.

Erection problems can often be helped by treatments such as those listed in the [surgery](#) section, including medicines. For more about coping with erection problems and other sexuality issues, see [Sexuality for the Man With Cancer](#).

To learn more, see the [Radiation Therapy](#) section of our website.

- [References](#)

[See all references for Prostate Cancer](#)

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Cryotherapy for Prostate Cancer

Cryotherapy (also called **cryosurgery** or **cryoablation**) is the use of very cold temperatures to freeze and kill prostate cancer cells. Despite it sometimes being called cryosurgery, it is not actually a type of surgery.

When is cryotherapy used?

Cryotherapy is sometimes used to treat early-stage prostate cancer. Most doctors do not use cryotherapy as the first treatment for prostate cancer, but it is sometimes an option if the cancer has come back after [radiation therapy](#). As with brachytherapy, this may not be a good option for men with large prostate glands.

How is cryotherapy done?

This type of procedure requires spinal or epidural anesthesia (the lower half of your body is numbed) or general anesthesia (you are asleep).

The doctor uses [transrectal ultrasound \(TRUS\)](#) to guide several hollow probes (needles) through the skin between the anus and scrotum and into the prostate. Very cold gases are then passed through the needles to freeze and destroy the prostate. To be sure the prostate is destroyed without too much damage to nearby tissues, the doctor carefully watches the ultrasound during the procedure. Warm saltwater is circulated through a catheter in the urethra during the procedure to keep it from freezing. The catheter is left in place for several weeks afterward to allow the bladder to empty while you recover.

After the procedure, you might need to stay in the hospital overnight, but many patients leave the same day.

Cryotherapy is less invasive than [surgery](#), so there is usually less blood loss, a shorter hospital stay, shorter recovery period, and less pain. But compared with surgery or radiation therapy, doctors know much less about the long-term effectiveness of cryotherapy. Cryotherapy doesn't appear to be as good as radiation for more advanced prostate tumors.

Possible side effects of cryotherapy

Side effects from cryotherapy 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.

Freezing might also affect the bladder and rectum, 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 often damages the nerves near the prostate that control erections. Erectile dysfunction is more common after cryotherapy than after radical prostatectomy. For information on coping with erection problems and other sexuality issues, see [Sexuality for the Man With Cancer](#).

[Urinary incontinence](#) (having problems controlling urine) is rare in men who have cryotherapy as their first treatment for prostate cancer, but it is more common in men who have already had radiation therapy.

After cryotherapy, less than 1% of men develop a fistula (an abnormal connection) between the rectum and bladder. This rare but serious problem can allow urine to leak into the rectum and often requires surgery to repair.

- [References](#)

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Hormone Therapy for Prostate Cancer

Hormone therapy is also called **androgen deprivation therapy** (ADT) or **androgen suppression therapy**. The goal is to reduce levels of male hormones, called androgens, in the body, or to stop them from affecting prostate cancer cells.

Androgens stimulate prostate cancer cells to grow. The main androgens in the body are testosterone and dihydrotestosterone (DHT). Most of the androgens are made by the testicles, but the adrenal glands (glands that sit above your kidneys) also make a small amount. Lowering androgen levels or stopping them from getting into prostate cancer cells often makes prostate cancers shrink or grow more slowly for a time. But hormone therapy alone does not cure prostate cancer.

When is hormone therapy used?

Hormone therapy may be used:

- If the cancer has spread too far to be cured by [surgery](#) or [radiation](#), or if you can't have these treatments for some other reason
- If the cancer remains or comes back after treatment with surgery or radiation therapy
- Along with radiation therapy as initial treatment if you are at higher risk of the cancer coming back after treatment (based on a high [Gleason score](#), high [PSA level](#), and/or growth of the cancer outside the prostate)

- Before radiation to try to shrink the cancer to make treatment more effective

Types of hormone therapy

Several types of hormone therapy can be used to treat prostate cancer.

Treatments to lower androgen levels

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 most of the androgens (testosterone and DHT) are made. This causes most prostate cancers to stop growing or shrink for a time.

This is done as an outpatient procedure. It is probably the least expensive and simplest form of hormone therapy. But unlike some of the other treatments, it is permanent, and many men have trouble accepting the removal of their testicles.

Some men having this surgery are concerned about how it will look afterward. If wanted, artificial testicles that look much like normal ones can be inserted into the scrotum.

LHRH agonists

Luteinizing hormone-releasing hormone (LHRH) agonists (also called *LHRH analogs* or *GnRH agonists*) are drugs that lower the amount of testosterone made by the testicles. Treatment with these drugs is sometimes called *chemical castration* or *medical castration* because they lower androgen levels just as well as orchiectomy.

Even though LHRH agonists cost more than orchiectomy and require more frequent doctor visits, most men choose this method. With these drugs, the testicles remain in place, but they will shrink over time, and they may even become too small to feel.

LHRH agonists 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 agonists available in the United States include:

- Leuprolide (Lupron, Eligard)
- Goserelin (Zoladex)
- Triptorelin (Trelstar)

- Histrelin (Vantas)

When LHRH agonists are first given, testosterone levels go up briefly before falling to very low levels. This effect is called *flare* and results from the complex way in which these drugs work. Men whose cancer has spread to the bones may have bone pain. If the cancer has spread to the spine, even a short-term increase in tumor growth as a result of the flare could press on the spinal cord and cause pain or paralysis. Flare can be avoided by giving drugs called *anti-androgens* (discussed below) for a few weeks when starting treatment with LHRH agonists.

LHRH antagonist

Degarelix (Firmagon) is an LHRH antagonist. It works like the LHRH agonists, but it lowers testosterone levels more quickly and doesn't cause tumor flare like the LHRH agonists do. Treatment with this drug can also be considered a form of *medical castration*.

This drug is used to treat advanced prostate cancer. It is given as a monthly injection under the skin. The most common side effects are 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 below.

CYP17 inhibitor

LHRH agonists and antagonists can stop the testicles from making androgens, but other cells in the body, including prostate cancer cells themselves, can still make small amounts, which can fuel cancer growth.

Abiraterone (Zytiga) blocks an enzyme called CYP17, which helps stop these cells from making androgens.

Abiraterone can be used in men with advanced prostate cancer that is either:

- High risk (cancer with a high [Gleason score](#), spread to several spots in the bones, or spread to other organs)
- Castrate-resistant (cancer that is still growing despite low testosterone levels from an LHRH agonist, LHRH antagonist, or orchiectomy)

This drug is taken as pills every day. It doesn't stop the testicles from making testosterone, so men who haven't had an orchiectomy need to continue treatment with an LHRH agonist or antagonist. Because abiraterone also lowers the level of some other hormones in the body, prednisone (a corticosteroid drug) needs to be taken during treatment as well to avoid certain side effects.

Drugs that stop androgens from working

Anti-androgens

Androgens have to bind to a protein in the prostate cell called an *androgen receptor* to work. Anti-androgens are drugs that bind to these receptors so the androgens can't.

Drugs of this type include:

- Flutamide (Eulexin)
- Bicalutamide (Casodex)
- Nilutamide (Nilandron)

They are taken daily as pills.

Anti-androgens are not often used by themselves in the United States. An anti-androgen may be added to treatment if orchiectomy or an LHRH agonist or antagonist is no longer working by itself. An anti-androgen is also sometimes given for a few weeks when an LHRH agonist is first started to prevent a tumor flare.

An anti-androgen can also be combined with orchiectomy or an LHRH agonist 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 agonist alone. If there is a benefit, it appears to be small.

In some men, if an anti-androgen is no longer working, simply stopping the anti-androgen can cause the cancer to stop growing for a short time. Doctors call this the *anti-androgen withdrawal effect*, although they are not sure why it happens.

Enzalutamide (Xtandi) and **apalutamide (Erleada)** are newer types of anti-androgens. Normally when androgens bind to their receptor, the receptor sends a signal to the cell's control center, telling it to grow and divide. These drugs block this signal. They are taken as pills each day.

These drugs can often be helpful in men whose cancer is no longer responding to other forms of hormone therapy (known as *castrate-resistant prostate cancer*, described below). Enzalutamide is typically used for metastatic cancer (cancer that has spread to other parts of the body), while apalutamide is typically used for non-metastatic cancer.

Other androgen-suppressing drugs

Estrogens (female hormones) 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 replaced by other types of hormone therapy. Still, estrogens may be tried if other hormone treatments are no longer working.

Ketoconazole (Nizoral), first used for treating fungal infections, blocks production of certain hormones, including androgens, much like abiraterone. It's most often used to treat men just diagnosed with advanced prostate cancer who have a lot of cancer in the body, as it offers a quick way to lower testosterone levels. It can also be tried if other forms of hormone therapy are no longer working.

Ketoconazole also can block the production of cortisol, an important steroid hormone in the body, so men treated with this drug often need to take a corticosteroid (such as prednisone or hydrocortisone).

Possible side effects of hormone therapy

Orchiectomy and LHRH agonists and antagonists can all cause similar side effects from lower levels of hormones such as testosterone. These side effects can include:

- [Reduced or absent sexual desire](#)
- [Erectile dysfunction \(impotence\)](#)
- Shrinkage of testicles and penis
- Hot flashes, which may get better or 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 sharpness](#)
- Loss of muscle mass
- [Weight gain](#)
- [Fatigue](#)
- Increased cholesterol levels
- [Depression](#)

Some research has suggested that the risk of high blood pressure, diabetes, strokes, heart attacks, and even death from heart disease is higher in men treated with hormone therapy, although not all studies have found this.

Anti-androgens have similar side effects. The major difference from LHRH agonists and antagonists and orchiectomy is that anti-androgens may have fewer [sexual side](#)

[effects](#). When these drugs are used alone, sexual desire and erections can often be maintained. When these drugs are given to men already being treated with LHRH agonists, [diarrhea](#) is the major side effect. [Nausea](#), liver problems, and [tiredness](#) can also occur.

Enzalutamide and **apalutamide** can cause [diarrhea](#), [fatigue](#), and worsening of hot flashes. These drugs can also cause some nervous system side effects, including dizziness and, rarely, seizures. Men taking one of these drugs are [more likely to fall](#), which may lead to injuries.

Abiraterone can cause joint or muscle pain, high blood pressure, fluid buildup in the body, hot flashes, [upset stomach](#), and [diarrhea](#).

Many side effects of hormone therapy can be prevented or treated. For example:

- Hot flashes can often be helped by treatment with certain antidepressants or other drugs.
- Brief radiation treatment to the breasts can help prevent their enlargement, but this is not effective once breast enlargement has occurred.
- Several drugs can help prevent and treat osteoporosis.
- Depression can be treated with antidepressants and/or counseling.
- Exercise can help reduce many side effects, including fatigue, weight gain, and the loss of bone and muscle mass.

There is growing concern that hormone therapy for prostate cancer may lead to [problems thinking, concentrating, and/or with memory](#), but this has not been studied thoroughly. Still, hormone therapy does seem to lead to memory problems in some men. These problems are rarely severe, and most often affect only some types of memory. More studies are being done to look at this issue.

Current issues 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 are now looking at these issues. A few of them are discussed here.

Treating early-stage cancer: Some doctors have used hormone therapy instead of [watchful waiting or active surveillance](#) in men with early stage prostate cancer who do not want [surgery](#) or [radiation](#). Studies have not found that these men live any longer than those who don't get any treatment until the cancer progresses or symptoms develop. Because of this, hormone treatment is not usually advised for early-stage

prostate cancer.

Early versus delayed treatment: For men who need (or will eventually need) hormone therapy, such as men whose PSA levels are rising after surgery or radiation or men with advanced prostate cancer who don't yet have symptoms, it's not always clear when it is best to start hormone treatment. Some doctors think that hormone therapy works better if it's started as soon as possible, even if a man feels well and is not having any symptoms. Some studies have shown that hormone treatment may slow the disease down and perhaps even help men live longer.

But not all doctors agree with this approach. Some are waiting for more evidence of benefit. They feel that because of the side effects of hormone therapy and the chance that the cancer could become resistant to therapy sooner, treatment shouldn't be started until a man has symptoms from the cancer. This issue is being studied.

Intermittent versus continuous hormone therapy: Most 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 might not be needed, so they advise intermittent (on-again, off-again) treatment. The hope is that giving men a break from androgen suppression will also give them a break from side effects like decreased energy, sexual problems, and hot flashes.

In one form of intermittent hormone therapy, treatment is stopped once the PSA drops to a very low level. If the PSA level begins to rise, the drugs are started again. Another form of intermittent therapy uses hormone therapy for fixed periods of time – for example, 6 months on followed by 6 months off.

At this time, it isn't clear how this approach compares to continuous hormone therapy. Some studies have found that continuous therapy might help men live longer, but other studies have not found such a difference.

Combined androgen blockade (CAB): Some doctors treat patients with both androgen deprivation (orchiectomy or an LHRH agonist or antagonist) plus an anti-androgen. Some studies have suggested this may be more helpful than androgen deprivation alone, but others have not. Most doctors are not convinced there's enough evidence that this combined therapy is better than starting with one drug alone when treating prostate cancer that has spread to other parts of the body.

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) 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.

Castrate-resistant versus hormone-refractory prostate cancer: Both these terms are sometimes used to describe prostate cancers that are no longer responding to hormones, although there is a difference between the two.

- **Castrate-resistant** means the cancer is still growing even when the testosterone levels are as low as what would be expected if the testicles were removed (called castrate levels). Levels this low could be from an orchiectomy, an LHRH agonist, or an LHRH antagonist. Some men might be uncomfortable with this term, but it's specifically meant to refer to these cancers, some of which might still be helped by other forms of hormone therapy, such as the drugs abiraterone, enzalutamide, and apalutamide. Cancers that still respond to some type of hormone therapy are not completely hormone-refractory.
- **Hormone-refractory** refers to prostate cancer that is no longer helped by any type of hormone therapy, including the newer medicines.
- [References](#)

[See all references for Prostate Cancer](#)

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Chemotherapy for Prostate Cancer

Chemotherapy (chemo) 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.

When is chemotherapy used?

Chemo is sometimes used if prostate cancer has spread outside the prostate gland and [hormone therapy](#) isn't working. Recent research has also shown that chemo might be helpful if given along with hormone therapy.

Chemo is not a standard treatment for early prostate cancer, but some studies are looking to see if it could be helpful if given for a short time after [surgery](#).

Chemo drugs used to treat prostate cancer

For prostate cancer, chemo drugs are typically used one at a time. Some of the chemo drugs used to treat prostate cancer include:

- Docetaxel (Taxotere)
- Cabazitaxel (Jevtana)
- Mitoxantrone (Novantrone)
- Estramustine (Emcyt)

In most cases, the first chemo drug given is docetaxel, combined with the steroid drug prednisone. If this drug does not work (or stops working), cabazitaxel is often the next chemo drug tried (although there may be other treatment options as well).

Both of these drugs have been shown to help men live longer, on average, than older chemo drugs. They may slow the cancer's growth and also reduce [symptoms](#), resulting in a better quality of life. Still, chemo is very unlikely to cure prostate cancer.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to allow the body time to recover. Each cycle typically lasts for a few weeks.

Possible side effects of chemotherapy

Chemo drugs attack 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 (where new blood cells are made), the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells can also be affected by chemo, which can lead to side effects.

The side effects of chemo depend on the type and dose of drugs given and how long they are taken. Some common side effects can include:

- [Hair loss](#)
- [Mouth sores](#)
- [Loss of appetite](#)
- [Nausea and vomiting](#)
- [Diarrhea](#)

- Increased chance of [infections](#) (from having too few white blood cells)
- Easy [bruising or bleeding](#) (from having too few blood platelets)
- [Fatigue](#) (from having too few red blood cells)

These side effects usually go away once treatment is finished. There is help for many of these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Along with the risks above, some side effects are seen more often with certain chemo drugs. For example:

- Docetaxel and cabazitaxel sometimes cause severe allergic reactions. Medicines are given before each treatment to help prevent this. These drugs can also damage nerves (known as [peripheral neuropathy](#)), which can cause numbness, tingling, or burning sensations in the hands or feet.
- Mitoxantrone can, very rarely, cause [leukemia](#) several years later.
- Estramustine carries an increased risk of blood clots.

If you notice any [side effects](#) while getting chemo report them to your medical team so that they can be treated promptly. In some cases, the doses of the chemo drugs may need to be reduced or treatment may need to be delayed or stopped to prevent the effects from getting worse.

To learn more about chemo, see the [Chemotherapy](#) section of our website.

- [References](#)

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Vaccine Treatment for Prostate Cancer

Sipuleucel-T (Provenge) is a [cancer vaccine](#). Unlike traditional vaccines, which boost the body's immune system to help prevent infections, this vaccine boosts the immune system to help it attack prostate cancer cells.

The vaccine is used to treat advanced prostate cancer that's no longer responding to hormone therapy but is causing few or no symptoms.

This vaccine is made specifically for each man. To make it, white blood cells (cells of the immune system) are removed from your blood over a few hours while you are hooked up to a special machine. The cells are then sent to a lab, where they are exposed to a protein from prostate cancer cells called prostatic acid phosphatase (PAP). The cells are then sent back to the doctor's office or hospital, where they are given back to you by infusion into a vein (IV). This process is repeated 2 more times, 2 weeks apart, so that you get 3 doses of cells. The cells help your other immune system cells attack the prostate cancer.

The vaccine hasn't been shown to stop prostate cancer from growing, but it seems to help men live an average of several months longer. As with [hormone therapy](#) and [chemotherapy](#), this type of treatment has not been shown to cure prostate cancer.

Studies are now being done to see if this vaccine can help men with less advanced prostate cancer.

Possible side effects of vaccine treatment

Side effects from the vaccine tend to be milder than those from hormone therapy or chemotherapy. Common side effects can include [fever](#), chills, [fatigue](#), back and joint [pain](#), [nausea](#), and headache. These most often start during the cell infusions and last no more than a couple of days. A few men may have more severe symptoms, including [problems breathing](#) and high blood pressure, which usually get better after treatment.

- [References](#)

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Preventing and Treating Prostate Cancer Spread to Bones

If prostate cancer spreads to other parts of the body, it nearly always goes to the bones

first. [Bone metastasis](#) can be painful and can cause other problems, such as fractures (breaks) or high blood calcium levels, which can be dangerous or even life threatening.

If the cancer has grown outside the prostate, preventing or slowing the spread of the cancer to the bones is a major goal of treatment. If the cancer has already reached the bones, controlling or relieving pain and other complications is also a very important part of treatment.

Treatments such as [hormone therapy](#), [chemotherapy](#), and [vaccines](#) may help with this, but other treatments more specifically target bone metastasis and the problems it may cause.

Bisphosphonates

Bisphosphonates are drugs that work by slowing down bone cells called osteoclasts. These cells normally break down the hard mineral structure of bones to help keep them healthy. Osteoclasts often become overactive when prostate cancer spreads to the bones, which can cause problems. Bisphosphonates can be used:

- To help relieve pain and high calcium levels caused by cancer that has spread to the bones
- To help slow the growth of cancer that has spread to the bones and help delay or prevent fractures
- To help strengthen bones in men who are getting hormone therapy

Zoledronic acid (Zometa) is the most commonly used bisphosphonate for prostate cancer. This drug is given as an intravenous (IV) injection, usually once every 3 or 4 weeks. Men given this drug are advised to take a supplement containing calcium and vitamin D to prevent problems with low calcium levels.

Some doctors use other bisphosphonates to treat prostate cancer that has spread to bone.

Bisphosphonates can have side effects, including flu-like symptoms and bone or joint [pain](#). They can also cause kidney problems, so patients with poor kidney function might not be able to be treated with these medicines.

A rare but very serious side effect of these drugs is osteonecrosis of the jaw (ONJ). With this condition, part of the jaw bone loses its blood supply and dies. This can lead to tooth loss and infections of the jaw bone that are hard to treat. Some people develop ONJ when dental work is done during treatment. Many cancer doctors advise men to

have a dental checkup and have any tooth or jaw problems treated before they start taking a bisphosphonate. Maintaining good oral hygiene by flossing and brushing, making sure that dentures fit properly, and having regular dental checkups may also help prevent ONJ.

Denosumab

Denosumab (Xgeva, Prolia) is another drug that can help when prostate cancer spreads to bone. Like the bisphosphonates, denosumab also blocks bone cells called *osteoclasts*, but it does so in a different way. This drug can be used:

- To help prevent or delay problems like fractures in men whose cancer has already spread to the bones. It may be helpful even if zoledronic acid is no longer working.
- To help slow the spread of the cancer to the bones in men with no obvious cancer spread but with rising [PSA levels](#) despite hormone therapy

This drug is injected under the skin every 4 weeks. Men given this drug are often advised to take a supplement containing calcium and vitamin D to prevent problems with low calcium levels.

Common side effects include [nausea](#), [diarrhea](#), and feeling [weak](#) or [tired](#). Like the bisphosphonates, denosumab can also cause ONJ, so doctors recommend taking the same precautions (such as having teeth and jaw problems treated before starting the drug).

Corticosteroids

Some studies suggest that corticosteroid drugs (such as prednisone and dexamethasone) can help relieve bone pain in some men. They also can help lower PSA levels.

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

Radiopharmaceuticals are drugs that contain radioactive elements. They are injected into a vein and settle in areas of damaged bones (like those containing cancer spread). Once there, they give off radiation that kills cancer cells. These drugs can be used to treat prostate cancer that has spread to many bones. Unlike [external beam radiation](#), these drugs can reach all the affected bones at the same time.

The radiopharmaceuticals that can be used to treat prostate cancer spread to bone include:

- Strontium-89 (Metastron)
- Samarium-153 (Quadramet)
- Radium-223 (Xofigo)

All of these drugs can help relieve pain caused by bone metastases. Radium-223 has also been shown to help men who have prostate cancer spread only to their bones (as opposed to spread to other organs such as the lungs) to live longer. For these men, radium-223 may be an early part of treatment.

The major side effect of these drugs is a [decrease in blood cell counts](#), which could increase risks for [infections](#) or [bleeding](#), especially if your counts are already low. Other side effects have also been seen, so ask your doctor what you can expect.

Pain medicines

When properly prescribed, pain medicines are very effective. Pain medicines work best when they're taken on a regular schedule. They don't work as well if they're only used when the pain becomes severe.

If you have bone pain from prostate cancer, it's very important that it's treated. This can help you feel better and let you focus on the things that are most important to you. 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.

To learn a lot more about cancer pain, how to talk to your cancer care team about it, and the different ways to manage it, see [Cancer Pain](#).

- [References](#)

[See all references for Prostate Cancer](#)

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Considering Prostate Cancer Treatment Options

For most men diagnosed with prostate cancer, the cancer is found while it's still at an early stage -- it's small and has not spread beyond the prostate gland. These men often have several treatment options to consider.

Not every man with prostate cancer needs to be treated right away. If you have early-stage prostate cancer, there are many factors such as your age and general health, and the likelihood that the cancer will cause problems for you to consider before deciding what to do. You should also think about the possible side effects of treatment and how likely they are to bother you. Some men, for example, may want to avoid possible side effects such as [incontinence](#) or [erection problems](#) for as long as possible. Other men are less concerned about side effects and more concerned about removing or destroying the cancer.

If you're 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 [watchful waiting or active surveillance](#), 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 accept possible side effects of treatment if they offer you the best chance for cure. Most doctors believe that surgery, external radiation, and [brachytherapy](#) all 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, and the benefits should be weighed against possible risks and side effects.

Choosing among treatment options is complicated even further by the development of newer types of surgery (such as [robotic-assisted prostatectomy](#)) and radiation therapy (such as [proton beam radiation](#)) in recent years. Many of these seem very promising,

but there is very little long-term data on them, which means comparing their effectiveness and possible side effects is difficult, if not impossible.

Getting help with treatment decisions

Making such a complex decision is often hard to do by yourself. You might find it helps to talk with your family and friends before making a decision. You might also find it helpful to speak with other men who have faced or are currently facing the same issues. The American Cancer Society and other organizations offer support programs where you can meet and discuss these and other cancer-related issues. For more about our programs, call us toll-free at 1-800-227-2345 or see [Find Support Programs and Services](#). It's important to know that each man's experience with prostate cancer is different. Just because someone you know had a good (or bad) experience with a certain type of treatment doesn't mean the same will be true for you.

You might 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 therapy. Doctors specializing in newer types of treatment may be more likely to recommend their therapies. Talking to each of them might 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.

Some things to consider when choosing among treatments

Before deciding on treatment, here are some 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 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 (such as robotic surgery or proton beam radiation therapy), which might have some theoretical advantages? Or do

you prefer to go with treatment methods that are better proven and with which doctors might have more experience?

- Which potential treatment side effects (incontinence, impotence, bowel problems) might be most distressing to you? (Some treatments are more likely to cause certain side effects than others.)
- 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, so it’s important to take your time and decide which option is right for you.

- [References](#)

[See all references for Prostate Cancer](#)

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Initial Treatment of Prostate Cancer, by Stage

The [stage](#) of your cancer is one of the most important factors in choosing the best way to treat it. Prostate cancer is staged based on the extent of the cancer (using T, N, and M categories) and the [PSA level and Gleason score](#) at the time of diagnosis.

But other factors, such as your age, overall health, life expectancy, and personal preferences should also be taken into account when looking at treatment options. In fact, many doctors determine a man’s possible treatment options based not just on the stage, but on the risk of cancer coming back (recurrence) after the initial treatment and on the man’s life expectancy.

You might want to ask your doctor what factors he or she is considering when discussing your treatment options. Some doctors might recommend options that are different from those listed here.

Stage I

These prostate cancers are small (T1 or T2a) and have not grown outside 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, [watchful waiting or active surveillance](#) is often recommended. For men who wish to start treatment, [radiation therapy](#) (external beam or brachytherapy) or [radical prostatectomy](#) may be options.

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

Stage II

Stage II cancers have not yet grown outside of the prostate, but are larger, have higher Gleason scores, and/or have higher PSA levels than stage I cancers. Stage II cancers that are not treated with surgery or radiation are more likely than stage I cancers to eventually spread beyond the prostate and cause [symptoms](#).

As with stage I cancers, [active surveillance](#) 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 might 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 a few months after surgery.
- External beam radiation only*
- Brachytherapy only*
- Brachytherapy and external beam radiation combined*
- Taking part in a [clinical trial](#) of newer treatments

* All of the radiation options may be combined with several months of [hormone therapy](#) if there is a greater chance of cancer recurrence based on PSA level and/or Gleason

score.

Stage III

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

Treatment options at this stage may include:

- External beam [radiation](#) plus [hormone therapy](#)
- Radiation (external beam plus brachytherapy), possibly with a short course of hormone therapy
- [Radical prostatectomy](#) in selected cases (often with removal of the pelvic [lymph nodes](#)). This may be followed by radiation therapy.

Men who are older or who have other medical problems may choose less aggressive treatment such as hormone therapy (by itself) or even [active surveillance](#).

Taking part in a [clinical trial](#) of newer treatments is also an option for many men with stage III prostate cancer.

Stage IV

Stage IV cancers have already spread to nearby areas such as the bladder or rectum (T4), to nearby lymph nodes, or to distant organs such as the bones. A small portion of T4 cancers may be curable using some of the same treatments for stage III cancers. Most stage IV cancers can't be cured, but are treatable. The goals of treatment are to keep the cancer under control for as long as possible and to improve a man's quality of life.

Initial treatment options may include:

- [Hormone therapy](#), possibly along with [chemotherapy](#)
- External beam [radiation](#) (sometimes along with brachytherapy), plus hormone therapy
- [Radical prostatectomy](#) in some men whose cancer has not spread to the [lymph nodes](#) or other parts of the body. This might be followed by external radiation therapy.

- Surgery ([TURP](#)) to relieve [symptoms](#) such as bleeding or urinary obstruction
- Treatments aimed at [bone metastases](#), such as denosumab (Xgeva), a bisphosphonate like zoledronic acid (Zometa), external radiation aimed at bones, or a [radiopharmaceutical](#) such as strontium-89, samarium-153 or radium-223
- [Active surveillance](#) (for those who are older or have other serious health issues and do not have major symptoms from the cancer)
- Taking part in a [clinical trial](#) of newer treatments

Treatment of stage IV prostate cancer may also include treatments to help prevent or relieve symptoms such as [pain](#).

The options above are for the *initial treatment* of prostate cancer at different stages. But if these treatments aren't working (the cancer continues to grow and spread) or if the cancer comes back, other treatments might be used. (See [Treating Prostate Cancer That Doesn't Go Away or Comes Back After Treatment](#).)

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- [References](#)

[See all references for Prostate Cancer](#)

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Following PSA Levels During and After Prostate Cancer Treatment

A man's [prostate-specific antigen \(PSA\)](#) blood level is often a good indicator of how effective treatment is or has been. 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.

Before starting treatment, you might want to ask your doctor what he or she expects your PSA level to be during and after treatment, and what levels might cause concern. It's important to know that the PSA level is only one part of the overall picture. Other factors can also play a role in determining if cancer is still there, if it is growing, or if it has come back.

It's also important to know that PSA levels can sometimes fluctuate a bit on their own, even during or after treatment, so they may not always reflect what is actually happening with your cancer. Understandably, many men being treated for prostate cancer are very concerned about even very small changes in their PSA levels. The PSA level is an important tool to monitor the cancer, but not every rise in PSA means that the cancer is growing and requires treatment right away. To help limit unnecessary anxiety, be sure you understand what change in PSA level your doctor might be concerned about.

During watchful waiting or active surveillance

If you choose [watchful waiting or active surveillance](#), your PSA level will be monitored closely (most likely along with other tests) to help decide whether the cancer is growing and if treatment should be considered.

Your doctor will watch the PSA level itself and how quickly it is rising. Not all doctors agree on exactly what PSA levels might require further action (such as a [prostate biopsy](#) or treatment). Again, talk to your doctor so you understand what change in your PSA might be considered cause for concern.

After surgery

Your PSA should fall to a very low or even undetectable level within a couple of months after [radical prostatectomy](#). Because some PSA can 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 checking the PSA level.

Some men might worry if their PSA is still detectable even at a very low level after surgery, but this does not always mean cancer is still in the body. Modern PSA blood tests can detect even tiny amounts of PSA, but these amounts might not always be significant, especially if they are not rising over time. It could just mean that you have some cells in the body making PSA, but these aren't necessarily cancer cells.

Still, having any detectable PSA after surgery can be stressful for men and their

families. If your PSA is still detectable after surgery, even at a very low level, talk to your doctor about what it might mean, and what he or she thinks the best course of action is. Some doctors advise following such low PSA levels over time to get a better idea of what's going on, possibly with repeat tests every few months. Other doctors might be more inclined to recommend further treatment.

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 still make some PSA.

The pattern of the drop in PSA after radiation therapy is also different from after surgery. PSA levels after radiation tend to drop slowly, and might 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 might not mean that the cancer is still there (or has returned), as PSA levels can fluctuate slightly from time to time. However, a PSA that is rising on consecutive tests after treatment might indicate that cancer is still there. Some medical groups have proposed that if the PSA rises more than 2 ng/mL above the lowest level it reached, further treatment should be considered, but some doctors might advise tests to look for cancer in the body even if the PSA has not yet risen this much.

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 goes back down. Doctors aren't sure why this happens, but it doesn't seem to affect a man's prognosis.

During treatment for advanced prostate cancer

When treatments such as [hormone therapy](#), [chemotherapy](#), or [vaccine therapy](#) are used for more advanced prostate cancer, the PSA level can help show how well the treatment is working or when it might be time to try a different treatment.

Treatments should lower the PSA level (at least at first), although in some cases they may just help keep it from rising further, or even just slow the rise. Of course, other factors, such as whether you're having [symptoms](#) from your cancer and whether it is growing based on [imaging tests](#), are also important when deciding if it might be time to

change treatments.

If the cancer has spread outside the prostate, the actual PSA level is often not as important as whether it changes, and how quickly it changes. The PSA level itself does not predict whether or not a man will have symptoms or how long he will live. Many men have very high PSA levels and feel just fine. Other men can have low PSA levels and still have symptoms.

- [References](#)

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Treating Prostate Cancer That Doesn't Go Away or Comes Back After Treatment

If your [prostate-specific antigen \(PSA\)](#) blood level shows that your prostate cancer has not been cured or has come back (recurred) after the initial treatment, further treatment can often still be helpful. Follow-up treatment will depend on where the cancer is thought to be and what treatment(s) you've already had. Imaging tests such as [CT](#), [MRI](#), or [bone scans](#) may be done to get a better idea about where the cancer is.

Cancer that is still thought to be in or around the prostate

If the cancer is still thought to be just in the area of the prostate, a second attempt to cure the cancer might be possible.

After surgery: If you've had a [radical prostatectomy](#), [radiation therapy](#) might be an option, sometimes along with [hormone therapy](#).

After radiation therapy: If your first treatment was radiation, treatment options might include [cryotherapy](#) or radical prostatectomy, but when these treatments are done after radiation, they carry a higher risk for side effects such as [incontinence](#). Having radiation therapy again is usually not an option because of the increased potential for serious side effects, although in some cases [brachytherapy](#) may be an option as a second treatment after external radiation.

Sometimes it might not be clear exactly where the remaining cancer is in the body. If the only sign of cancer recurrence is a rising PSA level (as opposed to the cancer being seen on imaging tests), another option for some men might be [active surveillance](#) instead of active treatment. Prostate cancer often grows slowly, so even if it does come back, it might not cause problems for many years, at which time further treatment could then be considered.

In a Johns Hopkins University study of men whose PSA level began to rise after surgery for prostate cancer, there was an average of about 10 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.

Factors such as how quickly the PSA is going up and the original [Gleason score](#) of the cancer can help predict how soon the cancer might show up in distant parts of the body and cause problems. If the PSA is going up very quickly, some doctors might recommend that you start treatment even before the cancer can be seen on tests or causes [symptoms](#).

Observation might be a more appealing option to certain groups of men, such as those who are older and in whom the PSA level is rising slowly. Still, not all men might be comfortable with this approach.

If the PSA is rising quickly enough to warrant treatment, but localized treatments (such as surgery, radiation therapy, or cryotherapy) aren't likely to be helpful, [hormone therapy](#) is often the next option. If one type of hormone therapy isn't helpful, another can be tried (see castrate-resistant prostate cancer, below).

Cancer that clearly has spread

If the cancer has spread outside the prostate, it will most likely go to nearby [lymph nodes](#) first, and then to 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 isn't likely to cure the cancer, and at some point it might stop working. Usually the first treatment is a luteinizing hormone-releasing hormone (LHRH) agonist or antagonist (or orchiectomy). If this stops working, an anti-androgen drug may be added. Another option might be to get [chemotherapy](#) along with the hormone therapy. Other treatments aimed at [bone metastases](#) might be used as well.

Castrate-resistant and hormone-refractory prostate cancer

Hormone therapy is often very effective at shrinking or slowing the growth of prostate cancer that has spread, but it usually becomes less effective over time. Doctors use different terms to describe cancers that are no longer responding to hormones.

- **Castrate-resistant prostate cancer (CRPC)** is cancer that is still growing despite the fact that hormone therapy (an orchiectomy or an LHRH agonist or antagonist) is keeping the testosterone level in the body as low as what would be expected if the testicles were removed (called *castrate levels*). The cancer might still respond to other forms of hormone therapy, though.
- **Hormone-refractory prostate cancer (HRPC)** is cancer that is no longer helped by any form of hormone therapy.

Men whose prostate cancer is still growing despite initial hormone therapy now have many more treatment options than they had even a few years ago.

If an anti-androgen drug was not part of the initial hormone therapy, it is often added at this time. If a man is already getting an anti-androgen but the cancer is still growing, stopping the anti-androgen (while continuing other hormone treatments) seems to help sometimes.

Other forms of hormone therapy may also be helpful for a while, especially if the cancer is causing few or no [symptoms](#). These include abiraterone (Zytiga), enzalutamide (Xtandi), apalutamide (Erleada), ketoconazole, estrogens (female hormones), and corticosteroids.

The [prostate cancer vaccine](#) sipuleucel-T (Provenge) is another option for men whose cancer is causing few or no symptoms. This might not lower PSA levels, but it can often help men live longer.

For cancers that are no longer responding to initial hormone therapy and are causing symptoms, several options might be available. Chemotherapy with the drug docetaxel

(Taxotere) is often the first choice because it has been shown to help men live longer, as well as to reduce pain. If docetaxel doesn't work or stops working, other chemo drugs, such as cabazitaxel (Jevtana), may help. Another option may be a different type of hormone therapy, such as abiraterone, enzalutamide, or apalutamide (if they haven't been tried yet).

[Bisphosphonates](#) or denosumab can often help if the cancer has spread to the bones. These drugs can reduce pain and even slow cancer growth in many men. Other medicines and methods can also help keep pain and other symptoms under control. External radiation therapy can help treat bone pain if it's only in a few spots. [Radiopharmaceutical drugs](#) can often reduce pain if it's more widespread, and may also slow the growth of the cancer.

If you are having [pain](#) from prostate cancer, make sure your doctor and entire health care team know about it.

Several promising new medicines are now being tested against prostate cancer, including [vaccines](#), [monoclonal antibodies](#), and other new types of drugs. Because the 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](#).

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- [References](#)

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