

# RADIATION THERAPY FOR CANCER



Your Partners in Cancer Treatment

# ASTRO

TARGETING CANCER CARE

AMERICAN SOCIETY FOR RADIATION ONCOLOGY

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Remember, your radiation oncologist, radiation therapist and radiation oncology nurse are the best people to make recommendations and answer questions about radiation treatments.

## Introduction

This booklet was written for people exploring radiation therapy as a treatment option. Radiation, alone or in combination with other cancer therapies, can be used to successfully treat many different types of cancer.

Learning you have cancer can bring on a flood of feelings and concerns. Finding out as much as you can about your disease and ways to treat it can be overwhelming and confusing. As you prepare for treatment, it may help to learn about your treatment options and what you may experience.

Radiation therapy techniques and procedures may vary among different doctors, hospitals and treatment centers. Be sure to ask questions if the advice of your doctor is different from what you read here, find on the Internet, see in other publications or hear on the news.

Your care is individually tailored for you by your team, and there is no way to describe the infinite combinations of therapies given to patients in this type of brochure. Rather, presented are some general themes and principles for your information.



## RADIATION THERAPY AND CANCER

Cancer doctors usually treat cancer with radiation therapy, surgery or medications, including chemotherapy, hormonal therapy and/or biologic therapy, either alone or in combination. If your cancer can be treated with radiation, you will be referred to a radiation oncologist — a doctor who specializes in treating patients with radiation therapy. Your radiation oncologist will work with your primary doctor and other cancer specialists, such as surgical and medical oncologists, to oversee your care. He or she will discuss the details of your cancer with you, the role of radiation therapy in your overall treatment plan and what to expect from your treatment.

Physicians have been treating patients with radiation therapy safely and effectively for more than 100 years. Nearly two-thirds of cancer patients are treated with radiation during their illness.

## HOW DOES RADIATION THERAPY WORK?

**Radiation therapy**, or **radiotherapy**, is the use of various forms of radiation to safely and effectively treat cancer and other diseases. Radiation therapy works by damaging the genetic material within cancer cells and limiting their ability to successfully reproduce. When these damaged cancer cells die, the body naturally eliminates them. Normal cells are also affected by radiation, but they are able to repair themselves in a way that cancer cells cannot. In addition, your radiation oncologist will develop a plan to deliver the radiation to the tumor area, shielding as much surrounding normal tissue as possible.

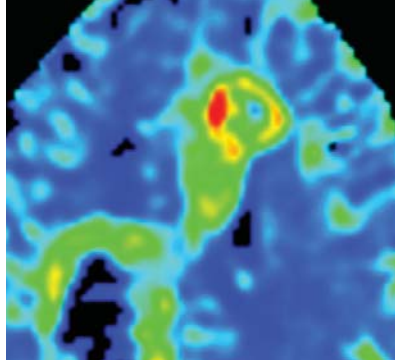
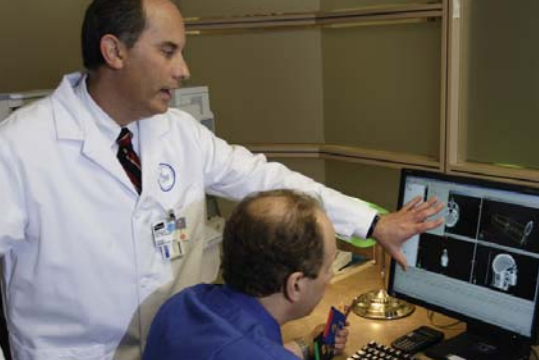
Your radiation oncologist may recommend using radiation therapy in a number of different ways. Often, the goal is to **cure** the cancer. In this case, radiation therapy may be used to:

- Eliminate tumors that have not spread to other parts of your body.
- Reduce the risk that cancer will return after you undergo surgery or chemotherapy by killing small amounts of cancer that might remain.
- Shrink the cancer before surgery.

### Did You Know?

Physicians have been treating patients with radiation therapy safely and effectively for more than 100 years. Nearly two-thirds of cancer patients are treated with radiation during their illness.



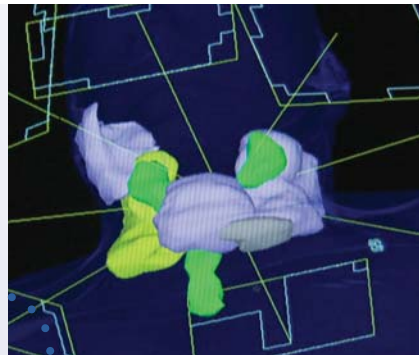


Sometimes, the goal is to reduce the symptoms caused by growing tumors and to improve your quality of life. When radiation therapy is administered for this purpose, it is called **palliative care** or **palliation**. In this instance, radiation may be used to:

- Shrink tumors that are interfering with your quality of life, such as a lung tumor that is causing shortness of breath.
- Relieve pain by reducing the size of a tumor.

### Did You Know?

Radiation therapy works by damaging the DNA within cancer cells and destroying the ability of the cancer cells to reproduce. When these damaged cancer cells die, the body naturally eliminates them. Normal cells are also affected by radiation, but they are able to repair themselves in a way that cancer cells cannot.



It is important for you to discuss the goal of your treatment with your radiation oncologist. Some patients are concerned that radiation therapy will cause another cancer. In fact, the risk of developing a second tumor because of radiation therapy is very low. For many people, radiation therapy can cure the cancer, which outweighs any small risk that the treatment could cause a later cancer or other serious health conditions. In some diseases, such as Hodgkin's disease, improvements in cure rates have allowed doctors to use lower doses or smaller areas of radiation to help lessen the side effects of treatment. However, you should discuss the risks and benefits of all of your treatments with your treatment team. If you smoke, the most important thing you can do to reduce your risk of a second cancer is to quit smoking.

## WHAT ARE THE DIFFERENT KINDS OF RADIATION?

The goal of radiation therapy is to get enough radiation into the body to kill the cancer cells while preventing damage to healthy tissue. There are several ways to do this. Depending on the location, size and type of cancer, you may receive one or a combination of techniques. Your treatment team will help you to decide which treatments are best for you.

Radiation therapy can be delivered in two ways, from a distance and very close to the tumor. With **external beam radiation therapy** the radiation oncology team uses a machine to direct high-energy X-rays at the cancer, usually from about a meter away. Treatment much closer to the tumor, called **brachytherapy**, is usually internal and involves placing radioactive sources (for example, radioactive seeds) inside your body. Less commonly, brachytherapy is used externally for some skin cancers.

### External Beam Radiation Therapy

During external beam radiation therapy, a beam (or multiple beams) of radiation is directed through the skin to the cancer and the immediate surrounding area in order to destroy the main tumor and any nearby cancer cells. To minimize side effects, the treatments are typically given five days a week, Monday through Friday, for a number of weeks. This allows doctors to get enough radiation into the body to kill the cancer while giving healthy cells time to recover.

The radiation beam is usually generated by a machine called a **linear accelerator**, or **linac**. The linear accelerator is capable of producing high-energy X-rays or electrons for the treatment of your cancer. Using treatment

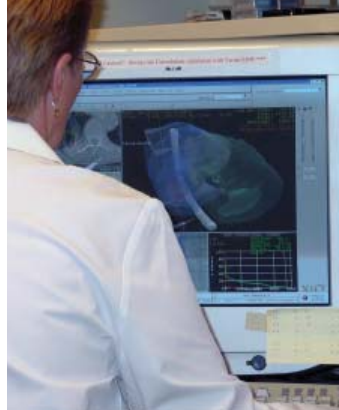
planning computers and software, your treatment team controls the size and shape of the beam, as well as how it is directed at your body, to effectively treat your tumor while sparing the surrounding normal tissue.

Several special types of external beam therapy are discussed in the next sections. These are used for specific types of cancer, and your radiation oncologist will recommend one of these treatments if he or she believes it will help you.



## Three-Dimensional Conformal Radiation Therapy (3D-CRT)

Tumors are not regular; they come in different shapes and sizes. **Three-dimensional conformal radiation therapy**, or **3D-CRT**, uses computers and special imaging techniques such as **CT**, **MR** or **PET** scans to show the size, shape and location of the tumor as well as surrounding organs. Your radiation oncologist can then precisely tailor the radiation beams to the size and shape of your tumor with shielding called **multileaf collimators** or **custom fabricated field-shaping blocks**. Because the radiation beams are very precisely directed, nearby normal tissue receives less radiation and is able to heal more quickly.



## Intensity Modulated Radiation Therapy (IMRT)

**Intensity modulated radiation therapy**, or **IMRT**, is a specialized form of 3D-CRT that allows radiation to be more exactly shaped to fit the tumor. With IMRT, the radiation beam can be broken up into many “beamlets,” and the intensity of each beamlet can be adjusted individually. Using IMRT, it may be possible to further limit the amount of radiation received by healthy tissue near the tumor. In some situations, this may also safely allow a higher dose of radiation to be delivered to the tumor, potentially increasing the chance of a cure.

## Proton Beam Therapy

**Proton beam therapy** is a form of external beam radiation treatment that uses protons rather than electron X-rays to treat certain types of cancer and other diseases. The physical characteristics of the proton therapy beam allow the radiation oncologist to more effectively reduce the radiation dose to nearby healthy tissue. Proton therapy is available at only a few centers in the country and is used in unique clinical situations.

## Neutron Beam Therapy

Like proton therapy, **neutron beam therapy** is a specialized form of external beam radiation therapy. It is often used to treat certain tumors that are **radioresistant**, meaning they are very difficult to kill using conventional X-ray radiation therapy. Neutrons have a greater biologic impact on cells than other types of radiation. Used carefully, this added impact can be an advantage in certain situations. Neutron therapy is available at only a few centers in the country.



## Image Guided Radiation Therapy (IGRT)

Radiation oncologists use **image guided radiation therapy**, or **IGRT**, to help better deliver the radiation to the cancer since tumors can move between treatments due to differences in organ filling or movements while breathing. IGRT involves conformal radiation treatment guided by imaging, such as CT, ultrasound or X-rays, taken in the treatment room just before the patient is given the radiation treatment on a daily basis.

All patients first undergo a CT scan as part of the planning process. The information from the CT scan is then transmitted to a computer in the treatment room to allow doctors to compare the earlier image with the images taken just before treatment. During IGRT, doctors compare these images to see if the treatment needs to be adjusted. This allows doctors to better target the cancer while avoiding nearby healthy tissue. In some cases, doctors will implant a tiny marker in or near the tumor to pinpoint it for IGRT. This helps to account for organ/tumor motion even if the body is immobilized by a casting device.

## Stereotactic Radiation Therapy

**Stereotactic radiotherapy** is a specialized technique that allows your radiation oncologist to use extremely focused beams of radiation to destroy certain types of tumors using higher doses than with daily radiation treatments. Since the beam is so precise, your radiation oncologist may be able to spare more healthy tissue. In selected cases, stereotactic treatments can be used to retreat tumors that have received radiation before.

Stereotactic radiotherapy originally developed first to treat brain tumors in a single dose (sometimes called **stereotactic radiosurgery** or **SRS**). In addition to treating some cancers or benign tumors, radiosurgery can also be used to treat malformations in the brain's blood vessels and certain noncancerous (benign)



## Did You Know?

Each external beam radiation treatment is painless and takes only a few minutes. Treatments are typically scheduled five days a week, Monday through Friday, and continue for up to 10 weeks.

neurologic conditions. In some cases, using more than a single dose may help decrease the risk of side effects with stereotactic radiation therapy.

Treatment outside the brain is called **stereotactic body radiation therapy (SBRT)**, given in a few treatments (typically three to eight). Often used for the lung, spine or liver, it may allow radiation to be given in a way that is safer and more effective than other radiation techniques.

Because specialized treatments with stereotactic radiation are often much higher doses than daily radiation treatment, additional precision and quality assurance is necessary. By using a very secure immobilization of the head or body or by using techniques that allow the radiation beam to follow organ motion during treatment, stereotactic radiation offers new ways for your doctor to treat cancer.

In many clinics, these technologies are called by the name of the vendor that makes it or the product name. Visit [www.rtanswers.org](http://www.rtanswers.org) to see a current list of brand names of linear accelerators.

## Did You Know?

Whether you receive external beam radiation therapy or brachytherapy, your treatment schedule may vary. Although it is often given as a daily treatment Monday to Friday, radiation therapy may be given in different doses. In selected cases, radiation treatments are given in smaller doses twice a day or higher doses less than every day. These different schedules are designed to improve tumor control, lessen side effects or both.



## BRACHYTHERAPY

**Brachytherapy** is the placement of radioactive sources in or just next to a tumor. The word brachytherapy comes from the Greek “brachy” meaning “close or short distance.” During brachytherapy, the radioactive sources may be left in place permanently or only temporarily, depending upon your cancer.

There are two main types of brachytherapy – **intracavitary treatment** and **interstitial treatment**. With intracavitary treatment, the radioactive sources are put into a space near where the tumor is located, such as the cervix, the vagina or the windpipe. With interstitial treatment, the radioactive sources are put directly into the tissues, such as the prostate.

These procedures may require anesthesia, a surgical procedure and a brief stay in the hospital.

Patients with permanent implants may have a few restrictions at first and then can quickly return to their normal activities. Temporary implants are left inside your body for minutes, hours or days. While the radioactive sources are in place, you will stay in a private room. During the time when radiation is present in your system, doctors, nurses and other medical staff will continue to take care of you, but they will take special precautions to limit their exposure to radiation.

A less common use of brachytherapy is **surface mold brachytherapy**, which can be used externally to treat some skin cancers.

**High-dose-rate (HDR) brachytherapy** involves the remote placement of the powerful radiation source, accurately directed by your radiation oncologist and team, into the tumor for several minutes through a tube called a **catheter**, it is usually given in multiple doses once or twice daily, or once or twice weekly. Your doctor and team will control this treatment from outside the treatment room, monitoring you as the therapy is being given. Devices called high-dose-rate remote afterloading machines allow radiation oncologists to deliver a brachytherapy treatment quickly, in about 10 to 20 minutes. You may be able to go home shortly after the procedure.

**Low-dose-rate (LDR) brachytherapy** involves the longer placement of the temporary (several days) or permanent radiation source into the tumor area.

Most patients feel little discomfort during brachytherapy. If the radioactive source is held in place with an applicator, you may feel discomfort from the **applicator**. There are medications that can relieve this discomfort. If you feel weak or queasy from the anesthesia, ask your radiation oncologist for medication to make you feel better.

Depending on the type of brachytherapy you receive, you may need to take some precautions after you leave your treatment, particularly if you plan to be around young children or pregnant women. Because temporary implants are removed after treatment, these radiation safety precaution apply mainly with permanent implants. Ask your radiation oncologist or radiation oncology nurse about anything special you should know.

Brachytherapy may be used alone or in conjunction with external radiation treatments. Your radiation oncologist will advise you of the sequencing of these treatments that is appropriate for you.

## SIDE EFFECTS

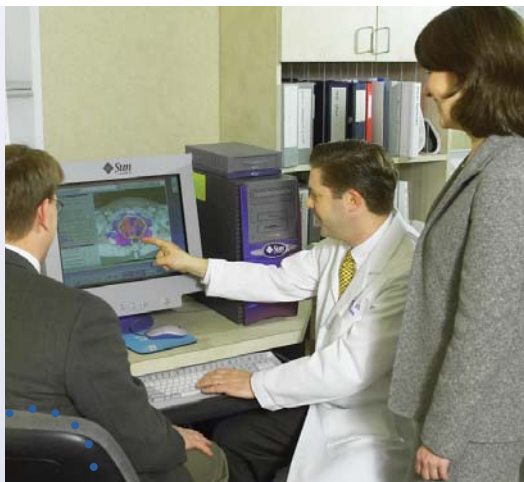
Most of the side effects of radiation therapy are only in the area being treated. For example, a breast cancer patient may notice skin irritation on her chest, like a mild to moderate sunburn, while a patient with cancer in the mouth may have soreness when he swallows. Some patients who are having their midsection treated may report feeling sick to their stomach. These side effects are related to injury to rapidly dividing cells. They are usually temporary and can be treated by your doctor. Side effects usually begin by the second or third week of treatment, and they may last for several weeks after the final radiation treatment. In rare instances, serious side effects develop after radiation therapy is finished.

The side effect most often reported by patients receiving radiation is fatigue. The fatigue patients experience is usually mild or moderate, differs for each patient, and may also relate to the area being treated and the other therapies, such as chemotherapy, the patient is receiving. Patients may be able to continue all or a portion of their normal daily activities. However, treating cancer often requires considerable mental and physical effort. Whenever possible, try to take time during your treatment to rest and relax.

If you experience discomfort or other symptoms during or after treatment, be sure to tell your radiation oncologist or radiation oncology nurse. He or she may be able to recommend strategies, prescribe medication or suggest changes to your diet to help.

### Did You Know?

Before you receive radiation therapy, your radiation oncologist, dosimetrist and medical physicist work together using sophisticated computer software to calculate the best treatment for your situation. This treatment planning ensures that the tumor site receives the maximum amount of radiation while minimizing exposure to healthy tissue and organs.



## ADDITIONAL TREATMENT OPTIONS

### Intraoperative Radiation Therapy

Radiation therapy given during surgery is called **intraoperative radiation therapy**, which can be helpful when vital normal organs are too close to the tumor. During an operation, a surgeon temporarily moves the normal organs out of the way so radiation can be applied directly to the tumor.

This allows your radiation oncologist to avoid exposing those organs to radiation. Intraoperative radiation can be given as external beam therapy or as brachytherapy.

### Radiosensitizers

Any drug that can make tumor cells more sensitive to radiation is called a **radiosensitizer**. Combining radiation with radiosensitizers may allow doctors to kill more tumor cells. Some types of chemotherapy and some novel targeted therapies can act as radiosensitizers.

### Radioprotectors

Some medicines called **radioprotectors** can help protect healthy tissue from the effects of radiation.

### Systemic Radiation Therapy

Certain cancers may be treated by swallowing radioactive pills or receiving radioactive fluids in the vein (intravenous). This type of treatment is called **systemic radiation therapy** because the medicine goes to the entire body. For example, radioactive iodine (I-131) capsules are given to treat some types of thyroid cancer. Another example is the use of intravenous radioactive material to treat pain due to cancer that has spread to the bone. Radiolabeled antibodies are monoclonal antibodies with radioactive particles attached. These antibodies are designed to attach themselves directly to the cancer cell and damage it with small amounts of radiation.

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## WHO ARE THE MEMBERS OF THE RADIATION THERAPY TEAM?

A team of highly trained medical professionals will be involved in your care during radiation therapy. This team is led by a radiation oncologist, a doctor who specializes in using radiation to treat cancer.

### Radiation Oncologists

Radiation oncologists are the doctors who will oversee your radiation therapy treatments. These physicians work with the other members of the radiation therapy team to develop and prescribe your treatment plan and make sure that each treatment is given accurately. Your radiation oncologist will also track your progress and adjust the treatment as necessary to make sure you receive the best care. Radiation oncologists help identify and treat any side effects that may occur due to radiation therapy. They work closely with other cancer doctors, including medical oncologists and surgeons, and all members of the radiation oncology team.

Radiation oncologists are the only physicians with the expertise and training to deliver radiation therapy treatments. In addition to college and medical school, five years of additional training are required for radiation oncologists. They receive extensive training in cancer medicine, in the use of radiation to treat disease and in managing any side effects caused by radiation. Once they pass an examination by the American Board of Radiology, radiation oncologists are board certified.



## Radiation Therapists

Radiation therapists work with radiation oncologists to give the daily radiation treatment under the doctor's prescription and supervision. They maintain daily records and regularly check the treatment machines to make sure they are working properly.

## Radiation Oncology Nurses

Radiation oncology nurses work with every member of the treatment team to care for you and your family before, during and after treatment. They will explain the possible side effects you may experience and will describe how you can manage them. They will assess how you are doing throughout treatment and will help you cope with the changes you are experiencing.

## Medical Physicists

Medical physicists work directly with the radiation oncologist during treatment planning and delivery. They oversee the work of the dosimetrist and help ensure that complex treatments are properly tailored for each patient. Medical physicists develop and direct quality control programs for equipment and procedures. They are trained with advanced degrees and appropriately credentialed to provide this important service. These professionals make sure the equipment works properly by taking precise measurements of the radiation beam and performing other safety tests on a regular basis.

## Dosimetrists

Dosimetrists work with the radiation oncologist and medical physicist to carefully calculate the dose of radiation to make sure the tumor gets the prescribed amount. Using computers, they develop an optimized treatment plan that can best destroy the tumor while sparing the healthy tissue.

Other members of the treatment team may include social workers, nutritionists, patient navigators, radiation engineers, physical therapists, radiation data managers, dentists and clerical staff. In cases where radiation is used in combination with chemotherapy or surgery, a coordinated multidisciplinary team often extends beyond the radiation treatment team to include health care professionals from medical oncology and surgery.

## IS RADIATION THERAPY SAFE?

Some patients worry about the safety of radiation therapy. Radiation has been used successfully to treat patients for more than 100 years. In that time, many advances have been made to ensure that radiation therapy is safe and effective. With each advance, new quality checks have developed to ensure safe treatment.

Before you begin receiving radiation therapy, your radiation oncology team will carefully design your plan to make sure that you receive safe and accurate treatment.

Treatment will be carefully planned to focus on the cancer while avoiding healthy organs in the area. Throughout your treatment, members of your team check and recheck your plan. Special computers are also used to monitor and double-check the treatment machines to make sure that the proper treatment is given.

If you undergo external beam radiation therapy, you will not be radioactive after treatment ends because the radiation does not stay in your body. However, if you undergo brachytherapy, tiny radioactive seeds will be implanted into your body either temporarily or permanently. Your radiation oncologist will explain any special precautions that you or your family may need to take for a short time following treatment.



## WHAT HAPPENS BEFORE, DURING AND AFTER TREATMENT?

Once the diagnosis has been made, you will probably talk with your primary care physician along with several cancer specialists, such as a surgeon, a medical oncologist and a radiation oncologist. You will want to ask these doctors about all your treatment options. In many cases, your cancer will need to be treated by using more than one type of treatment. For example, if you have breast cancer, you might have surgery to remove the tumor (by a surgeon), then have radiation therapy to destroy any remaining cancer cells in or near your breast (by a radiation oncologist). You also might receive chemotherapy (by a medical oncologist) to destroy cancer cells that have traveled to other parts of the body. After reviewing your medical tests, including CT scans, MRI scans and PET scans, and completing a thorough examination, your radiation oncologist will discuss with you the potential benefits and risks of radiation therapy and answer your questions.

### BEFORE TREATMENT

If you are considering radiation therapy, you must first meet with a radiation oncologist. During your first visit, your doctor will evaluate your need for radiation therapy and its likely results. This includes reviewing your current medical problems, past medical history, past surgical history, family history, medications, allergies and lifestyle. The doctor will also perform a physical exam to assess the extent of your disease and judge your general physical condition. You may also be seen by a medical student, a resident (radiation oncologist in training), a nurse practitioner, a physician's assistant or a nurse.



## Simulation

To be most effective, radiation therapy must be aimed precisely at the same target or targets each and every time treatment is given. The process of measuring your body and marking your skin to help your team direct the beams of radiation safely and exactly to their intended locations is called **simulation**.

During simulation, your radiation oncologist and radiation therapist place you on the simulation machine in the exact position you will be in during the actual treatment. Your radiation therapist, under your doctor's supervision, then marks the area to be treated directly on your skin or on **immobilization devices**. Immobilization devices are molds, casts, headrests or other devices that help you remain in the same position during the entire treatment. The radiation therapist marks the immobilization devices and/or your skin with either a bright, temporary paint or a set of small, permanent tattoos. Often, a special treatment planning CT scan is done to help with the simulation and treatment planning. This CT scan is in addition to your diagnostic CT scan. Your radiation oncologist may request that special blocks or shields be made for you. These blocks or shields are put in the external beam therapy machine before each of your treatments and are used to shape the radiation to your tumor and keep the rays from normal tissue. **Multileaf collimators**, shaping devices located in the head of the linear accelerator itself, may also be used to shape the beam and achieve safe delivery of your radiation treatment.

## Treatment Planning

Once you have finished simulation, your radiation oncologist and other members of the treatment team review information obtained during simulation along with your previous medical tests to develop a **treatment plan**. A sophisticated treatment-planning computer and associated software may be used to help design the best possible treatment plan. After reviewing all of this information, your doctor will write a prescription that outlines exactly how much radiation you will receive and to what parts of your body.

## Quality Assurance Before Treatment

Once your doctor approves the radiation therapy plan in treatment planning the members of the radiation treatment team work together to ensure that your specific treatment plan works correctly on the linear accelerator before treatment begins. A 'dry run' is often completed for more complex treatments by a medical physicist to ensure that the radiation treatment designed for you is as accurate and as safe as possible.

## DURING EXTERNAL BEAM RADIATION THERAPY TREATMENTS

When you undergo external beam radiation therapy treatment, each session is painless, just like getting an X-ray. The radiation is directed at your tumor from a machine located away from your body, usually a linear accelerator. External beam radiation is noninvasive, unlike surgery, which is an invasive process. One of the benefits of radiation therapy is that it is usually given as a series of outpatient treatments (meaning you don't have to stay in the hospital). You may not need to miss work or experience the type of recuperation period that may follow other treatments. The radiation therapist will give you your external beam treatment following your radiation oncologist's instructions. It will take five to 15 minutes for you to be positioned for treatment and for the equipment to be set up. If an immobilization device was made during simulation, it will be used during every treatment to make sure that you are in the exact same position every day. Time spent in the treatment room may vary depending on the type of radiation, but it generally ranges from 10 to 40 minutes.

Once you are positioned correctly, the therapist will leave the room and go into the control room next door to closely monitor you on a television screen while giving the radiation. There is a microphone in the treatment room so you can always talk with the therapist if you have any concerns. The machine can be stopped at any time if you are feeling sick or uncomfortable.

The radiation therapist may move the treatment machine and treatment table to target the radiation beam to the exact area of the tumor. The machine might make noises during treatment that sound like clicking, knocking or whirring, but the radiation therapist is in complete control of the machine at all times.

Your radiation oncologist monitors your daily treatment and may alter your radiation dose based on these observations. Also, your doctor may order blood tests, X-rays and other tests to see how your body is responding to treatment. If the tumor shrinks significantly, another simulation may be required. This allows your radiation oncologist to change the treatment to destroy the rest of the tumor and spare even more normal tissue.

Sometimes a course of treatment may need to be interrupted for a day or more. This may happen if you develop side effects that require a break in treatment. These missed treatments may be made up by adding treatments at the end. However, it is best to try to arrive on time and not miss any of your

appointments. Treatments are usually scheduled five days a week, Monday through Friday, and continue for one to 10 weeks. The number of radiation treatments you will need depends on the size, location and type of cancer you have, the intent of the treatment, your general health, and other medical treatments you may be receiving.

A portion of your external radiation therapy may be directed at the tumor and surrounding tissues at risk for harboring microscopic cancer cells. This might be followed by shrinkage of the volume of tissue treated to the tumor area itself, since this area may require a higher dose to eliminate the cancer cells. This is called a boost.

In some cases, a patient may receive chemotherapy and radiation therapy at the same time. The chemotherapy may be delivered weekly, every three weeks or at some schedule determined by the medical oncologist together with the radiation oncologist. The chemotherapy may work to help sensitize the cancer cells in the target area to the radiation therapy and may also travel elsewhere in the body to help destroy or reduce microscopic cancer cells. Your treatment team will help coordinate these therapies and care for potential side effects.

### Weekly Checkups

During radiation therapy, your radiation oncologist and nurse will see you regularly to follow your progress, evaluate whether you are having any side effects, recommend treatments for those side effects (such as medication) and address any concerns you may have. Your doctor may also make changes in the schedule or treatment plan depending on your response or reaction to the therapy. Your radiation oncology team may gather on a regular basis with other health care professionals to review your case to ensure your treatment is proceeding as planned. During these sessions, all the members of the team discuss your progress and any concerns.



## Quality Assurance During Treatment

During your course of treatment, correct positions of the treatment beams will be regularly verified with images made using the treatment beam itself. These images (called port films, beam films or portal verification) represent an important quality assurance check but do not evaluate the tumor itself. Depending upon what kind of treatment you receive and what your doctor thinks will work best, the type of images used (e.g., X-ray, CT scan, ultrasound, etc.) may vary. These images assure your radiation oncologist that the treatment setup accurately matches the intended target.

## AFTER TREATMENT FOLLOW-UP

After treatment is completed, follow-up appointments will be scheduled so that your radiation oncologist can make sure your recovery is proceeding normally. Your radiation oncologist, in concert with other members of your team, may also order additional diagnostic tests. Reports on your treatment may also be sent to the other doctors helping treat your cancer. As time goes by, the number of times you need to visit your radiation oncologist will decrease. However, you should know that your radiation oncology team will always be available should you need to speak to someone about your treatment.

## WHAT ARE CLINICAL TRIALS?

Cancer specialists regularly conduct studies to test new treatments. These studies are called clinical trials. Most standard cancer treatments are based on the results of previous **clinical trials**. Clinical trials are available through cancer doctors everywhere — not just in major cities, university centers or in large hospitals.

Some clinical trials try to determine if a therapeutic approach is safe and potentially effective. Many large clinical trials compare the more commonly used standard treatment with a treatment that cancer experts think might be better. Patients who participate in clinical trials help doctors and future cancer patients find out whether a promising treatment is safe and effective. All patients who participate in clinical trials are carefully monitored to make sure they are getting quality care. Remember, clinical trials are completely voluntary. You can leave a trial at any time. Clinical trials testing new treatments are carried out in phases.

## Phase I — Is the Treatment Safe?

When doctors are developing a new drug, the first step is to determine the maximum safe dose of drug that can be administered. This needs to be done before any determination of whether the drug is effective (Phase II-see below). Radiation phase I trials are different since radiation oncologists already know that standard doses of radiation are effective. Phase I radiation trials attempt to increase the dose of radiation above that which is given under standard conditions, with the hope of increasing tumor control.

## Phase II — Does the Treatment Work?

In a phase II radiation study, radiation oncologists are trying to establish if the new treatment seems to show enough promise in terms of shrinking the tumor that it is worth testing against the standard therapy in a phase III trial.

## Phase III — Is the Treatment Better?

Phase III trials compare the new treatment against the current standard therapy and randomly assign patients into one of the two groups.

## Phase IV — Are There Better Ways to Use the Treatment?

In this final step, treatments are tested to make sure they are safe and work well over a long period of time. This phase most often occurs once the new treatment has been approved for standard use. Anywhere from several hundred to several thousand people are enrolled in a phase IV trial. Only you can make the decision about whether or not to participate in a clinical trial. Before making your decision, learn as much as possible about your cancer and the clinical trials that may be available to you. Your radiation oncologist can answer many of your questions if you are considering a trial or contact the **National Cancer Institute at 1-800-4-CANCER** or [www.cancer.gov](http://www.cancer.gov).



## HOW SHOULD I CARE FOR MYSELF DURING RADIATION THERAPY?

**Get plenty of rest.** Many patients experience fatigue during radiation therapy, so it is important to make sure you are well rested. If possible, ask friends and family to help out during treatment by running errands and preparing meals. This will help you get the rest you need to focus on fighting your cancer. If you need more help, ask your social worker or nurse to give you information on a local cancer support group or other resources. Volunteers may be able to help.

Even though it is important to recognize when you might need some rest, there is good evidence to suggest that some physical activity during treatment can help decrease the fatigue. For example, many patients feel a daily walk helps decrease some of their treatment-related fatigue. Ask your radiation oncologist what the best form of daily exercise might be for you.

**Follow your doctor's orders.** In many cases, your doctor will ask you to call if you develop a fever of 101° F or higher. Be sure to read your instructions as far as caring for yourself during treatment.

**Eat a balanced, nutritious diet.** A nutritionist, nurse or doctor may work with you to make sure you are eating the right foods to get the vitamins and minerals you need. With certain types of radiation, you may need to change your diet to minimize side effects. You should not attempt to lose weight during radiation therapy since you need more calories due to your cancer and treatment.

**Stay hydrated.** In some cases, you may be at risk of becoming dehydrated during treatment. Helpful fluids may include flat soda, JELL-O, juice, sorbet, broth and water. Discuss with your doctor what strategies will work best.

**Treat skin exposed to radiation with extra care.** The skin in the area receiving treatment may become red and sensitive, similar to a sunburn. Your radiation oncology nurse will review specific instructions for caring for your skin with you. Some guidelines include:

- Clean the skin daily with warm water and a mild soap recommended by your nurse.
- Avoid using any lotions, perfumes, deodorants or powders in the treatment area unless approved by your doctor or nurse. Avoid products containing alcohol, which may dry your skin.

- Avoid putting anything hot or cold on the treated skin. This includes heating pads and ice packs.
- Stay out of the sun. If you must be outdoors, wear a hat or clothing to protect your skin. After treatment, use sunscreen with an SPF of at least 15.

**Seek out support.** There are many emotional demands on you during your cancer diagnosis and treatment. It is common to feel anxious, depressed, afraid or hopeless. It may help to talk about your feelings. To find a support group in your area, ask your radiation oncology nurse.

There are many groups that meet in person, over the phone or on the Internet. Some support organizations can even help you manage financial issues, such as insurance and co-pays.



## WHAT QUESTIONS SHOULD I ASK MY DOCTOR?

### Questions to Ask Before Treatment

- What type and stage of cancer do I have?
- What is the purpose of radiation treatment for my type of cancer?
- How will the radiation therapy be given? Will it be external beam or brachytherapy? What do the treatments feel like?
- How long will I receive radiation? How many treatments will I receive per week?
- What are the chances that radiation therapy will work?
- What is the chance that the cancer will spread or come back if I do not have radiation therapy?
- Will I need chemotherapy, surgery or other treatments? If so, in what order will I receive these treatments? How soon after radiation therapy can I start them? How will the treatments be coordinated?
- Is there a clinical trial for which I might be eligible? Should I participate in a clinical trial?

### What are my benefits and risks?

- How should I prepare for this financially?
- What are some of the support groups I can turn to during treatment?
- Will radiation therapy affect my ability to have children?
- If I have questions after I leave here, who can I call or email?
- Do you take my insurance? Is there a co-pay?

### Questions to Ask During Treatment

- Can I drive myself to and from the treatment facility? Where should I park?
- What side effects may occur from the radiation and how are they managed?
- Do I need a special diet during or after my treatment?
- Will I be able to continue my normal activities?
- Can I smoke or drink alcohol?

- Is it safe to take vitamins during treatment?
- How can I expect to feel during treatment and in the weeks following radiation therapy?

### Questions to Ask After Treatment Ends

- What are reasons that I should call you after my treatment ends?
- How and when will you know if I am cured of cancer?
- What are the chances that the cancer will come back?
- How often do I need to return for checkups?
- How soon can I go back to my regular activities? Work? Sexual activity? Exercise?

**If you have any questions about your diagnosis, treatment or side effects, please contact your doctor or other members of your treatment team. To locate a radiation oncologist in your area, or for additional cancer treatment information, please visit [www.rtanswers.org](http://www.rtanswers.org).**



# I may need radiation therapy. Now what?



Go to [www.ranswers.org](http://www.ranswers.org) for answers to your radiation therapy questions.

- What is radiation therapy?
- How does radiation work for my illness?
- What should I ask my doctor?
- What do these terms mean?
- Who will I see during my treatments?
- Will there be side effects?
- Where can I go for support?




Receiving a diagnosis of cancer can be frightening and confusing. To help you better understand the treatment options available, ASTRO created this website to explain how doctors use radiation therapy to treat cancer safely and effectively.

**RTAnswers**  
ANSWERS TO YOUR RADIATION THERAPY QUESTIONS

Content written and approved by members of the American Society for Radiation Oncology.

**ASTRO**





THE AMERICAN SOCIETY FOR RADIATION ONCOLOGY (ASTRO) is the largest radiation oncology society in the world, with more than 10,000 members who specialize in treating patients with radiation therapies. As the leading organization in radiation oncology, biology and physics, ASTRO's mission is to advance the practice of radiation oncology by promoting excellence in patient care, providing opportunities for educational and professional development, promoting research and disseminating research results, and representing radiation oncology in a rapidly evolving health care environment.

Visit [www.astro.org](http://www.astro.org) for more information.

# ASTRO

TARGETING CANCER CARE

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