



Understanding Radiation Therapy

A guide for people with cancer,
their families and friends

A large yellow shape, resembling a stylized sun or a large drop, occupies the lower half of the page. On its right side, there is a purple circle containing the word "Treatment". A thin orange line extends from the bottom of the purple circle, curves to the left, and ends in a small telephone handset icon pointing towards the phone number.

Treatment

For information & support, call

13 11 20

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Understanding Radiation Therapy is reviewed approximately every two years. Check the publication date above to ensure this copy is up to date.

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Note to reader

Always consult your doctor about matters that affect your health. This booklet is intended as a general introduction to the topic and should not be seen as a substitute for medical, legal or financial advice. You should obtain independent advice relevant to your specific situation from appropriate professionals, and you may wish to discuss issues raised in this book with them.

All care is taken to ensure that the information in this booklet is accurate at the time of publication. Please note that information on cancer, including the diagnosis, treatment and prevention of cancer, is constantly being updated and revised by medical professionals and the research community. Cancer Council Australia and its members exclude all liability for any injury, loss or damage incurred by use of or reliance on the information provided in this booklet.

Cancer Council

Cancer Council is Australia's peak non-government cancer control organisation. Through the eight state and territory Cancer Councils, we provide a broad range of programs and services to help improve the quality of life of people living with cancer, their families and friends. Cancer Councils also invest heavily in research and prevention. To make a donation and help us beat cancer, visit cancer.org.au or call your local Cancer Council.



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Introduction

This booklet has been prepared to help you understand more about radiation therapy, one of the main treatments for cancer. Radiation therapy is also known as radiotherapy.

We cannot give advice about the best treatment for you, but we hope this information will help you think about questions to ask your treatment team. It may also be helpful to read the Cancer Council booklet about the type of cancer you have.

Some people feel concerned about the side effects of radiation therapy, but most side effects are temporary. We have included information about managing the most common side effects.

This booklet does not need to be read from cover to cover – just read the parts that are useful to you. Some medical terms that may be unfamiliar are explained in the glossary. You may also like to pass this booklet to your family and friends for their information.

How this booklet was developed

This information was developed with help from a range of health professionals and people affected by cancer who have had radiation therapy.

If you or your family have any questions, call Cancer Council **13 11 20**. We can send you more information and connect you with support services in your area. Turn to the last page of this book for more details.



**Cancer
Council
13 11 20**

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What is cancer?

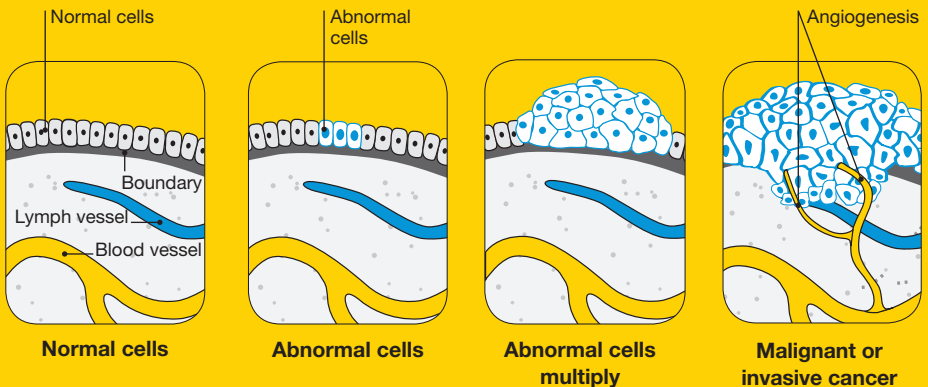
Cancer is a disease of the cells, which are the body's basic building blocks. The body constantly makes new cells to help us grow, replace worn-out tissue and heal injuries. Normally, cells multiply and die in an orderly way.

Sometimes cells don't grow, divide and die in the usual way. This may cause blood or lymph fluid in the body to become abnormal, or form a lump called a tumour. A tumour can be benign or malignant.

Benign tumour – Cells are confined to one area and are not able to spread to other parts of the body. This is not cancer.

Malignant tumour – This is made up of cancerous cells, which have the ability to spread by travelling through the bloodstream or lymphatic system (lymph fluid).

How cancer starts



The cancer that first develops in a tissue or organ is called the primary cancer. A malignant tumour is usually named after the organ or type of cell affected.

A malignant tumour that has not spread to other parts of the body is called localised cancer. A tumour may invade deeper into surrounding tissue and can grow its own blood vessels in a process known as angiogenesis.

If cancerous cells grow and form another tumour at a new site, it is called a secondary cancer or metastasis. A metastasis keeps the name of the original cancer. For example, breast cancer that has spread to the bones is called metastatic breast cancer, even though the person may be experiencing symptoms caused by cancer in the bones.

How cancer spreads

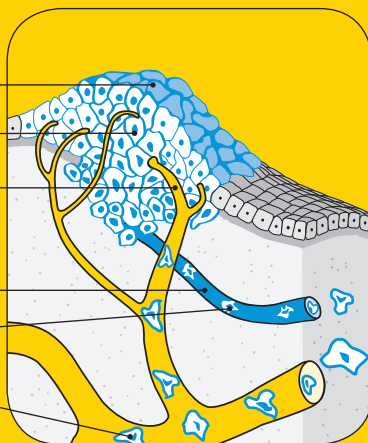
Primary cancer

Local invasion

Angiogenesis –
tumours grow their
own blood vessels

Lymph vessel

Metastasis –
cells invade other
parts of the body via
blood vessels and
lymph vessels





How cancer is treated

Most cancers are treated with surgery, chemotherapy and/or radiation therapy (radiotherapy). Other treatments, such as hormone therapy, immunotherapy and targeted therapy, can also be used for some types of cancer. The different treatments for cancer may be used alone or in combination.

Types of cancer treatments

Surgery	An operation to remove or repair a part of the body affected by cancer.
Systemic treatment	<p>When drugs or other substances are delivered into the bloodstream so the treatment travels throughout the body. Systemic treatment includes:</p> <ul style="list-style-type: none">• Chemotherapy – The use of drugs to kill cancer cells or slow their growth.• Hormone therapy – Treatment that blocks the body's natural hormones. It is used when the cancer is growing in response to hormones.• Targeted therapy – The use of drugs to attack specific particles within cells that let cancer grow.• Immunotherapy – Treatment that triggers the immune system to fight cancer.
Radiation therapy	The use of targeted radiation to kill or damage cancer cells so they cannot grow, multiply or spread. The radiation is usually in the form of x-ray beams.

The aim of treatment

Cancer treatments can be given with the aim of curing the cancer (curative treatment) or with the aim of controlling the cancer's growth and/or relieving symptoms to improve quality of life (palliative treatment).

The treatments you have depend on several factors, including:

- the type of cancer you have
- where it began (primary cancer)
- whether it has spread to other parts of your body (metastasis)
- your general health and age and your preferences
- what treatments are currently available.

Cancer Council has information about different cancer types and their treatments. Call Cancer Council 13 11 20 for free copies, or download them from your local Cancer Council website.

Radiation therapy for children

The information in this booklet is for adults having radiation therapy, although much of it will also be relevant for children. Talk to your treatment team for specific information about radiation therapy for children. For age-appropriate support and resources, you might also want to contact:

Camp Quality – supports children aged 0–13 and their families. Call **1300 662 267** or visit **campquality.org.au**.

CanTeen – supports young people aged 12–25 who have been affected by cancer. Call **1800 226 833** or visit their website at **canteen.org.au**.



Key questions

Q: What is radiation therapy?

A: Radiation therapy uses a controlled dose of radiation to kill cancer cells or damage them so they cannot grow, multiply or spread. The radiation is usually in the form of focused x-ray beams, also known as photons. It can also be in other forms such as electron beams, proton beams (see page 27) or gamma rays from radioactive sources (see page 30). It is a localised treatment, which means it generally affects only the part of the body where the radiation is targeted.

Q: How does radiation therapy work?

A: Radiation therapy kills or damages cancer cells in the area being treated. Cancer cells begin to die days or weeks after treatment starts, and continue to die for weeks or months after it finishes. Although the radiation can also damage healthy cells, these tend to be less sensitive than the cancer cells and can usually repair themselves. You should not feel any pain or heat during radiation therapy, but some side effects can cause pain or discomfort. Read about ways to prevent or manage side effects on pages 37–54.

Q: How is radiation therapy given?

A: There are two main ways of giving radiation therapy:

External beam radiation therapy (EBRT) – Radiation beams from a large machine are aimed at the area of the body where the cancer is located. The process is similar to having

an x-ray. You will lie on a treatment table underneath the machine, which will move around your body. You won't see or feel the radiation, although the machine can make noise as it moves. For more information, see pages 18–29.

Internal radiation therapy – A radiation source is placed inside the body or, more rarely, injected into a vein or swallowed. The most common form of internal radiation therapy is brachytherapy, where temporary or permanent radiation sources are placed inside the body next to or inside the cancer. For more information about internal radiation therapy, see pages 30–36.

You may have one or both types of radiation therapy, depending on the type of cancer and other factors.

Q: Where will I have treatment?

A: Radiation therapy is usually given in the radiation oncology department of a large hospital or treatment centre, or in private clinics. The large machines used for external beam radiation therapy (see page 18) will be in a dedicated room.

While treatment schedules vary, most people have radiation therapy as an outpatient. This means you do not stay in hospital, but travel to the treatment centre for each session. Radiation therapy centres will try to arrange treatment times that suit you. For some types of internal radiation therapy, you will need to stay in hospital overnight or for a few days.

Q: Why have radiation therapy?

A: Research shows that about one in two people with cancer would benefit from radiation therapy.¹ It can be used for different reasons:

As the main treatment to achieve remission or cure –

Radiation therapy may be given as the main treatment with the aim of causing the signs and symptoms of cancer to reduce or disappear. This is called curative or definitive radiation therapy.

To help other treatments achieve remission or cure –

Radiation therapy is often used before (neoadjuvant) or after (adjuvant) treatments such as surgery to make the treatment more effective. It can also be used at the same time as some treatments – when it is combined with chemotherapy, it is known as chemoradiation or chemoradiotherapy.

For symptom relief – Radiation therapy can help to relieve pain and other symptoms by making the cancer smaller or stopping it from spreading. This is known as palliative treatment.

Q: Will I be able to work during radiation therapy?

A: Many people can continue to work during their treatment and feel well enough to do all their usual activities. Others may need to reduce their hours or take time off. How much

you will be able to work depends on the type of radiation therapy you have, how the treatment makes you feel and the type of work you do. You may be able to organise your radiation therapy appointments for the beginning or end of the day.

Talk to your employer about your working arrangements. Explain that it is hard to predict how radiation therapy will affect you, and discuss the options of flexible hours, modifying duties or taking leave.

Your treatment team will encourage you to be as active as possible, and they can answer your questions about working during treatment.

Q: Can I have radiation therapy if I am pregnant?

A: You probably won't be able to have radiation therapy if you are pregnant, as radiation can harm a developing baby. It's important that you don't become pregnant during the course of treatment. If you suspect you may be pregnant at any stage, it is important to tell your doctor. Men who have radiation therapy should avoid getting their partner pregnant during treatment and for about six months afterwards, as radiation can damage sperm.

Your doctor will be able to give you more information about radiation therapy and pregnancy.

How do I prepare for radiation therapy?

The effects of radiation therapy depend on the part of the body being treated and the number of treatments required. Your treatment team will tell you the likely effects for you. It can be hard to know how to prepare, but a number of general issues are worth considering in advance.



Find out about quitting

If you smoke, try to quit or cut down before radiation therapy starts as smoking may make the treatment less effective and side effects worse. Quitting can be difficult, especially if you're already feeling anxious about the cancer diagnosis, so it is important to seek support – talk to your doctor, call Quitline on **13 7848** or visit **quitnow.gov.au**.



Explore ways to relax

Waiting for and having radiation therapy can make people feel anxious. Take something to read or listen to while you wait, ask a friend or family member to keep you company, or try chatting to other people waiting for treatment. To help you relax during the session, try meditation or breathing exercises, or ask the radiation therapists if you can listen to music.



Organise help at home

You may become very tired during the later weeks of treatment. Some support with housework, meals and errands can ease the load. If you have young children, you may need to arrange for someone to look after them during treatment sessions and possibly afterwards. Older children may need lifts to and from school and activities. Consider asking one friend or family member to coordinate offers of help.

Arrange transport

Talk to the hospital social worker or clinic receptionist about parking arrangements as there will often be spots set aside for radiation therapy patients. At first, you may feel well enough to drive yourself or catch public transport to radiation therapy sessions. However, you are likely to feel more tired as the treatment goes on, so try to arrange for a relative, friend or volunteer to drive you. You may be able to get community transport through your local council or Cancer Council.



Mention metal implants

Let your treatment team know if you have any medical devices in your body, such as a pacemaker, cochlear implant or another metal implant. Radiation therapy can affect these devices.



Ask about travel assistance

If the treatment centre is a long distance from your home, you may be eligible for financial assistance towards the cost of accommodation or travel. Your local Cancer Council may also provide accommodation services. For details, speak to the hospital social worker or clinic receptionist, call Cancer Council **13 11 20**, or visit your local Cancer Council website (see back cover).

Discuss your concerns

Keep a list of questions for your treatment team. If you are feeling anxious about the diagnosis and treatment, try talking to a member of the radiation therapy team, your GP, or a family member or friend. You can also call Cancer Council **13 11 20** to speak to a health professional.

Consider fertility

Some types of radiation therapy can affect your fertility. If you think you may want to have children in the future, talk to your treatment team about your options before radiation therapy begins (see pages 52–53).

Q: How will I know the treatment has worked?

A: Because cancer cells continue to die for weeks or months after treatment ends, your radiation oncologist most likely won't be able to tell you how the cancer is responding during treatment. However, they can help you manage any side effects. After treatment finishes, you will have regular check-ups. Your radiation oncologist will do a physical examination and arrange tests or scans to check whether the cancer has responded to treatment. It may be some time after radiation therapy finishes before the full benefit is known.

If radiation therapy is given as palliative treatment, the relief of symptoms will indicate that the treatment has worked. This may take a few days or weeks. Until then, you may need to have symptoms treated in other ways, e.g. medicine for pain.

Q: Which health professionals will I see?

A: After a diagnosis of cancer, you will usually be cared for by a range of health professionals who specialise in different areas of your treatment. This is called a multidisciplinary team (MDT). For external beam radiation therapy and brachytherapy, the main specialist doctor will be a radiation oncologist. You may be referred to a radiation oncologist by your GP or by another specialist such as a surgeon or medical oncologist. Some of the health professionals you may see during and after treatment are listed in the table opposite.

Health professionals in the MDT

radiation oncologist*	assesses you for radiation therapy, prescribes and coordinates the course of radiation therapy
radiation therapist	plans and delivers radiation therapy
radiation oncology nurses	help you manage emotional and physical problems, including side effects that you may experience during treatment
radiation oncology medical physicist	ensures radiation therapy is delivered accurately and safely by checking radiation treatment plan and ensuring radiation therapy machines are running correctly
dietitian	recommends an eating plan to follow while you are in treatment and recovery
speech pathologist	helps with communication and swallowing
social worker	links you to support services and helps you with emotional, practical or financial issues
psychologist	uses counselling to help you manage your emotional response to diagnosis and treatment
physiotherapist	helps you with any physical or practical issues associated with cancer and treatment
occupational therapist	assists in adapting your living and working environment to help you resume usual activities
lymphoedema practitioner/therapist	educates people about lymphoedema prevention and management, and provides treatment if lymphoedema occurs

* *Specialist doctor*



Making treatment decisions

Sometimes it is difficult to decide on the type of treatment to have. You may feel that everything is happening too fast. Check with your doctor how soon your treatment should start, and take as much time as you can before making a decision.

Understanding the disease, the available treatments and possible side effects can help you weigh up the pros and cons of different treatments and make a well-informed decision that's based on your personal values. You may also want to discuss the options with your doctor, friends and family.

You have the right to accept or refuse any treatment offered. Some people with more advanced cancer choose treatment even if it offers only a small benefit for a short period of time. Others want to make sure the benefits outweigh the side effects so they have the best possible quality of life.

Talking with doctors

When your doctor first tells you that you have cancer, you may not remember the details about what you are told. Taking notes or recording the discussion may help. Many people like to have a family member or friend go with them to take part in the discussion, take notes or simply listen.

If you are confused or want clarification, you can ask for further explanation – see page 60 for a list of suggested questions. If you have several questions, you may want to talk to a nurse or ask the office manager if it is possible to book a longer appointment.

A second opinion

You may want to get a second opinion from another specialist to confirm or clarify your doctor's recommendations or reassure you that you have explored all of your options. Specialists are used to people doing this.

Your doctor can refer you to another specialist and send your initial results to that person. You can get a second opinion even if you have started treatment or still want to be treated by the first doctor. You might decide you would prefer to be treated by the doctor who provided the second opinion.

Taking part in a clinical trial

Your doctor or nurse may suggest you take part in a clinical trial. Doctors run clinical trials to test new or modified treatments and ways of diagnosing disease to see if they are better than current methods. For example, if you join a randomised trial for a new treatment, you will be chosen at random to receive either the best existing treatment or the modified new treatment.

Over the years, trials have improved treatments and led to better outcomes for people diagnosed with cancer.

It may be helpful to talk to your specialist or clinical trials nurse, or to get a second opinion. If you decide to take part, you can withdraw at any time. For more information, call Cancer Council 13 11 20 for a free copy of *Understanding Clinical Trials and Research*, or visit australiancancertrials.gov.au.



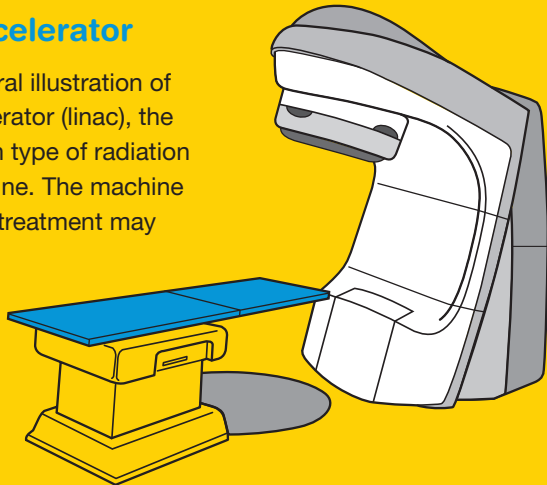
External beam radiation therapy

External beam radiation therapy (EBRT) uses a radiation machine to precisely direct radiation beams at the cancer. The radiation is targeted only at the part of the body where the cancer is; for example, if you have breast cancer, the radiation will treat only the breast.

You will lie on a treatment table or “couch” under the machine, which will usually be a linear accelerator (see illustration below). The machine does not touch you, but it may rotate around you to deliver radiation beams to the area of the cancer from different directions. This allows the radiation to be more precisely targeted at the cancer and limits the radiation to surrounding normal tissues. You won’t be able to see or feel the radiation. Once the machine is switched off, it no longer gives off radiation.

Linear accelerator

This is a general illustration of a linear accelerator (linac), the most common type of radiation therapy machine. The machine used for your treatment may look different.



The treatment course

Your radiation oncologist will work out the total dose needed to treat the cancer. In most cases, this will then be divided into several smaller doses called fractions that are given on different days. Each session lasts about half an hour, with the treatment itself taking only a few minutes (see pages 22–23).

A course of treatment refers to the total number of sessions of radiation therapy you receive. The length of the course varies between people depending on the type of cancer, the total dose required, the location of the cancer and the reason for having the treatment.

In general, higher total doses are used for curative treatment, and a fraction will be given each day, Monday to Friday, for 3–8 weeks. Dividing the dose into separate sessions with weekend rest breaks allows the healthy cells to recover. Occasionally, the radiation oncologist may recommend two treatments per day, with several hours between the sessions.

If you are having radiation therapy as palliative treatment to relieve symptoms, you may have only one or a few treatments.

Each fraction of radiation causes a little more damage to cancer cells, so it's important to attend all of your scheduled sessions. This ensures you receive the required amount of treatment to eventually kill the cells or relieve symptoms. When you miss sessions, cancer cells have more time to repair the damage, so your treatment may become less effective.

Planning the treatment

Treatment needs to be carefully planned to ensure that enough radiation reaches the cancer, while as little as possible reaches healthy tissues and organs. The planning steps below may occur over a few appointments.



Initial appointment and examination

This may take up to two hours. Your radiation oncologist will assess whether radiation therapy is the right treatment for you. This will involve talking to you, doing a physical examination, and looking at all your tests and scans.

The benefits and side effects of radiation therapy and what to expect during planning and treatment will be explained. You might also meet the radiation oncology nurse and a radiation therapist who can give you more information.

The radiation oncologist may arrange further x-rays, scans or other tests to find out more about the cancer.

You may want to take someone with you to keep you company, ask questions and make notes.



Masks and casts

In most cases, you will need some type of device to ensure you are in the same position for each session and to help keep you still during treatment. This is known as an immobilisation device or cast and it will be custom-made to fit you. Depending on the area being treated, the device could be a mask, head rest, breast board, or a knee or foot cushion.

For radiation therapy to the head or neck, you may need to wear a plastic mask. This can feel strange and confining, but you will still be able to hear, speak and breathe. Tell the radiation therapists if you feel anxious or claustrophobic before or during treatment. They can suggest breathing or relaxation exercises, or arrange for you to have a mild sedative.



Skin markings

To ensure you are positioned in the same way for each treatment session, a few very small permanent ink spots (tattoos) may be marked on your skin. These tattoos are the size of a small freckle and can't be easily seen.

Sometimes temporary ink marks are made on the skin. Ask the radiation therapist if you can wash these off or if you need to keep them until the full course of treatment is finished. The ink can be redrawn during the course of treatment, but it will gradually fade.

If you have to wear a mask or cast, the markings may be made on this rather than on your skin.

For image-guided radiation therapy (see page 26), you may have a small surgical procedure to insert markers (usually gold grains) into the cancer. These internal markers can then be seen on scans during the treatment.



CT planning

You will need to have a planning CT scan even if you have already had a CT scan to diagnose the cancer. This step is known as CT planning or simulation.

For this scan, you will be placed in the same position on the table that you will be in for treatment. If you have a mask or cast, you will use it during the scan. The images from the CT scanner will build up a three-dimensional picture of your body. This will show the exact location that needs to receive the radiation.

The radiation therapists will send the images from the scans to a computer. This allows the radiation oncologist to outline exactly where they need to treat. The oncologist will prescribe the appropriate dose of radiation therapy, which will help the medical physicist and therapists to precisely plan your treatment.



The information in this booklet will apply in most cases, but you may find that things are done slightly differently where you have treatment. Visit targetingcancer.com.au/radiation-therapy/ebrt to watch a video explaining the radiation therapy process.

What to expect at treatment sessions

There will be at least two radiation therapists at each treatment session. They may ask you to change into a hospital gown before taking you into the treatment room. You will be able to leave your belongings in a secure locker. The treatment room will be in semi-darkness so the therapists can see the light beams from the treatment machine and line them up with the tattoos or marks on your body or mask.

If you are having image-guided radiation therapy (see page 26), the radiation therapists will take x-rays or a CT scan to ensure you are in the correct position on the treatment table. They may move the table or physically move your body. They will check the scans straightaway and make any adjustments needed.

Receiving the treatment

Once you are in the correct position, the radiation therapists will go into a nearby room to operate the machine. You will be alone in the treatment room, but you can talk to the therapists over an intercom, and they will watch you on a television screen. The therapists will move the machine automatically from outside the treatment room if necessary.

The machine will not touch you. You won't usually see or feel anything unusual, but you may hear a buzzing noise from the machine while it is working and when it moves.

It is important to stay very still to ensure the treatment targets the correct area. The radiation therapists will tell you when you can move. If you feel uncomfortable, tell the therapists – they can switch off the machine and start it again when you're ready. You will usually be able to breathe normally during the treatment. For some radiation to the chest area, you may be instructed to take a deep breath and hold it while the radiation is delivered.

The treatment itself takes only a few minutes, but each session may last 10–20 minutes because of the time it takes the radiation therapists to set up the equipment and put you into the correct position. You will be able to go home once the session is over. You will see the radiation oncologist, a registrar (doctor training in radiation oncology) or radiation oncology nurse regularly during a course of treatment to check how you are going.

Managing anxiety

The treatment machines are large and kept in an isolated room. This may be confronting, especially at your first treatment session. Some people feel more at ease with each session as they get to know the staff, procedures and fellow patients. If you are afraid of confined spaces (claustrophobic) or feel anxious, let the radiation therapists know so they can help you.

Discomfort during treatment

EBRT itself is painless – you won't feel it happening. You may feel some discomfort when you're lying on the treatment table, either because of the position you're in or because of pain from the cancer. In this case, talk to the radiation oncology nurse about whether to take pain medicine before each session.

Some people who have treatment to the head say they see flashing lights or smell unusual odours. These effects are not harmful, but tell the radiation therapists if you experience them.

Safety precautions

EBRT does not make you radioactive because the radiation does not stay in your body during or after treatment.

You will not need to take any special precautions with bodily fluids (as you would with chemotherapy). It is safe for you to be with family, friends, children and pregnant women and for them to come into the radiation therapy centre with you. However, they cannot be in the room during the treatment.

Imaging scans you may have

During planning and treatment, you may need to have some of the following tests to show the exact position and shape of the cancer.

X-ray – Powerful invisible radiation passes through the body and creates an image on x-ray film, with black areas representing soft tissues and lighter areas showing denser tissues, such as bones.

CT scan – CT stands for computerised tomography scan. It uses x-ray beams and computer technology to create a detailed, cross-sectional picture of the inside of the body. You may be given an injection of a dye to make the images clearer. The CT scanner is large and round like a doughnut and you will lie on a table that moves in and out of the centre of the doughnut.

MRI scan – MRI stands for magnetic resonance imaging scan. It uses radio waves and magnetism to create cross-sectional pictures of the inside of the body. You may be given an injection of a dye before the scan. You will lie on a table that slides into a narrow metal cylinder. The machine can be quite noisy.

PET scan – PET stands for positron emission tomography scan. It involves an injection of a small amount of radioactive glucose solution. Cancerous areas take up more of the glucose and show up brighter on the scan.

PET-CT scan – This combines a PET scan and a CT scan in one machine. The machine looks similar to a CT scanner.

Ultrasound – A device is placed on or in your body to send out high frequency soundwaves that you won't be able to hear. The soundwaves are reflected when they meet something dense, like an organ or tumour. A computer then creates a picture from these soundwave reflections.

Your treatment team will explain what to expect from each test, or you can call Cancer Council 13 11 20 for more information.

Techniques and types of EBRT

EBRT can be given using different techniques and different types of radiation.

Your treatment centre may not offer all methods, but your radiation oncologist will recommend the most appropriate combination for you.

Three-dimensional conformal radiation therapy (3DCRT)

- Common type of EBRT.
- Uses imaging scans (see previous page) to help plan the treatment.
- A computer uses the scans to precisely map the location of the cancer within the body.
- The radiation is then shaped (conformed) so that the cancer receives most of the radiation, and surrounding tissues receive much less.

Intensity-modulated radiation therapy (IMRT)

- Highly accurate type of conformal radiation therapy.
- Shapes and divides multiple radiation beams into tiny beams (beamlets) that vary in strength.
- Widely used for most cancer types, especially for curative treatment.
- Volumetric modulated arc therapy (VMAT) and helical tomotherapy (HT) are specialised forms of IMRT that use a treatment machine that rotates around the body.

Image-guided radiation therapy (IGRT)

- Uses a treatment machine that takes x-rays or scans at the start of each session.
- Markers (usually grains of gold) may be inserted into the cancer so they can be seen in the x-rays or scans.
- Positioning can be very finely adjusted, often to millimetre accuracy.
- Radiation oncologists may recommend IGRT for areas likely to be affected by movement, such as the lungs and liver when you breathe, or the prostate when the fullness of your bladder or bowel varies.

Stereotactic radiosurgery (SRS)

- Specialised type of radiation therapy.
- Combines many small radiation fields to give precisely targeted radiation in one single high dose.
- Used to treat small cancers in the brain while minimising the radiation reaching healthy brain tissue.
- A custom-made mask (see page 20) keeps the head still during SRS.
- Despite the name, this is not surgery and does not involve any surgical cuts.

Stereotactic body radiation therapy (SBRT)

- Similar to SRS, this method allows a few high doses of radiation to be delivered very precisely.
- May be used to treat small cancers in the body, including small lung or liver cancers or small metastases (cancer that has spread away from the primary cancer).
- Sometimes called stereotactic ablative body radiation therapy (SABR).

Proton therapy

- Uses radiation from protons rather than x-rays.
- Protons are tiny parts of atoms with a positive charge that release most of their radiation within the cancer – useful when the cancer is near sensitive areas, such as the brainstem or spinal cord, especially in children.
- Special machines, known as cyclotrons and synchrotrons, are used to generate and deliver the protons.
- Proton therapy is not yet available in Australia (as at December 2017), but there is funding in special cases to allow Australians to travel overseas for treatment.



Jackie's story

I was diagnosed with early-stage breast cancer after a routine mammogram. I had surgery, and my doctor recommended I have radiation therapy as well.

At my first appointment with the radiation oncologist, she explained what radiation therapy is and described what would happen during each session. She told me the radiation therapist would give me small tattoos to make sure the treatment reached the same area each time. I don't like tattoos, and it really caught me by surprise that I had to get them. As it turns out, they're very small and I didn't feel any pain having them.

At the planning appointment, the radiation therapists placed me in the position I would be in at each session. They told me I had to keep very still to make sure the treatment was effective. I saw the room where I would

be having treatment, which was really helpful as it meant I knew what to expect at my first session.

I had treatment Monday to Friday for six weeks. Some days I had treatment very quickly, and on other days I had to wait a bit longer. I passed the time by reading a book or doing puzzles. The actual treatment took only a few minutes each visit. I didn't find it hard to keep still, as the therapists positioned me very well and I was kept in place with a mould shaped like a wedge.

Towards the end of the six weeks, I started to feel very tired and I would sleep a lot. The nurses gave me cream and gel to put on the skin of the treatment area. I used it every day as soon as treatment started and for a short time after it finished. I developed dark marks that looked like burns, but most of them have faded.



Key points

- In EBRT, radiation is directed at the cancer from a special machine, usually a linear accelerator.
- The treatment is painless and does not make you radioactive. The radiation can't be seen or felt.
- The length of treatment course will vary depending on the type of cancer, the prescribed dose, and the aim of treatment. Most curative treatments occur Monday to Friday for 3–8 weeks.
- Most people will need a special device, such as a cast, mask or mould, to keep them still and in the same position during treatment sessions.
- Your radiation therapists will put small marks (dots of ink or tattoos) on your skin to help them position you correctly each time.
- During the CT planning appointment, the radiation therapists will use a CT scan to work out exactly where to direct treatment. You may also have other scans, such as an MRI, a PET scan or ultrasound. The scans will help the radiation oncologist to prescribe the correct dose to the exact location of the cancer.
- Most sessions last for 10–20 minutes. The radiation therapy itself takes only a few minutes. Most of the time is spent setting up the equipment and placing you in the correct position.
- You will lie on a table called a treatment couch. The radiation therapists will be in the next room to control the machine. They will be able to see you and talk with you through a speaker, and they can pause the treatment if necessary.



Brachytherapy

Brachytherapy is the most common type of internal radiation therapy. As with external beam radiation therapy, the main treating specialist for brachytherapy is a radiation oncologist (see page 15). Procedures for brachytherapy may vary between hospitals. The general process is described in this chapter, but your treatment team can give you more specific information.

How brachytherapy works

In brachytherapy, sealed radioactive sources are placed inside the body, close to or inside the cancer. The sources produce gamma rays, which have the same effect on cancer as the x-rays used in external beam radiation therapy, but act only over a short distance. It is a way of giving a high dose of radiation to the cancer with a very low dose to surrounding tissues and organs.

The type of brachytherapy used depends on the type of cancer. It may include “seeds”, needles, wires or small mobile sources that move from a machine into the body through applicators (thin plastic tubes). Brachytherapy may be used alone or with external beam radiation therapy (see pages 18–29).

Planning the treatment


The radiation oncologist will explain the treatment process and tell you whether you can have treatment during a day visit (outpatient) or will need a short stay in hospital (inpatient). You will have tests and scans to help your team decide where to place the radioactive sources and to determine the correct dose to

deliver to the cancer. These tests may include an ultrasound, CT scan and/or MRI scan (see page 25). The radiation oncologist will explain possible side effects and discuss any safety precautions.

What to expect at treatment sessions

Depending on the type of brachytherapy you are having, you may need to have a local anaesthetic to numb the area being treated, or a general anaesthetic so you will be unconscious for the treatment. The radiation sources will be positioned in your body, sometimes with the help of imaging scans (such as x-ray, ultrasound and CT) and computerised machines.

You should not have any severe pain or feel ill during a course of brachytherapy. If the radioactive sources are being held in place by an applicator, you may feel some discomfort, but your doctor can prescribe medicine to help you relax and relieve any pain. Once the applicator is removed, you may be sore or sensitive in the treatment area. After the treatment, you may have to limit physical and sexual activity and take some safety precautions for a period of time – your treatment team will advise you.



If you need to stay in hospital for treatment, take reading material, an iPad or other tablet device, and other activities to keep you occupied while you're alone in the room (see page 33). You may also be able to watch television or listen to music. Check with your doctor what you can take into the room, as there may be restrictions.

Dose rates

You may be told you are having high-dose-rate, low-dose-rate or pulsed-dose-rate brachytherapy.

High-dose-rate (HDR)

Uses sources that release high doses of radiation in short sessions, each lasting a number of minutes. The sources will be removed at the end of each session.

Low-dose-rate (LDR)

Uses sources that release radiation over days, weeks or months. The sources may be temporary or permanent.

Pulsed-dose-rate (PDR)

Uses sources that release radiation for a few minutes every hour over a number of days. The sources will be removed at the end of treatment.

Types of brachytherapy

Depending on the type of cancer and your radiation oncologist's recommendation, the radioactive sources may be placed in your body for a limited time or permanently.

Temporary brachytherapy

In temporary brachytherapy, the radioactive sources are removed at the end of each treatment session. The sources are often inserted using applicators such as thin plastic tubes (catheters) or cylinders. These applicators may be removed at the end of each session, or left in place until after the final session.

Temporary brachytherapy is mostly used for prostate cancers and gynaecological cancers (such as cervical and vaginal cancers).

Safety precautions – While the radioactive sources are in place, some radiation may pass outside your body. For this reason, hospitals take certain safety precautions to avoid exposing staff and your visitors to radiation. Staff will explain any restrictions before you start brachytherapy treatment.

In some cases, the treatment will be high-dose-rate brachytherapy (see box, opposite) and it will be given for a few minutes at a time during multiple sessions. The radiation therapists will leave the room briefly during the treatment, but will be able to see and talk to you from another room. You may be able to have this treatment as an outpatient.

In other cases, the sources will deliver low-dose-rate or pulsed-dose-rate brachytherapy over 1–6 days. During this time, you will be an inpatient and will stay alone in a dedicated treatment room within or close to the main hospital ward.

For low-dose-rate or pulsed-dose-rate brachytherapy, hospital staff will only come into the room for short periods of time, and visitors may be restricted – children under 18 and pregnant women are usually not allowed to enter the room. You can use an intercom to talk with staff and visitors outside the room.

Once the sources are removed, you are not radioactive and there is no risk to other people.

Permanent brachytherapy

In permanent brachytherapy, radioactive seeds about the size of an uncooked grain of rice are put inside special needles and implanted into the body. The needles are removed, and the seeds are left in place to gradually decay. As the seeds decay, they release small amounts of radiation over weeks or months. They will eventually stop releasing radiation, but they will not be removed. This is a low-dose-rate technique (see table, page 32) and it is often used to treat small prostate cancers.

Safety precautions – If you have permanent brachytherapy, you will be radioactive for a short time after the seeds are inserted. The radiation is usually not harmful to people around you, so it is generally safe to go home. However, you may need to avoid close contact with young children and pregnant women for a short time – your treatment team will advise you of any precautions to take. You will usually be able to return to your usual activities a day or two after the seeds are inserted.

““ For the first few weeks after the seeds were implanted, I thought this is a doddle. Then suddenly, I started getting this really urgent need to urinate. That gave me a few weeks of disturbed sleep, but the urgency gradually eased off and I thought this is pretty good. Now after three years, there’s no sign of the cancer and I’ve had no long-term side effects. ●● Derek

Other types of internal radiation therapy

For particular cancers, you may be referred to a nuclear medicine specialist for other types of internal radiation therapy.

Radionuclide therapy –

Also known as radioisotope therapy, this therapy involves radioactive material being taken by mouth as a capsule or liquid or given by injection. The material spreads through the body, but particularly targets cancer cells.

Different radionuclides are used to treat different cancers. The most common radionuclide therapy is radioactive iodine, which is taken as a capsule and used for thyroid cancer. Cancer Council's booklet *Understanding Thyroid Cancer* has more information about this treatment – call **13 11 20** for a free copy or visit your local Cancer Council website. Other radionuclide therapies are used for neuroendocrine tumours (NETs) of the pancreas, bowel and lung; some advanced prostate cancers; cancer

that has spread to the bone; and lymphoma. Talk to your treatment team or call **13 11 20** for more information.

SIRT – Also known as radioembolisation, SIRT stands for selective internal radiation therapy. This method delivers high doses of radiation to cancers in the liver. It uses tiny pellets called microspheres, which contain a radioactive substance. The pellets are injected into a thin tube called a catheter, which is inserted into the main artery (hepatic artery) that supplies blood to the liver. Radiation from the microspheres damages the blood supply of the cancers. This means the cancers can't get the nutrients they need and they shrink. Read more about SIRT in Cancer Council's booklet *Understanding Cancer in the Liver*.



Key points

- Brachytherapy uses radiation to directly target and destroy cancer cells.
- The radiation sources may include “seeds”, needles or wires that will be put into your body inside or near the cancer.
- You may have high-dose-rate, low-dose-rate or pulsed-dose-rate brachytherapy.
- How long the radiation sources are left in place varies and depends on the dose required. Temporary sources can remain in place for minutes, hours or days. Permanent sources will not be removed.
- For some types of temporary brachytherapy, you may need to stay in hospital in an isolated room, and visitors may be restricted.
- No radiation will be left in your body after a temporary implant is removed. If you have a permanent implant, the risk of exposing other people to radiation is very low, but you may need to avoid contact with young children and pregnant women for a short time. Your treatment team will advise you of any precautions you need to take.
- Radionuclide therapy is taken as a capsule or liquid, or given as an injection. The most common therapy of this kind is radioactive iodine, which is used to treat thyroid cancer.
- SIRT stands for selective internal radiation therapy. Also known as radioembolisation, this method uses tiny beads to deliver high-dose radiation therapy, usually to the liver.



Managing side effects

Radiation therapy is an effective treatment for many cancers, but it can also injure healthy cells at or near the treatment area. This can lead to side effects. Before recommending any treatment, the radiation oncologist will consider whether the potential benefits outweigh the possible side effects. To minimise side effects, a range of new techniques have made radiation therapy highly precise (see pages 26–27).

Some people experience many side effects, while others have very few or none. Side effects can be different even with the same type of radiation therapy to the same part of the body. Many factors can affect the type and severity of side effects, including: the part of the body treated; the type of radiation therapy; the dose of radiation needed; any other treatments you might be having; and your general health. If you have severe side effects, the radiation oncologist may change the treatment or prescribe a break, but will advise against this if it would affect how well the treatment works.

It is important to maintain your general health during treatment. People with diabetes in particular should ensure the condition is well managed as it can interfere with effective healing – see your general practitioner (GP) before treatment starts.

Your treatment team can suggest ways to ease side effects. Check with your radiation oncologist before using any over-the-counter medicines, vitamins, creams or other therapies, as some may affect the way radiation therapy works or make side effects worse.



How long side effects may last

Radiation therapy can cause side effects during and just after treatment – these are called short-term or acute effects. It can also cause long-term or late effects months or years down the track.

Short-term side effects

For short courses of treatment lasting 1–5 days, you may notice side effects from the first day of treatment. For longer courses, side effects often build up gradually during treatment and it could be a few weeks before you notice anything. Often the full impact comes at the end of treatment or even a week or two afterwards.

During treatment, tell your radiation oncology team about any side effects, as they can usually be controlled with the right care and medicine. Most side effects are temporary and go away in time, usually within days to weeks of treatment finishing.

Long-term or late effects

Radiation therapy can also cause effects months or years after treatment. These late effects are usually mild, they may come and go, and they may not have any major impact on your daily life. However, they may be more significant. Some may go away or improve on their own, while others may be permanent and need to be treated or managed.

Very rarely, years after successful treatment, patients can develop a new unrelated cancer in or near the area treated. The risk of this late effect is very low, but other factors, such as continuing to smoke or very rare genetic conditions, can increase this risk.

Common side effects

The side effects of radiation therapy often relate to the type of cancer and the part of the body treated, so it can be useful to read the booklet about the type of cancer you have. You can call **13 11 20** to ask for a free copy, or visit your local Cancer Council website. The table below lists some common side effects of radiation therapy but you are unlikely to experience all of them.

	Short-term side effects	Long-term or late side effects
Fatigue	•	
Skin problems	•	
Appetite loss	•	
Nausea	•	
Mouth and throat problems	•	
Bladder problems	•	•
Bowel problems	•	•
Hair loss	•	
Lymphoedema	•	•
Tissue hardening (fibrosis)		•
Sexuality and intimacy issues	•	•
Infertility		•

Fatigue

Feeling exhausted and lacking energy for day-to-day activities is a common side effect of radiation therapy. During treatment, your body uses a lot of energy dealing with the effects of radiation on normal cells. Fatigue can also be caused by travelling to treatment and appointments. It usually builds up slowly during the course of treatment, particularly towards the end, and may last for some weeks after treatment finishes. Many people find that they cannot do as much as they normally would, but others are able to continue their usual activities.



Tips for managing fatigue

- Listen to your body. If you feel tired, rest.
- Try to spread activities out through the day.
- Ask family and friends for help, e.g. with shopping, housework and driving.
- Take a few weeks off work during or after treatment, reduce your hours, or work from home. Discuss your situation with your employer.
- Do some light exercise, such as walking. Regular exercise may give you more energy and make you feel less tired. Talk to your treatment team about suitable activities for you.
- Limit caffeinated drinks, such as cola, coffee and tea. While caffeine may give a burst of energy, it can make you feel jittery and irritable, and cause insomnia and dehydration.
- Limit your alcohol intake. Also try to quit smoking if you smoke (see page 12).
- Eat a healthy, well-balanced diet, and don't skip meals.

Skin problems

External beam radiation therapy may make skin in the treatment area dry and itchy. Your skin may look red, sunburnt or tanned. Less commonly, it may peel and feel painful. Skin changes often start 10–14 days after the first treatment and improve with time. You may need dressings and creams to assist healing, avoid infection and make you more comfortable, and you might be prescribed a special moisturiser. Pain medicine can help if the skin is very sore. Let your treatment team know about skin changes, such as cracks or blisters, moist areas, rashes, infections or peeling.



Tips for caring for your skin

- Follow skin care instructions from your treatment team as soon as treatment starts, even before you notice any skin changes. Check with your treatment team before using any over-the-counter creams.
- Avoid using razors, hair dryers, hot water bottles, heat packs, wheat bags or icepacks on the area.
- Bathe or shower in lukewarm water, as hot or very cold water can damage sensitive skin. Do not use harsh soaps or other products. Pat skin dry with a soft towel.
- Let skin markings wear off gradually. Don't scrub your skin to remove them.
- Wear loose, soft cotton clothing. Avoid tight-fitting items, belts or collars over the treatment area.
- Cover your skin before going outside and stay out of the sun when you can.
- Avoid chlorinated swimming pools, spas and saunas.

Appetite loss and nausea

Good nutrition is important during and after cancer treatment. It can help to manage the side effects of treatment and speed up recovery. However, some people may lose interest in food or find it difficult to eat well during radiation therapy. This can depend on the part of the body being treated.

With radiation therapy to the abdomen (including stomach and bowel), pelvic region or head, some people feel sick (nauseous) or even vomit after a treatment session. Your radiation oncologist may prescribe medicine to take at home before and after each session to prevent nausea. If you are finding nausea difficult to manage, talk to the radiation oncologist or nurse about some strategies, or call Cancer Council 13 11 20.

If you have radiation therapy to the head and neck area, chewing or swallowing may be difficult or painful. Your sense of taste may also change if radiation therapy has affected the salivary glands or tastebuds. See page 45 for ways to manage these effects and maintain good nutrition.

For more information about appetite loss, nausea and nutrition, call 13 11 20 for a copy of *Nutrition and Cancer*, or download a digital version from your local Cancer Council website.

“At first, I couldn't think about eating without thinking about throwing up. Drinking ginger beer helped control the nausea.”  Simon



Managing appetite loss

- Eat smaller amounts as often as possible rather than a few large meals.
- Try to eat extra on days when you have an appetite.
- Ask a dietitian for advice on the best eating plan during treatment and recovery.
- If you don't feel like eating solid foods, try enriching your drinks with powdered milk, yoghurt, eggs or honey.
- Do not use nutritional supplements or medicines without your doctor's advice, as some could interfere with treatment.
- Cooking smells may put you off eating. It might help if someone else prepares your food, or you could consider reheating precooked meals.
- Try to do some light physical activity, such as walking. This may improve your appetite.

Managing nausea

- Have a bland snack, such as toast and apple juice, before each session. You may find that ginger or peppermint-flavoured food and drinks help to reduce nausea.
- Sip on water and other fluids throughout the day to prevent dehydration.
- Eat dry biscuits, crackers or toast.
- Some people find that anti-nausea medicine helps. Ask your doctor for a prescription, and tell them if the prescribed medicine doesn't help – it may take some time to find one that works for you.
- Contact your doctor if the symptoms of nausea don't improve after a few days, or if you have been vomiting for more than 24 hours.

Mouth and throat problems

Radiation therapy is often used to treat cancer in the mouth, throat, neck or upper chest region. Depending on the area treated, radiation therapy may affect your mouth and teeth. This can make eating and swallowing difficult and change your sense of taste.

Treatment to the mouth may increase the chance of tooth decay or other problems in the future. You will need to have a dental check-up before treatment starts and regular check-ups after it finishes.

If you're seeing a dental specialist, such as an orthodontist, ask if they can liaise with your usual dentist about any work you need to have before radiation therapy starts. Your dentist can give you detailed instructions about caring for your mouth to help prevent tooth decay and deal with side effects such as mouth sores.

Dryness and other issues

After several weeks of treatment, your mouth or throat may become dry and sore, and your voice may become hoarse. Radiation therapy can affect your salivary glands so you produce less saliva, which can contribute to the dry mouth. These effects will gradually improve after treatment finishes, but it may take several weeks or even months. In some cases, the effects may improve but not completely disappear.

You may have thick phlegm in your throat, or a lump-like feeling that makes it hard to swallow. Food may also taste different. Taste changes may last for many months after treatment, but normal taste usually returns eventually.



Tips for managing mouth and throat problems

- If possible, have a dental check-up before treatment begins with a dentist who specialises in the effect radiation therapy has on teeth.
- Keep your mouth moist by sucking on ice chips and sipping cool drinks. Carry a bottle of water with you.
- Ask your doctor, nurse or pharmacist for information about artificial saliva to moisten your mouth.
- Avoid tobacco and alcohol, as they will irritate your mouth and make dryness worse.
- If chewing and swallowing are painful, try to consume more liquids or soft food. Talk to a dietitian, who can suggest nourishing foods that will not hurt your mouth.
- If you have trouble swallowing, ask your doctor for a referral to a speech pathologist.
- To manage taste changes, try different ways of preparing food. For example, add lemon juice to meat and vegetables, marinate foods or add spices.
- Talk to your doctor if eating is uncomfortable or difficult. If you are in pain, ask for pain medicine, which may help with swallowing.
- Rinse your mouth regularly using an alcohol-free mouthwash recommended by your doctor or dentist. Saltwater is a natural disinfectant – you can make a saltwater mouthwash at home by dissolving $\frac{1}{4}$ teaspoon of salt into 1 cup of warm water. Rinse your mouth with plain water afterwards.
- Call **13 11 20** or visit your local Cancer Council website for more information. The *Nutrition and Cancer* booklet includes recipes for soft meals, and you'll find many tips in the fact sheets *Understanding Taste and Smell Changes* and *Mouth Health and Cancer Treatment*.

Bladder problems

Radiation therapy to the abdomen or pelvic area can irritate the bladder or, more often, the urethra (the tube that carries urine from the bladder to the outside of the body).

Possible bladder changes include:

- some stinging when you pass urine
- a little blood in the urine
- needing to pass urine more often, especially at night
- a weaker stream of urine than before
- leaking urine, for example, when you cough or sneeze.

To help manage these side effects, drink plenty of fluids and avoid strong coffee, tea and alcohol. Let your treatment team know if you are experiencing bladder or urinary problems, as they will be able to suggest strategies and may recommend medicines. You can also call the National Continence Helpline on 1800 33 00 66.

Bowel problems

To reduce the effects of radiation on the bowel, the radiation therapists may advise you to drink fluids before each session so you have a full bladder. This will expand your bladder and push the bowel higher up into the abdomen, away from the radiation.

Even with precautions, radiation therapy can irritate the lining of the bowel or stomach. This may lead to side effects such as:

- frequent loose bowel movements or diarrhoea
- abdominal cramps

- minor bleeding
- feeling an urgency to empty the bowels even though little faeces is passed
- mucus in the faeces
- excess wind
- discomfort opening the bowels.

Talk to your treatment team about ways to manage any bowel issues that occur. You can also visit the Australian Government's Bladder and Bowel website at bladderbowel.gov.au.



Tips for managing diarrhoea

- Avoid high-fibre and spicy foods, e.g. wholegrains, nuts, legumes and curries, which can trigger diarrhoea.
- Drink lots of clear liquids when you first notice symptoms of diarrhoea to avoid dehydration. Try apple juice, weak tea and clear broth.
- Eat or drink as well as you can so your body gets the energy and nutrients it needs.
- Check with your treatment team before taking any home remedies. You may be prescribed medicine to relieve diarrhoea, and taking them together may cause unwanted effects.
- Slowly reintroduce fresh fruits, vegetables, and wholegrain breads and pasta after the diarrhoea has stopped.
- Contact your treatment team immediately if there is blood in your bowel motions or if you have more than 5–6 bowel movements in 24 hours.

Hair loss

If you have hair in the area being treated, you may lose some or all of it during or just after radiation therapy. The hair will usually grow back a few months after treatment has finished, but sometimes hair loss is permanent.

When cancers on one part of the face or head are treated, hair on the other side of the head may be lost due to radiation passing from one side to the other.



Tips for managing hair loss

- Wear a wig, toupee, hat, scarf or turban, or leave your head bare. Do whatever feels comfortable and gives you the most confidence.
- If you prefer to leave your head bare, wear a hat, beanie or scarf to protect your head against sunburn and the cold.
- If you plan to wear a wig, choose it before treatment starts so you can match your own colour and style. For information about wig services, you can call Cancer Council **13 11 20**.
- As your hair grows back, talk to your hairdresser or barber about how to style it. It may be thinner, or curly where it was once straight, and the new growth may be patchy for a while.
- Contact Look Good Feel Better. This program teaches techniques to help restore appearance and improve self-confidence. For details, visit lgfb.org.au or call **1800 650 960**.
- Visit your local Cancer Council website to read the *Hair Loss* fact sheet.

Lymphoedema

The body's lymphatic system filters the blood and helps to fight infection. It is made up of a network of lymph vessels that transport lymph fluid throughout the body. Along the lymph vessels are many small, bean-shaped structures known as lymph nodes (glands).

Sometimes radiation therapy damages lymph nodes or lymph vessels in the area being treated, especially if some lymph nodes have already been removed by surgery. Because the lymph fluid no longer drains properly, it can build up and cause part of the body to swell. This swelling is known as lymphoedema. It usually occurs in an arm or leg, but can also affect other parts of the body.

Lymphoedema or swelling is sometimes just a temporary effect of radiation therapy, but it can be ongoing. It can also be a late effect, appearing months or even years after the treatment.

Early diagnosis of lymphoedema allows the condition to be well managed, so let your treatment team know if any new swelling appears. In some hospitals, a lymphoedema practitioner can assess your risk of developing lymphoedema and give you some simple exercises to help you reduce your risk and regain movement. To prevent lymphoedema getting worse, it is very important to avoid infection in the swollen area.

For more information about lymphoedema, call Cancer Council 13 11 20 or look for our *Understanding Lymphoedema* fact sheet on your local Cancer Council website.



Radiation therapy can cause the skin or internal tissue to become less stretchy and harden. This is known as fibrosis. It can occur weeks or months after treatment and have a range of impacts, such as pain, lack of flexibility and narrowing of passages (such as the vagina or rectum). Let your treatment team know if you start experiencing any new pain or stiffness, as early treatment can help.

Sexuality and intimacy issues

Radiation therapy can make you feel too tired or sick to want to be intimate. Some people may feel less sexually attractive to their partner because of changes to their body. Talking to your partner or a counsellor about your concerns may help.

You might find it useful to read Cancer Council's booklet *Sexuality, Intimacy and Cancer*. Call 13 11 20 and ask for a free copy, or download it from your local Cancer Council website.

Radiation therapy to the pelvic region

This can make sexual intercourse uncomfortable. You may notice a change in your sexual desire (libido). These changes are common and may be only short term.

Effects on women – Radiation therapy to the pelvic area usually affects the ovaries. This can cause women to stop having periods, which is called menopause. The symptoms of menopause include hot flushes, dry skin, vaginal dryness, mood swings, trouble sleeping (insomnia) and tiredness. Talk to your doctor or call Cancer Council 13 11 20 for ways to manage these symptoms.

If the vagina is treated with radiation therapy, it may become inflamed and intercourse could be painful. This usually settles down in the weeks after you finish treatment.

Down the track, the vagina may remain dry and can get tighter and shorter. This can make intercourse difficult or painful. Shortening and tightening of the vagina can be prevented by having regular intercourse or using a device called a vaginal dilator. Your treatment team can provide you with a dilator and instructions for how to use it.

Effects on men – Men may have problems getting and maintaining erections, and ejaculation may be painful for a few weeks after treatment. For some men, the difficulty with erections may be permanent.

Talk to your radiation oncologist if these effects are ongoing and causing you distress. They can suggest ways to manage them, such as the use of prescription medicine.

Using contraception

Your doctor may talk to you about using contraception during and after radiation therapy. Although radiation therapy often affects fertility, a woman could still become pregnant (unless the reproductive organs have been removed during surgery). A man having radiation therapy could get his partner pregnant.

A woman's eggs (ova) and a man's sperm can be affected by very small amounts of radiation when having radiation therapy

to any part of the body. If pregnancy is possible, your doctor will advise you to use contraception or avoid sexual intercourse during radiation therapy and for at least six months after you have finished treatment. Talk to your doctor as soon as possible if pregnancy occurs.

In some cases, your doctor may recommend you use a barrier method of contraception (such as a condom or a female condom) for a certain period of time. This is to prevent the risk of infections if the lining of your genitals is inflamed and sore.

Infertility

Depending on the area treated, radiation therapy can temporarily or permanently affect your ability to have children (fertility).

If infertility is a potential side effect, your radiation oncologist will discuss it with you before treatment starts. Let them know if you think you may want to have children in future and ask what can be done to reduce the chance of problems and whether you should see a fertility specialist beforehand. It is important to realise, however, that sometimes it is not possible to properly treat the cancer and maintain fertility.


Radiation therapy to the brain can affect the pituitary gland, which controls the hormones the body needs to produce eggs and sperm. Radiation therapy to the abdomen, pelvis and reproductive organs can affect the fertility of women and men in different ways.

Effects on women – Treatment to the pelvic area or abdomen can affect the ovaries and cause periods to stop permanently, leading to menopause and infertility. If you wish to have children in the future, talk to your radiation oncologist before treatment starts about ways to preserve your fertility, such as storing eggs or embryos.

Effects on men – Radiation therapy to the pelvic area or near the testicles may temporarily reduce sperm production. You may feel the sensations of orgasm, but ejaculate little or no semen. This is called a dry orgasm.

Semen production often returns to normal after a few months. For some men, the effect is permanent and causes infertility. If you want to father a child, you may wish to store sperm before treatment starts so your partner can conceive through artificial insemination or in vitro fertilisation in the future.

Radiation therapy may also affect the ability to get erections (see page 51). Discuss this and any other fertility concerns with your radiation oncologist.



Many people experience a sense of loss when they learn they may no longer be able to have children. If you have a partner, talk to them about your feelings. Talking to a counsellor may also help. For more information about infertility, call **13 11 20** for a copy of *Fertility and Cancer*, or download it from your local Cancer Council website.



Key points

- The side effects you experience will depend on the type and dose of radiation therapy, the part of the body being treated, your general health and other treatments you might be having.
- Your health care team can suggest ways to prevent and manage side effects.
- Some effects occur months or years after treatment finishes. These are called late effects.
- Fatigue is common during radiation therapy. Try to plan activities around your energy levels, and ask family and friends for help.
- If your skin is red or sore, use creams recommended by the radiation oncology nurse. Protect your skin when you go out in the sun.
- A dietitian can advise you on a suitable eating plan.
- You may experience nausea and diarrhoea after treatment to the abdomen or pelvic area. Drink lots of fluids to prevent dehydration. Prescription medicine may help.
- Let your treatment team know if radiation therapy to the head area causes difficulty swallowing. Radiation therapy to this area can also cause dryness and mouth irritation and soreness.
- In some cases, radiation therapy causes lymph fluid to build up (lymphoedema) or tissue to harden (fibrosis). Seek treatment as soon as symptoms appear.
- Treatment may affect your fertility. If you would like to have children in the future, talk to your doctor before treatment starts.
- You will be advised to avoid pregnancy during treatment.



After treatment

After radiation therapy has finished, your treatment team will give you general information about your recovery. They will tell you how to look after the treatment area and recommend ways to manage side effects. They will also suggest who to call if you have any questions or concerns.

Radiation therapy usually does not have an immediate effect, and it could take days, weeks or months to see any change in the cancer. The cancer cells may then keep dying for weeks or months after the end of treatment. It may be some time before you know whether the radiation therapy has controlled the cancer.

Follow-up appointments

You will have regular check-ups with the radiation oncologist at the treatment centre. These will become less frequent over time. You may also have follow-up appointments with nurses from your treatment centre to help manage any ongoing symptoms, as well as regular check-ups with other specialists who have been involved in your treatment.

When a follow-up appointment or test is approaching, many people find that they think more about the cancer and may feel anxious. Talk to your treatment team or call Cancer Council 13 11 20 if you are finding it hard to manage this anxiety.

Let your treatment team know immediately of any health problems between these follow-up appointments. Many of the long-term or late effects of radiation therapy (see previous chapter) can be managed better if identified early.



Cancer Council services

Cancer Council offers a range of services to support people affected by cancer, their families and friends.

Cancer Council 13 11 20 – This is many people's first point of contact if they have a cancer-related question. Trained professionals will answer any questions you have about your situation. For more information, see the inside back cover.

Practical help – Your local Cancer Council can help you access services or offer advice to manage the practical impact of a cancer diagnosis. This may include access to transport and accommodation or legal and financial support. Call 13 11 20 to find out what help is available in your state or territory.

Support services – You might find it helpful to share your experiences with other people affected by cancer. For some people, this means joining a support group. Others prefer to talk to a trained volunteer who has had a similar cancer experience.

Cancer Council can link you with others by phone, in person or online. You can find the Cancer Council Online Community at cancercouncil.com.au/OC. Call us to find out what other services are available in your area.

Life after cancer – It's natural to feel a bit lost after finishing treatment. You might notice every ache or pain and worry that the cancer is coming back. Cancer Council can provide information and support to people adjusting to life after cancer – call 13 11 20 for details.

Printed, online and audiovisual resources – Cancer Council produces a wide variety of free information about cancer-related topics, including easy-to-read booklets and fact sheets on more than 20 types of cancer, treatment, emotional issues and recovery.

Cancer Council publications are developed in consultation with health professionals and consumers. Content is reviewed regularly according to best practice guidelines for health information.

Related publications

You might find the following free Cancer Council publications and audiovisual resources* useful:

- *Emotions and Cancer*
- Relaxation and meditation CDs
- *Cancer, Work & You*
- *Cancer and Your Finances*
- *Sexuality, Intimacy and Cancer*
- *Fertility and Cancer*
- *Overcoming Cancer Pain*
- *Nutrition and Cancer*
- *Exercise for People Living with Cancer*
- *Lymphoedema* (online fact sheet)
- *Mouth Health and Cancer Treatment* (online fact sheet)
- *Understanding Taste and Smell Changes* (online fact sheet)
- *Hair Loss* (online fact sheet)
- *Living with Advanced Cancer*
- *Caring for Someone with Cancer*

Call **13 11 20** for copies, or download digital versions from your local Cancer Council website (see back cover).

* May not be available in all states and territories.



Caring for someone with cancer

You may be reading this booklet because you are caring for someone with cancer. Being a carer can be stressful and cause you much anxiety. Try to look after yourself – give yourself some time out, and share your worries and concerns with somebody neutral, such as a counsellor or your doctor.

Many cancer support groups and cancer education programs are open to carers, as well as people with cancer. Support groups and programs can offer valuable opportunities to share experiences and ways of coping.

Support services such as Meals on Wheels, home help or visiting nurses can help you in your caring role. You can find local support services, as well as practical information and resources, through the Carer Gateway. Call 1800 422 737 or visit carergateway.gov.au.

There are also many groups and organisations that can provide you with information and support, such as Carers Australia, the national body representing carers in Australia. Carers Australia works with the Carers Associations in each of the states and territories. Phone 1800 242 636 or visit carersaustralia.com.au for more information and resources.

You can also call Cancer Council 13 11 20 to find out more about carers' services and support groups, and to get a free copy of the *Caring for Someone with Cancer* booklet.



Useful websites

The internet has many useful resources, although not all websites are reliable. The websites listed below are good sources of support and information.

Australian

Cancer Council Australia.....	cancer.org.au
Cancer Australia.....	canceraustralia.gov.au
Cancer Council Online Community.....	cancercouncil.com.au/OC
Carers Australia.....	carersaustralia.com.au
Department of Health.....	health.gov.au
Department of Human Services.....	humanservices.gov.au
Healthdirect Australia.....	healthdirect.gov.au
Radiation Oncology: Targeting Cancer.....	targetingcancer.com.au

International

American Cancer Society.....	cancer.org
Cancer.Net (US).....	cancer.net
Cancer Research UK.....	cancerresearchuk.org
Macmillan Cancer Support (UK).....	macmillan.org.uk
National Cancer Institute (US).....	cancer.gov



Question checklist

You may find this checklist helpful when thinking about the questions you want to ask your doctor about radiation therapy. If your doctor gives you answers that you don't understand, ask for clarification.

- Why do I need radiation therapy?
- What do you expect the radiation therapy to do to the cancer?
- What kind of radiation therapy will I have?
- Will it be my only treatment, or will I have other treatments?
- What side effects should I expect? Will they be long-term or short-term?
- How long will treatment take? How will it be given?
- Will I have radiation therapy as an inpatient or outpatient?
- Will I be radioactive? Will my partner be affected?
- Is it safe to have sex during the course of radiation therapy?
- Will treatment interact with any other medicines or vitamins I am taking?
- When will I know whether the treatment has been successful?
- How much will treatment cost? Will the cost be covered by health insurance?
- Where can I have this treatment? Will I have to travel away from home?
- Can I get help with travel expenses or accommodation if I need it?



Glossary

abdomen

The part of the body between the chest and hips, which contains the stomach, spleen, pancreas, liver, gall bladder, bowel, bladder and kidneys.

applicator

A tool that is used to insert a radiation source into the body for the cancer treatment known as brachytherapy.

brachytherapy

A type of internal radiation therapy in which radioactive material is placed into or near the cancer.

cells

The basic building blocks of the body. A human is made of billions of cells that are adapted for different functions.

chemotherapy

The use of drugs to kill cancer cells or slow their growth.

CT scan

Computerised tomography scan.

This scan uses x-rays to create a picture of the inside of the body. It is often used to help plan a course of radiation therapy.

curative treatment

Treatment given with the aim of getting rid of all the cancer cells.

external beam radiation therapy (EBRT)

Radiation therapy delivered to the cancer from outside the body.

fertility

The ability to conceive a child.

fraction

The individual, usually daily, dose of radiation that makes up part of a course of radiation therapy.

helical tomotherapy (HT)

A type of highly targeted external beam radiation therapy that uses a machine that rotates around you.

hormone therapy

A treatment that blocks natural hormones in the body that sometimes help cancer cells grow.

image-guided radiation therapy (IGRT)

The use of imaging techniques, such as x-ray or CT scans, at the start of each radiation therapy session. IGRT allows positioning to be very finely adjusted.

immobilisation device

A device, such as a mask or wedge, that helps keep a person in a fixed position during radiation therapy.

immunotherapy

Treatment that stimulates the body's immune system to fight cancer.

infertility

The inability to conceive a child.

intensity-modulated radiation therapy (IMRT)

A highly accurate type of external beam radiation therapy that shapes and divides multiple radiation beams into many beamlets that vary in strength. This reduces the amount of radiation reaching normal tissue and potentially reduces the severity of side effects.

internal radiation therapy

Radiation therapy that delivers radiation to the cancer from within the body. Brachytherapy is the most common type of internal radiation therapy. Other types include radionuclide therapy and SIRT (selective internal radiation therapy).

linear accelerator (linac)

A machine used to create high-energy radiation beams for use in external beam radiation therapy.

lymphatic system

A network of tissues, capillaries, vessels, ducts and nodes that removes excess fluid from tissues, absorbs fatty acids, transports fat and produces immune cells. Includes the bone marrow, spleen, thymus and lymph nodes.

lymph nodes

Small, bean-shaped glands that form part of the lymphatic system. They collect and destroy bacteria and viruses. Also called lymph glands.

lymphoedema

Swelling caused by a build-up of lymph fluid. This happens when lymph vessels or nodes can't drain properly because they have been removed or damaged.

menopause

When a woman stops having periods (menstruating).

metastasis

A cancer that has spread from another part of the body.

MRI scan

Magnetic resonance imaging scan.

A scan that uses magnetism and radio waves to take detailed cross-sectional pictures of the body.

palliative treatment

Medical treatment for people with advanced cancer to help them manage pain and other symptoms of cancer. Treatment may include radiation therapy.

PET scan

Positron emission tomography scan.

A scan in which a person is injected with a small amount of radioactive glucose solution. Cancerous areas show up brighter in the scan because they take up more of the glucose.

proton therapy

A form of external beam radiation therapy that uses radiation from protons rather than x-rays.

radiation

Energy in the form of waves or particles, including gamma rays, x-rays and ultraviolet (UV) rays. This energy is harmful to cells and is used in radiation therapy to destroy cancer cells.

radiation therapy

The use of targeted radiation to kill or damage cancer cells so they cannot grow, multiply or spread. The radiation is usually in the form of x-ray beams. Also called radiotherapy.

radionuclide therapy

The use of radioactive substances that can be taken by mouth as

a capsule or liquid, or given by injection (intravenously). Also called radioisotope therapy.

SIRT

Selective internal radiation therapy. A type of internal radiation therapy used to treat liver cancers. Also called radioembolisation.

stereotactic radiosurgery (SRS)/ stereotactic body radiation therapy (SBRT)

Types of external beam radiation therapy that deliver a few high doses very precisely.

surgery

An operation by a surgeon to remove or repair a part of the body affected by cancer.

three-dimensional conformal radiation therapy (3DCRT)

A common type of external beam radiation therapy that uses imaging scans to help plan treatment. A computer maps the location of the cancer. The radiation is then shaped (conformed) so that the cancer receives high doses of radiation, but surrounding tissues receive much less.

tissue

A collection of cells that make up a part of the body.

tumour

A new or abnormal growth of tissue on or in the body. A tumour may be benign (not cancer) or malignant (cancer).

ultrasound

A non-invasive scan that uses soundwaves to create a picture of part of the body. An ultrasound scan can be used to measure the size and position of a cancer.

volumetric modulated arc therapy (VMAT)

A type of external beam radiation therapy in which the radiation machine rotates around the treatment area to deliver an exceptionally accurate dose of radiation to the body.

x-ray

A type of high-energy radiation that shows solid areas in the body.

Can't find a word here?

For more cancer-related words, visit:

- cancercouncil.com.au/words
- cancervic.org.au/glossary
- cancersa.org.au/glossary

Reference

1. MB Barton et al., "Estimating the demand for radiotherapy from the evidence: a review of changes from 2003 to 2012", *Radiotherapy and Oncology*, vol. 112, no. 1, 2014, pages 140–44. doi: 10.1016/j.radonc.2014.03.024.



How you can help

At Cancer Council, we're dedicated to improving cancer control. As well as funding millions of dollars in cancer research every year, we advocate for the highest quality care for cancer patients and their families. We create cancer-smart communities by educating people about cancer, its prevention and early detection. We offer a range of practical and support services for people and families affected by cancer. All these programs would not be possible without community support, great and small.

Join a Cancer Council event: Join one of our community fundraising events such as Daffodil Day, Australia's Biggest Morning Tea, Relay For Life, Girls' Night In and other Pink events, or hold your own fundraiser or become a volunteer.

Make a donation: Any gift, large or small, makes a meaningful contribution to our work in supporting people with cancer and their families now and in the future.

Buy Cancer Council sun protection products: Every purchase helps you prevent cancer and contribute financially to our goals.

Help us speak out for a cancer-smart community: We are a leading advocate for cancer prevention and improved patient services. You can help us speak out on important cancer issues and help us improve cancer awareness by living and promoting a cancer-smart lifestyle.

Join a research study: Cancer Council funds and carries out research investigating the causes, management, outcomes and impacts of different cancers. You may be able to join a study.

To find out more about how you, your family and friends can help, please call your local Cancer Council.



Cancer Council

13 11 20

Being diagnosed with cancer can be overwhelming. At Cancer Council, we understand it isn't just about the treatment or prognosis. Having cancer affects the way you live, work and think. It can also affect our most important relationships.

When disruption and change happen in our lives, talking to someone who understands can make a big difference. Cancer Council has been providing information and support to people affected by cancer for over 50 years.

Calling 13 11 20 gives you access to trustworthy information that is relevant to you. Our cancer nurses are available to answer your questions and link you to services in your area, such as transport, accommodation and home help. We can also help with other matters, such as legal and financial advice.

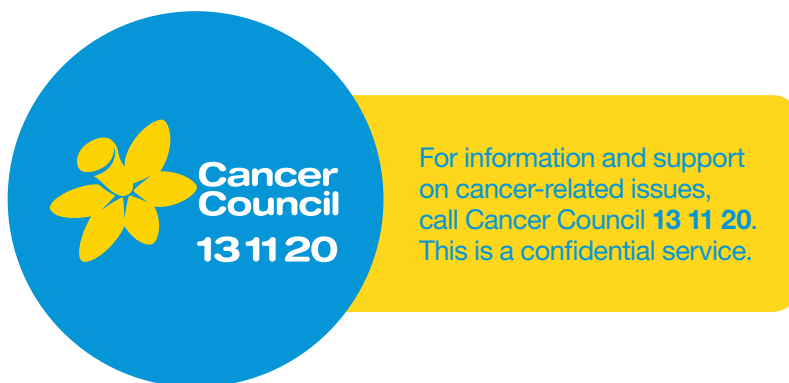
If you are finding it hard to navigate through the health care system, or just need someone to listen to your immediate concerns, call 13 11 20 and find out how we can support you, your family and friends.

Cancer Council services and programs vary in each area.
13 11 20 is charged at a local call rate throughout Australia (except from mobiles).



If you need information in a language other than English, an interpreting service is available. Call 13 14 50.

If you are deaf, or have a hearing or speech impairment, you can contact us through the National Relay Service. www.relayservice.gov.au



Visit your local Cancer Council website

Cancer Council ACT
actcancer.org

Cancer Council NSW
cancercouncil.com.au

Cancer Council NT
nt.cancer.org.au

Cancer Council Queensland
cancerqld.org.au

Cancer Council SA
cancersa.org.au

Cancer Council Tasmania
cancertas.org.au

Cancer Council Victoria
cancervic.org.au

Cancer Council WA
cancerwa.asn.au

Cancer Council Australia
cancer.org.au

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To support Cancer Council, call your local Cancer Council or visit your local website.*