

Radiotherapy

From the JASCAP booklet series

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++ Separate booklets are available from JASCAP

** Separate factsheet is available from JASCAP

General information on radiotherapy

This section has been written to give you information about radiotherapy. We hope that it will answer some of the questions that you may have about this treatment.

If you have any further questions relating to your treatment, please don't hesitate to ask the doctor, nurse or radiographer looking after you. It is important to talk to someone who is familiar with your treatment, as radiotherapy differs from one person to another. Other people you meet may be having different treatments, even if they have a similar type of cancer.

What is radiotherapy?

Radiotherapy is the use of high energy x-rays and similar rays (such as electrons) to treat disease. Since the discovery of x-rays over one hundred years ago, radiation has been used more and more in medicine, both to help with diagnosis (by taking pictures with x-rays), and as a treatment (radiotherapy). While radiation obviously has to be used very carefully, doctors and radiographers have a lot of experience in its use in medicine.

Many people with cancer will have radiotherapy as part of their treatment. This can be given either as external radiotherapy from outside the body using x-rays or from within the body as internal radiotherapy.

Radiotherapy works by destroying the cancer cells in the treated area. Although normal cells can also be damaged by the radiotherapy, they can usually repair themselves.

Radiotherapy treatment can cure some cancers and can also reduce the chance of a cancer coming back after surgery. It may be used to reduce cancer symptoms. Some people find that the side effects are very mild and that they just feel tired during their course of radiotherapy treatment.

Why radiotherapy is given?

Curative treatment

Radiotherapy is often given with the aim of destroying a tumour and curing the cancer. When radiotherapy is given in this way it is described as radical radiotherapy. Radiotherapy may be used on its own or may be given before or after surgery or chemotherapy. Chemotherapy is the use of anti-cancer drugs to destroy cancer cells. If radiotherapy and chemotherapy are given at the same time, this treatment is known as chemoradiotherapy. For some types of curative radiotherapy treatment, you may need to go to the hospital each weekday for between two and seven weeks. In this situation, a small dose of radiotherapy is given each time. This is because as well as damaging cancer cells, radiotherapy can also cause damage to healthy cells in the treatment area. If a very high dose of treatment was given all in one go, it could cause too much damage to the healthy cells, so small doses are given to allow them to recover in between.

Palliative treatment

Sometimes, when it is not possible to cure a cancer, radiotherapy may be given to relieve symptoms – for example, to lessen pain. This is called palliative treatment. Lower doses of radiotherapy are given than for curative treatment, usually over a shorter period of time (sometimes just a single treatment).

Research - clinical trials for radiotherapy treatments

Cancer research trials are carried out to try to find new and better treatments for cancer. Trials that are carried out on patients are known as clinical trials.

Clinical trials may be carried out to:

- test new treatments, such as new chemotherapy drugs, gene therapy or cancer vaccines
- look at new combinations of existing treatments, or change the way they are given, to make them more effective or to reduce side effects
- compare the effectiveness of drugs used to control symptoms
- find out how cancer treatments work
- see which treatments are the most cost-effective.

Trials are the only reliable way to find out if a different operation, type of chemotherapy, radiotherapy, or other treatment is better than what is already available.

Taking part in a trial

You may be asked to take part in a treatment research trial. There can be many benefits in doing this. Trials help to improve knowledge about cancer and develop new treatments. You will also be carefully monitored during and after the study. Usually, several hospitals around the country take part in these trials. It is important to bear in mind that some treatments that look promising at first are often later found not to be as good as existing treatments, or to have side effects that outweigh the benefits.

If you decide not to take part in a trial your decision will be respected and you do not have to give a reason. There will be no change in the way that you are treated by the hospital staff and you will be offered the standard treatment for your situation.

The process of clinical trials is described in more detail in our booklet on cancer research trials.

Blood and tumour samples

Many blood samples and bone marrow or tumour biopsies may be taken to help make the right diagnosis. You may be asked for your permission to use some of your samples for research into cancer. If you are taking part in a trial you may also be asked to give other samples which will be frozen and stored for future use, when new research techniques become available. These samples will have your name removed from them so you can't be identified.

The research may be carried out at the hospital where you are treated, or it may take place at another hospital. This type of research takes a long time, so you are unlikely to hear the results. The samples will, however, be used to increase knowledge about the causes of cancer and its treatment. This research will, hopefully, improve the outlook for future patients.

Work and radiotherapy

Sometimes people can carry on working part-time during their treatment, but many people feel very tired and may feel unwell. In this case you may need to make changes to your usual routines. Most employers will be sympathetic if you explain why you need time off work. It is helpful to talk to your employer or personnel officer to explain how much time off you may need and what you will

be able to do. It can be hard to predict exactly what you will be able to do, but your employer will appreciate being given some idea of what to expect.

Children and radiotherapy

Radiotherapy can be a frightening experience for both children and their parents, but once everyone understands what is involved this fear can be reduced. The radiotherapy staff are used to treating children and they can offer help and support.

Young children, especially if they are aged three or younger, may have their treatment under a mild general anaesthetic. As your child can't eat or drink for at least four hours before his or her treatment, you will probably have a morning appointment. The anaesthetic is usually given in the radiotherapy department by an anaesthetist. You can stay with your child until they are asleep.

Although you won't be able to stay in the radiotherapy room during your child's treatment, you can watch through the window or on the TV screen. The nurses will look after the child until he or she wakes up, usually after 20 minutes to an hour. You will then both be able to go home, unless your child is an in-patient, in which case a nurse will take him or her back to the ward.

Older children may take a while to get used to the size and sound of the machines, but this should get easier once they get to know the staff and the surroundings. If you are finding it difficult to cope with your child's illness, you may find it helpful to contact one of the children's cancer groups.

Sharing your experiences with other parents can help you to cope with your own problems and fears. Our booklet on children's cancers gives more information.

Being Treated

Where do you have your radiotherapy treatment?

Radiotherapy equipment is very complex and takes up a lot of space, as well as support from specially trained staff, so radiotherapy departments tend to be in the larger regional and teaching hospitals. Often you will have your initial cancer treatment (such as surgery) at your local hospital and will then be referred to your nearest specialist cancer treatment hospital for radiotherapy.

Radiotherapy departments have varying types of equipment and are organised according to local needs, so they are run in different ways. While most of the information in this booklet is fairly general, and will apply to most departments, you may find that there are some differences at the hospital where you are treated.

You can usually have external radiotherapy as an outpatient, but if you are unwell, or having chemotherapy at the same time, you may need to stay in hospital and will be taken to the radiotherapy department each day from the ward. If you are having internal radiotherapy, you may have to stay in hospital for a few days.

Staff in the radiotherapy department

- Clinical oncologist
- Radiographers
- Physicist
- Mould room technician
- Nursing staff
- Other members of the cancer support team

Clinical oncologist

Although you will continue to be in the care of your GP during and after your radiotherapy, you will be under the care of a clinical oncologist while you are having the treatment itself. A clinical oncologist is a doctor trained in the use of radiotherapy and chemotherapy. The clinical oncologist will be responsible for prescribing and supervising your course of treatment.

You may see your oncologist before, during, and after your course of radiotherapy treatment, so that the effect of the treatment can be monitored. If you have any problems before or after your treatment, the nurses or radiographers can arrange an extra appointment for you.

If you are having chemotherapy as well as radiotherapy, this treatment may be supervised by your clinical oncologist or may be organised by a different doctor, called a medical oncologist. Medical oncologists specialise in chemotherapy treatment.

Medical oncologists and clinical oncologists work as part of a team. The team includes all the other health care staff who look after people having treatment for cancer. This multidisciplinary team (MDT) will have regular meetings to co-ordinate and plan care and treatment.

Radiographers

Radiographers are specially trained in using x-ray equipment. There are two main types of radiographer: therapy radiographers and diagnostic radiographers.

Therapy radiographers are the people who operate the machines that give you your radiotherapy treatment. They are highly trained in giving radiotherapy and patient care.

Diagnostic radiographers use x-rays and scans to diagnose illness – you may have x-rays or scans from time to time during and after your treatment to check the effect of your radiotherapy treatment.

Therapy radiographers work closely with your specialist and physicist to plan your treatment. Where possible, you will see the same radiographers throughout your course of treatment so you get to know each other quite well. They can give you help and advice about any aspect of your treatment, and you can discuss any of your concerns or anxieties with them. You can ask to be treated by a radiographer of the same sex as yourself, if you prefer.

Some radiographers, known as information radiographers, specialise in giving information to patients and their relatives.

Physicist

Working with the clinical oncologist is a physicist – a radiation expert – who will help to plan your treatment, assisting your specialist in decisions about the best way of giving the prescribed amount of radiation. The physicist is also responsible for maintaining the accuracy of the equipment used. Although you may meet the physicist at your initial planning appointment, they usually work behind the scenes.

Mould room technician

If you need to have a mould made of part of your body to keep it still during treatment, this will usually be done by technical staff in the mould room.

Nursing staff

Like hospital wards, the radiotherapy clinic has nursing staff – usually a sister or charge nurse and a team of nurses. They ensure that the clinic is running smoothly and look after any general needs

you have, such as dressings and medicines. The nurses in the radiotherapy department can also give information and advice about the treatment and they give practical support.

Many cancer centres also have specialist cancer nurses (sometimes called clinical nurse specialists) who will have expert knowledge of your type of cancer. They can be a good source of support and information during your treatment.

Other members of the cancer support team

Dietitian

A dietitian can give you advice if you have any problems eating and drinking because of your radiotherapy, such as difficulty swallowing or a dry mouth.

Social worker

Social workers can give advice about any non-medical problems that you may have. This includes practical and financial help: for example, some patients can claim travelling expenses and others may be eligible for a grant from a charity.

Social workers can also give or organise counselling and emotional support for you and your family. If necessary they will refer you to local support services that can help you at home. You can ask to see a social worker if you think that this would be helpful.

Symptom control team (palliative care team)

Many hospitals have a symptom control team to give additional help and support for people whose symptoms or treatment are causing problems. There may be other staff, such as dietitians or physiotherapists, who can help with any specific questions you may have.

Counsellors

Counsellors are available in some hospitals. If you feel that speaking to a counsellor would be helpful, ask the staff looking after you to arrange an appointment.

Secretaries and clerical staff

The secretaries and clerical staff in the radiotherapy department help to keep the appointment system running smoothly.

External beam radiotherapy

- About your treatment
- Getting to your appointment
- Giving your consent
- Planning your treatment
- Molds
- First Planning Visit
- Skin markings
- Having your treatment

About your treatment

External radiotherapy is normally given as a series of short, daily treatments in the radiotherapy department, using equipment similar to a large x-ray machine.

The treatments are usually given from Monday to Friday, with a rest at the weekend. Each treatment is called a fraction. Giving the treatment in fractions ensures that less damage is done to normal cells than to cancer cells. The damage to normal cells is mainly temporary, but is the reason why radiotherapy has some side effects.

The number of treatments you have depends on several factors, including:

- your general health
- the type of cancer being treated and where it is in the body
- whether or not you have had, or are going to have, surgery, chemotherapy or hormonal therapy as part of your treatment.

For these reasons, treatment is individually planned for each patient, and even people with the same type of cancer may have different types of radiotherapy treatment.

External radiotherapy does not make you radioactive, and it is perfectly safe for you to be with other people, including children, throughout your treatment.

A course of curative (radical) treatment may be given every weekday for two to seven weeks. Instead of having one treatment a day or having a rest at the weekend, some people will have different treatment plans. They may have more than one treatment daily, or treatment every day for two weeks. Sometimes treatment may only be given on three days each week (for example, Mondays, Wednesdays and Fridays).

Palliative treatment (for symptom control) may involve only one or two sessions of treatment, or up to ten sessions.

There are several different types of radiotherapy machines that work in different ways. Radiotherapy treatment for most cancers, apart from skin cancers, is given by machines called linear accelerators (LinAcs).

The type of radiotherapy machine used will be carefully chosen by your specialist and physicist to give you the most appropriate treatment. Some machines are quicker than others and may give treatment in a very short time, such as a few seconds. Usually, radiotherapy treatment (including the time taken to position you) takes 10–15 minutes or less on any type of machine.

The radiotherapy machine does not normally touch you, although for some types of cancer it may press against your skin. If you have a specific type of radiotherapy known as electron treatment, a small applicator may be used, which touches a small area of skin.

The treatment itself is painless, although it may gradually cause some uncomfortable side effects. Radiotherapy affects people in different ways; some find that they can carry on working, only needing time off for their treatment, while others find it too tiring and prefer to stay at home. If you have a family to look after, you may find that you need extra help.

Don't be afraid to ask for help, whether it's from your employer, family or friends, social services, or the staff in the radiotherapy department. As your treatment progresses, you will have a better idea of how it makes you feel, so you can make any necessary changes to your daily life.

Where possible, the radiotherapy staff will try to give you an appointment for the same time each day. This allows you to get into a regular routine.

Getting to your appointment

If you have to do a lot of travelling each day to get to your appointment you may feel very tired, particularly if you are feeling some side effects from your treatment.

If the treatment makes you feel tired, you could ask a family member or friend to drive you to the hospital, or ask for hospital transport if friends or family can't easily drive you there.

If you rely on your own or public transport you can sometimes arrange a radiotherapy appointment which suits you. However, due to the large numbers of people having radiotherapy, it's not always possible to get an appointment exactly when you want it.

Some hospitals in the UK provide transport and, if necessary, this can be arranged for you. The hospital's transport department will assess your needs and make all the arrangements if they are able to provide transport for you.

Some local support groups and charities also provide hospital transport. If transport is very difficult, or you live a long way from the hospital, you may need to stay in a 'hostel' ward in the hospital or nearby. Sometimes it is possible for the hospital to organise local accommodation while you are having radiotherapy.

Giving your consent

Before you have your radiotherapy, your doctor will explain the aims of the treatment to you. They will usually ask you to sign a form saying that you give your permission (consent) for the hospital staff to give you the treatment. No medical treatment can be given without your consent, and before you are asked to sign the form you should have been given full information about:

- the type and extent of the treatment you are advised to have
- the advantages and disadvantages of the treatment
- any other treatments that may be available
- any significant risks or side effects of the treatment.

If you do not understand what you have been told, let the staff know straight away so that they can explain again. Some cancer treatments are complex, so it is not unusual for people to need repeated explanations.

It is often a good idea to have a friend or relative with you when the treatment is explained, to help you remember the discussion more fully. You may also find it useful to write down a list of questions before you go to your appointment.

Patients often feel that the hospital staff are too busy to answer their questions, but it is important for you to be aware of how the treatment is likely to affect you. The staff should be willing to make time for you to ask questions.

You can always ask for more time to decide about the treatment if you feel that you can't make a decision when it is first explained to you.

You are also free to choose not to have the treatment. The staff can explain what may happen if you do not have it. It is essential to tell a doctor, or the nurse in charge, so that they can record your decision in your medical notes. You do not have to give a reason for not wanting to have treatment, but it can be helpful to let the staff know your concerns so that they can give you the best advice.

Possible pregnancy

Women of childbearing age will be asked whether they could be pregnant, as x-rays given during pregnancy could harm a baby. If you think that you may be pregnant, let the doctors and radiographers know immediately and you will be offered a pregnancy test.

Planning your treatment

For most curative (radical) treatments, planning is a very important part of radiotherapy and may take a few visits. Careful planning makes sure that the radiotherapy is as effective as possible. It ensures the radiotherapy rays are aimed precisely at the cancer and cause the least possible damage to the surrounding healthy tissues.

The treatment is planned by your clinical oncologist, a physicist and sometimes by a radiographer. You may have your first treatment on the same day as your planning session, but usually it is necessary to wait a number of days, sometimes up to two weeks, while the physicist and the oncologist prepare the final details of your treatment.

On your first visit to the radiotherapy department, you will have a CT (computerised tomography) scan taken of the area to be treated. A CT scan takes lots of images from different angles to build up a three-dimensional picture of the area. At the same time, therapy radiographers will take measurements from you which are needed for treatment planning. This session will usually take about 45–60 minutes.

Sometimes you may also need to go to the hospital's scanning department to have an MRI scan. This uses powerful magnetic fields to give a detailed picture of part of your body, which can give additional useful information.

The radiographer's measurements and the information from the scans is fed into the radiotherapy – planning computer to help your doctors plan your treatment more precisely.

Some special procedures may be necessary to make sure the radiographers get a clear picture. The radiographer will explain these to you. For example, to plan treatment to the pelvic area, a liquid that shows up on x-ray may be passed into your back passage or into your bladder, or a tampon may be used to show the exact position of the vagina. These procedures may be slightly uncomfortable but are not painful and take only a few minutes. They are used only for planning the treatment, and not during the treatment sessions.

It is important for you to feel that you are involved in your treatment, so feel free to ask as many questions as you like.

For some conditions, like many skin cancers and for palliative radiotherapy, radiotherapy may be planned and given in a very simple way. Your specialist may simply put marks on your skin, with a soft pen, where the treatment is needed.

Positioning

During the treatment planning you will be lying on a fairly hard couch that can be uncomfortable. If it is, let the radiographer know as you can often be made more comfortable by having foam pads put underneath you. You have to lie very still for a few minutes so that accurate measurements can be taken and your exact position recorded. The radiographer can then make sure that you are lying in the correct position each time you have treatment.

Moulds

To help you stay very still and keep your position during your treatment you may need a device called a 'mould'. This will be made before planning starts and is used to stop you moving so that the treatment is as effective as possible. Moulds are often used for treatments to the head and neck area. Sometimes a mould of your leg, arm or other body part is used to keep the area still during treatment. Marks can be made on the mould instead of your skin.

Moulds are commonly used for children having radiotherapy.

The mould is made of clear Perspex or a plastic mesh. The Perspex mould is made using a plaster cast that is first taken of the body part. This involves using strips of wet plaster bandage that are laid across the body. The plaster takes about five minutes to set. Some people may find this claustrophobic or a little frightening, especially if the mould is of the face and neck, but it only feels like this for a few minutes. After you leave the department, Perspex is moulded onto the cast to form a mask.

Some hospitals use a plastic mesh instead. The plastic mesh becomes soft in warm water and can be moulded to your body. It hardens after a few minutes and is then ready to use. Moulds covering the face will have holes cut for the eyes, nose and mouth.



A radiotherapy mask

Your mould should fit snugly and will be ready to wear at your first planning or treatment session. It may feel claustrophobic, but it can help to remember that you will only have a mould on for a few minutes at a time.

First Planning Visits

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Skin markings

Once the treatment area has been finalised, ink markings are usually made on your skin to pinpoint the exact place where the radiation is to be directed. The staff will explain how to look after these markings. If the marks begin to rub off, tell your radiographer. Do not try to redraw them yourself. Since they can rub off onto clothing, some people choose to wear older clothes next to the skin during their treatment.

Sometimes two, three or more tattoo marks are also made on the skin. These are permanent, but they are the size of a pinpoint and will only be done with your permission. It is a little uncomfortable while it is being done, but is a good way of making sure that treatment is directed accurately. The tattoo marks are also useful once treatment has finished, as they show where the radiotherapy was given and prevent further radiotherapy being given to that area in the future.

Having your treatment

Before your first treatment, the radiographers will explain to you what you will see and hear. It is quite normal to feel anxious about having your treatment, but as you get to know the staff and understand what is going on it should become easier.

The sight of large radiotherapy machines can be frightening, especially for children. Don't be afraid to talk about any fears or worries to the staff; they are there to help you, and the more you understand about your treatment the more relaxed you will be.

Radiotherapy itself is painless and each session may take anything from a few seconds to several minutes. Because your positioning is so important, the radiographers may take a little while to get you ready (they may call this setting up). The radiographers will position you carefully on the table and adjust the height and position of the table itself. The room may be in semi-darkness while this is happening.

Try to relax as much as possible

Once you are in the correct position the staff will need to leave you alone in the room, to prevent them from being exposed to any unnecessary radiation. Don't worry if the staff seem to rush out of the room once they have positioned you, this is just to keep your treatment time as short as possible. Radiotherapy units have many patients to treat and the staff need to keep appointments on time.

Some treatment rooms have tape or CD players so that you can listen to music while having your treatment, to help you to relax. During treatment you will be alone for a few minutes but there will often be an intercom so that you can talk to the radiographers. They will be watching you carefully from the next room, either through a window or on a closed-circuit television screen. To protect your privacy, no one else will be able to see you. If you have any problems, you can raise your hand to attract the radiographers attention and they will come in to help you.

Most radiotherapy machines will be able to rotate around your body to give the treatment from several different directions. At first, this and the sound of the machine can be unsettling.



Positioning the radiotherapy machine

The radiographers may have to come into the treatment room to change your position slightly in the middle of your treatment. Also, small changes sometimes have to be made to your treatment plan. There may be various reasons for this. Your specialist and the radiographers can explain any changes to you.

Making a radiotherapy mask

This information is about the process of making a radiotherapy mask. Perspex and plastic masks are often used when radiotherapy is given to the brain, or the head and neck area. It may be helpful to read this with our information on brain tumours or head and neck cancer, as well as our information on radiotherapy. You may also want to discuss it with a nurse or doctor involved in your treatment.

- Radiotherapy masks
- How the mask is made
- Perspex mask
- Mesh plastic mask
- Treatment planning

Radiotherapy masks

Radiotherapy is the use of x-rays (and other rays) to treat cancer. Radiotherapy has to be aimed very precisely to make sure that exactly the right area of the body is treated each time.

It is important that a person having radiotherapy lies still for a few minutes while the treatment is in progress. However, when radiotherapy is given to treat tumours of the head and neck area or brain tumours, it is even more important to be as still as possible. This is because even a tiny movement could effect how well the radiotherapy works.

To help with this, a radiotherapy mask (which is sometimes called a mould, a head shell or a cast) is made to be worn during the treatment. The mask is fixed to the radiotherapy treatment table. This ensures that your head and neck are held in exactly the right position for the treatment. Wearing a mask reduces the possibility of any movement whilst the radiotherapy is given. The mask is only worn during the treatment planning procedures and during the treatment itself, ie, for only a few minutes at a time each day. You will not have to wear the mask at any other time.

How the mask is made

The mask is made in the mould room of the radiotherapy department by a mould technician or radiographer. The process of making the mask can vary slightly between hospitals and usually takes around 30 minutes. One technique uses wet plaster bandages and the finished mask is made of perspex. The other technique uses a type of mesh plastic, which is moulded to fit the shape of your face.

Perspex mask

If you are having a perspex mask you may be given a swimming cap or some other covering to wear, to protect your hair from the mould mixture.



Strips of plaster of paris are applied to the face to make a mould

Firstly, the mould technician will apply a cool cream or gel onto your face. Then, they will put strips of plaster of paris bandage on top of this. You will still be able to breathe, as holes are left around your nose and mouth.

Plaster of paris gets warm while it is setting. This is normal and may make the process uncomfortable. Do not worry: it will not burn you. Once the plaster of paris has set (which will take about five minutes) the mould is taken off. A perspex mask is then made from this mould.



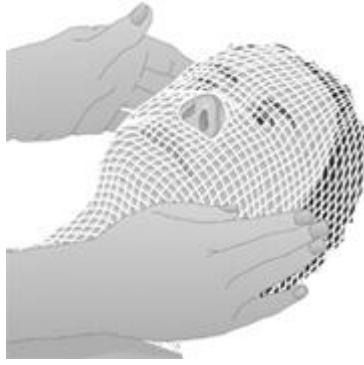
A finished perspex mask

Mesh plastic mask

This technique uses a special kind of plastic. The plastic is heated in warm water so that it becomes soft and pliable.

It is put onto your face so that the plastic gently moulds to fit your face exactly. It feels a little like having a warm flannel put onto your face. You can still breathe easily, as the plastic will not cover your nose or mouth.

Once the mesh has moulded and become hard (which takes a few minutes) the mask is taken off. It is then ready to be used when you have your treatment.



A warm plastic mesh is put onto your face so that the plastic gently moulds to fit your face

Treatment planning

Once the mask is ready, you might need to visit the mould room again so that adjustments can be made to position the mask correctly on the radiotherapy treatment table.

You may also have your treatment planned during this visit. Treatment planning ensures that the radiotherapy is aimed very precisely at the cancer. You may be positioned on a machine called a simulator (which helps the radiographer to work out the exact position you need to be in).

Sometimes scans or x-rays are necessary to help with planning. The doctor or radiographer may make a few ink marks on the mask; this makes it easier to position you correctly each time you come in for treatment. Radiotherapy planning can take more than one visit.

When you have the radiotherapy you will be lying down on a table below the radiotherapy machine. The mask is placed on your face and fixed to the table so that your head doesn't move while the radiotherapy is being given. Treatment usually takes only a few minutes and is not painful. The staff will be close by to answer any questions that you may have.

Specialised external radiotherapy techniques

Some newer ways of giving radiotherapy are being assessed to see whether they give better results than standard radiotherapy. Research studies are being carried out to see whether the new techniques can control the cancer better while causing fewer side effects. Some of the techniques are described below.

- Conformal radiotherapy
- Intensity-modulated radiotherapy (IMRT)
- Total body irradiation
- Proton therapy
- Stereotactic radiotherapy

Conformal radiotherapy

Many specialist hospitals now use a technique known as conformal radiotherapy. Conformal radiotherapy uses the same radiotherapy machine as normal radiotherapy treatment. However, a device called a multi-leaf collimator is used to arrange the beams to target the area of the cancer.

This ensures that a higher dose of radiation is given to the tumour. Healthy surrounding cells and nearby structures receive a lower dose of radiation, so the possibility of side effects is reduced.

The multi-leaf collimator consists of a number of metal sheets which are fixed to the radiotherapy machine. Each sheet can be adjusted so that the radiotherapy beams can be shaped to the treatment area.

Precise positioning of the radiotherapy machine is very important for conformal radiotherapy treatment and a special scanning machine may be used to check the position of your internal organs at the beginning of each treatment.

Intensity-modulated radiotherapy (IMRT)

High-resolution intensity-modulated radiotherapy, which is sometimes called three-dimensional IMRT (3D-IMRT) also uses a multi-leaf collimator. During this treatment the layers of the multi-leaf collimator are moved while the treatment is being given. This method is able to shape the treatment beams even more precisely and allows the dose of radiotherapy to be altered in different parts of the treatment area.

Research studies have shown that conformal radiotherapy and intensity-modulated radiotherapy have less side effects than traditional radiotherapy treatment. However, it is possible that by shaping the treatment area so precisely, microscopic cancer cells just outside the treatment area may not be destroyed. This means that the risk of the cancer coming back in the future could be higher with these specialised radiotherapy techniques. Research studies currently being carried out should show whether this is the case.

TomoTherapy

This is a specialist form of IMRT. The radiotherapy is given by a machine that rotates, much like a CT scanner rotates when taking a scan. Before each treatment the TomoTherapy machine takes a scan to locate the tumour. It then plans treatment to deliver the radiation precisely to the tumour, minimising radiation to healthy tissue. It's a very new treatment and not widely available in the UK.

Total body irradiation

This type of radiotherapy is used much less commonly than the other types of radiotherapy, but may be given to people who are having a stem cell transplant as part of their treatment. A large single dose, or six to eight smaller doses of radiation is given to the whole body to destroy the cells of the bone marrow. Very high doses of chemotherapy are also given. This treatment is followed by giving stem cells by a drip into a vein, to replace the bone marrow that has been destroyed.

This type of radiotherapy is described in our booklet on stem cell and bone marrow transplants.

Proton therapy

Proton therapy is only used to treat cancers affecting the eye, such as melanoma. It is given using a machine called a Cyclotron. The cyclotron uses proton radiation rather than x-rays to kill the cancer cells. The proton beam is aimed directly at the cancer and causes very little damage to surrounding healthy tissues. Some very rare cancers may be treated with high-dose proton therapy. This treatment is not available in the UK but the Department of Health can arrange for people who need this type of radiation to have it at centres in the USA or Europe, paid for by the NHS.

Stereotactic radiotherapy

Stereotactic radiotherapy is used to treat brain tumours.

This technique directs the radiotherapy from many different angles so that the dose going to the tumour is very high and the dose affecting surrounding healthy tissue is very low. Before treatment, several scans are analysed by computers to ensure that the radiotherapy is precisely targeted, and the patient's head is held still in a specially-made frame while having the radiotherapy. Several doses are given.

This treatment is available only in some specialist hospitals and isn't suitable for all patients with brain tumours. Your clinical oncologist can discuss whether it may be appropriate in your case.

Stereotactic radio-surgery (gamma knife)

In fact, this type of radiotherapy, again for brain tumours, does not use a knife but very precisely targeted beams of gamma radiotherapy from hundreds of different angles. Only one session of radiotherapy, taking about four to five hours, is needed.

For this treatment you will have a specially-made metal frame attached to your head. Then several scans and x-rays are carried out to find the precise area where the treatment is needed. During the radiotherapy, you lie with your head in a large helmet, which has hundreds of holes in it to allow the radiotherapy beams through.

This treatment is available only in specialist hospitals and is not suitable for all patients with brain tumours. You can discuss with your clinical oncologist whether it may be appropriate for you.

Internal radiotherapy

Internal radiotherapy is used mainly to treat cancers in the head and neck area, the cervix, womb, prostate gland or the skin.

- How it is given
- Safety measures
- Your feelings

How it is given

Treatment is given in one of two ways:

- by putting solid radioactive material (the source) close to or inside the tumour for a limited period of time
- by using a radioactive liquid, which is given either as a drink or as an injection into a vein.

If you have internal radiotherapy, you may have to stay in hospital for a few days and special precautions will be taken while the radioactive material is in place in your body. Once the treatment is over there is no risk of exposing your family or friends to radiation.

The process of putting solid radioactive material close to or inside the tumour is called brachytherapy.

Giving a radioactive liquid, either as a drink, a capsule, or as an injection into a vein is called radioisotope treatment. Your specialist will discuss your particular treatment with you.

Before having your treatment you will be asked to sign a form to say that you give your permission (consent).

Safety measures

Certain safety measures will be taken to prevent unnecessary radiation exposure to the hospital staff and your friends and relatives. Depending on the type of treatment you are having, the restrictions may be needed for a few days – but sometimes it is only for a few minutes.

The staff looking after you will explain the restrictions to you in more detail before you start your treatment. Each hospital has different routines, and it is worth visiting the treatment area beforehand to discuss with the nursing and medical staff what will happen.

You may be admitted to the ward the day before your treatment so that the staff can go over the procedure with you. This is a good time to ask questions and it may help to make a list beforehand so you don't forget something important.

While the radioactive source is in place, or after treatment with a liquid radioisotope:

- You will be nursed in a side room, away from the main ward.
- You may be nursed alone or with someone else having similar treatment.
- Lead screens may be put on either side of your bed to protect other people from any radiation given out.
- The doctors and staff on the ward will only stay in your room for short periods at a time.
- Children and pregnant women will not be allowed to visit.
- An instrument called a Geiger counter may be used to monitor the level of radiation in the room. The nurses may wear a small radiation counter.
- Visitors will be restricted, and only allowed to stay in the room or sit at the end of the bed for a short time, if at all. They may be able to talk to you from outside the room through an intercom.
- Staff and visitors will be asked to keep away from you, to reduce their exposure to the radiation.

The safety measures and visiting restrictions might make you feel very isolated, frightened and depressed at a time when you may want people around you. If you have these feelings it is important that you let the staff looking after you know. It might also be helpful to take in plenty of reading material and other items to keep you occupied while you are in the single room.

Brachytherapy

If you are having brachytherapy, you only need to stay in isolation while the radioactive source is in place. Once it is removed, the radioactivity disappears and it is perfectly safe to be with other people.

Radioisotope

If you are having treatment with a radioisotope (liquid), the radioactivity will disappear gradually and you will only need to stay in isolation until the radiation in your body has broken down. Before you leave hospital, the staff will check that most of the radioactivity in your body has gone, and that your belongings are free from any signs of radioactivity. After you leave hospital you should be able to carry on your life almost as normal, but there may be a few restrictions about contact with people – especially children and pregnant women – for a few more days.

Your feelings

People handle their fears in different ways; some want to know everything about their treatment, while others prefer to know as little as possible. If you need any explanations, the staff on the ward will be happy to help you. It often helps to talk to the staff or family and friends about any fears or worries you have. You will probably only be in the single room for a short time, perhaps only one or two days, during which you can read books and magazines, watch TV or listen to the radio.

Brachytherapy

- Internal radiotherapy for gynaecological cancers
- Selectron machine
- Microselectron
- After the treatment
- Side effects
- Possible long term side effects
- Caesium or irridium wires
- Brachytherapy for prostate cancer

Internal radiotherapy for gynaecological cancers

Internal (Intracavitary) radiotherapy (often called brachytherapy) gives radiation treatment directly to a particular part of the body. In women it is used for treating cancer of the cervix, womb (uterus) or vagina. It can be used on its own or combined with external radiotherapy. A piece of radioactive material, known as a source, is put close to the area of the cancer. The advantage of internal radiotherapy is that it gives a high dose of radiotherapy directly to the tumour, but a low dose to normal tissues.

The source is placed inside applicators (hollow plastic or metal tubes) which are positioned at the top of the vagina. (Sometimes only one tube is used). This keeps the source in place. The applicators are placed inside the vagina while you are under a general anaesthetic or sedation in the operating room. At the same time, a flexible tube called a urinary catheter may be put into your bladder to drain off urine. This means that during your treatment you won't have to move around to pass urine (which could dislodge the applicators).

Once the applicators are in place, an x-ray will be taken to check that they are in the correct position. Sometimes the radioactive source is put into the applicators while you are in the operating room, but more commonly it will be put in place once you are back on the ward in your own room. The applicators are kept in place by a pack (cotton/gauze padding) inside your vagina. This can be uncomfortable but you can have regular painkillers to ease any discomfort.

Once the source is in place you have to stay in bed, so that the applicators don't move out of position. If you need anything, you can call a member of staff by using the buzzer by your bed. If the source does move out of position, you should call the staff on the ward straight away.

Many women find the prospect of this treatment quite worrying. It's important to talk things through with your specialist so that you understand as much as you need to about what your treatment involves. Some hospitals have specialist nurses who are trained to give advice and support to women having treatment for gynaecological cancer. Ask your specialist what help is available in your hospital.

Selectron machine

In many hospitals a machine called a Selectron, or similar name, is used to put the radioactive material into the applicators. The machine is attached by tubes to the applicators. When the machine is switched on, it passes small radioactive balls into the applicators. If the machine is switched off, the radioactive balls are pulled back inside the machine.

The machine is kept switched on throughout treatment, except when someone needs to go into your room. It can then be turned off, to reduce their exposure to the rays. However, safety measures and visiting restrictions are still necessary. The time you spend on the machine varies, but it is usually between 12–48 hours.

Microselectron

Sometimes a machine called a Microselectron is used for internal radiotherapy. It gives the radiotherapy more quickly, so the treatments last for only a few minutes and you can go home the same day.

After the treatment

Once the complete radiation dose has been given, the source and the applicators will be removed. This is usually done on the ward. As it can be a little uncomfortable, you will be offered some painkillers beforehand. Sometimes a few breaths of the gas Entonox will help you to relax. Staff on the ward will check that all the applicators and sources have been removed. Your catheter may be removed at the same time.

Your specialist may suggest that you use vaginal douches for a few days after the applicator has been removed to keep the vagina clean. Your nurse will tell you how to use these.

You will probably be able to go home the same day, or the following day. Once the radioactive sources are removed, all traces of radioactivity immediately disappear.

Many women are given both internal and external radiotherapy to ensure the cancer is treated in the most effective way.

Side effects

It is not unusual to have slight bleeding or discharge once the radiotherapy treatment has ended. If it continues or becomes heavy it is important to let your doctor or nurse know.

Radiotherapy to the pelvic area can cause side effects such as tiredness, diarrhoea and a burning sensation when passing urine. These side effects can be mild or more troublesome depending on the strength of the radiotherapy dose and the length of your treatment. Your oncologist will be able to advise you what to expect.

Most of these side effects can be treated with medicines, which your oncologist can give to you. Any side effects should gradually disappear once your treatment is over.

It is important that you drink plenty of fluids and maintain a healthy diet during your treatment. If you have diarrhoea you can ask your doctor to prescribe anti-diarrhoea medicines. You may feel sick but this is not common. If you don't feel like eating, you can replace meals with nutritious high-calorie drinks, which are available from most chemists and can be prescribed by your GP. Our booklet on eating well has some helpful tips on eating when you are feeling ill.

Menopause

Unfortunately, radiotherapy for cancer of the cervix affects the ovaries, and brings on the menopause, usually about three months after the treatment starts. This means that your periods will stop and you will have menopausal side effects such as hot flushes, dry skin and possibly loss of concentration. Some women become less interested in sex and notice that their vagina is dry.

You can be protected from menopausal side effects by taking HRT (hormone replacement therapy) as tablets or skin patches. Your gynaecologist may suggest you start on these during the radiotherapy treatment or shortly after it has ended. It's important to discuss the possible effects of menopause with your specialist so that you can be given appropriate advice and support. An organisation called The Daisy Network can help women who have experienced premature menopause.

Sometimes radiotherapy causes a narrowing of the vagina, which can make sex uncomfortable. This can be distressing but there are things that can be done to help. See our sections sexuality and fertility for advice on how to deal with the effects on your sex life and fertility.

Possible long term side effects

Radiotherapy to the pelvic area can sometimes cause long-term side effects (sometimes called 'late effects'). However, improvements in treatment planning have made these much less likely. In a small number of people, the bowel or bladder may be permanently affected by the radiotherapy. If this happens the increased bowel motions and diarrhoea may continue, or the person may need to pass urine more often than before. The blood vessels in the bowel and bladder can become more fragile after radiotherapy treatment and this can make blood appear in the urine or bowel movements. This can take many months or even years to occur.

If you notice any bleeding it is important to let your doctor know so that tests can be done and appropriate treatment given.

Our section on pelvic radiotherapy in women has information on coping with these side effects.

Some people also find that radiotherapy affects the lymph glands in the pelvic area and can cause swelling of the legs. This is known as lymphoedema. It is more likely if you have had surgery as well as radiotherapy.

Caesium or irridium wires

These can be used to treat a number of types of tumours including those in the mouth, lip, cervix and breast. Very thin radioactive needles, wires or tubes are inserted while you are under general anaesthetic in the operating room.

An x-ray may be taken to ensure that the needles are in the correct position. You will be in a room on your own, and the safety measures will be used until the wires are removed – usually after 3–8 days. Sometimes the wires are removed under a general anaesthetic.

Wires in the mouth can be uncomfortable, and can make eating and talking difficult. You will need to have a soft or liquid diet while they are in place. Your nurse will show you how to keep your mouth clean, using regular mouthwashes. If eating is a problem you may be fed through a thin tube (a nasogastric or NG tube), passed up your nose and down into your stomach.

The wires are removed once the correct dose of radiation has been given. This may be after two days if the treatment is given as a booster following external treatment or up to one week if it is the only type of radiotherapy treatment being given.

Once the wires have been removed, the area will feel sore for up to two or three weeks afterwards. Your specialist will prescribe painkillers that you can take regularly until this improves. After caesium brachytherapy there is a slight risk of infection, but this is very rare. If you develop a high temperature or heavy bleeding after your treatment, contact your specialist as soon as possible. You will be prescribed antibiotics to treat the infection.

Brachytherapy for prostate cancer

Brachytherapy using radioactive seed implants is sometimes used to treat small tumours of the prostate gland.

Brachytherapy is available in some hospitals in the UK. It is carried out under a general anaesthetic, or sometimes a spinal anaesthetic. Small radioactive metal seeds are placed into the tumour within the prostate gland, and they release small doses of radiation very slowly over a period of time. The seeds are not removed, but stay in the prostate tissue. The radioactivity gradually fades away over approximately a year. The radiation affects only the area a few millimetres around the seeds, so there is no danger of it affecting other people.

Side effects

It is fairly common to feel some soreness and bruising after the seeds are implanted. Your doctor can prescribe painkillers to help.

Some men get blood in their urine, which is quite normal. If you notice a lot of blood you should let your doctor know. It can help to drink plenty of fluids to flush through any blood.

It may be painful to pass urine for a time, or you may need to pass urine more frequently, or have a weaker stream. Up to one in seven men will have difficulty passing urine after brachytherapy. Some men will need to have a catheter inserted for a while. Occasionally the tube that drains urine from the bladder (urethra) will narrow some time later. If this happens, the urethra can often be stretched.

Brachytherapy treatment may cause impotence, and some men may become infertile after treatment.

It's important to discuss this with your specialist who can advise you about the likely impact of brachytherapy on your sex-life and fertility, and suggest ways of coping.

Our section on early (localised) prostate cancer explains this treatment in more detail. See also our information about the possible late effects of pelvic radiotherapy.

Radioisotopes

Radioisotopes are given as a drink, in capsules that are swallowed, or by injection into a vein (as an intravenous injection). The same safety precautions are taken with this type of treatment as for other types of internal radiotherapy.

Radioactive iodine

The most common type of radioisotope treatment is radioactive iodine. It is used to treat tumours of the thyroid gland, and is given as capsules.

Any radioactive iodine that is not absorbed by the thyroid will be passed from the body in sweat and urine. You need to drink plenty of fluids during your treatment as this helps to flush the iodine out of the body. The amount of radiation in your body will be checked regularly and as soon as it falls to a safe level, after about four to seven days, you will be able to go home. You may need to take some special precautions after going home – you may need to avoid young children and pregnant women for a short time. The hospital staff will explain this to you.

Radioactive iodine doesn't usually cause side effects, but you may feel very tired for a few weeks after having this treatment.

Treating secondary bone cancer

Radioisotope treatment can also be given if certain types of cancer have spread to the bones (secondary cancer in the bone). A radioisotope is injected into a vein. You can be given it as an outpatient. Before you go home you will be given some simple advice to follow, as your urine and blood will be slightly radioactive for a few days. You may feel tired for a few weeks, but this type of radiotherapy treatment does not usually cause any other side effects.

You can read more about these treatments in our booklets on thyroid cancer and secondary bone cancer.

Follow-up after radiotherapy treatment

After your treatment has finished you will have regular follow-up appointments. These may be at the radiotherapy department or at your original hospital. The positive effects of radiotherapy may take some time to show. People sometimes expect to be given an x-ray or a scan at the end of their treatment to see if it has worked. However, in many cases the tumour may take some time to shrink and the radiotherapy may cause some inflammation, which means that x-rays and scans may not be helpful at this time.

How often you have check-ups will vary depending on your type of cancer and from one hospital to another, but as time goes by they will become less frequent. Your specialist will keep in contact with your own family doctor so they will know about your progress. Follow-up appointments are a good opportunity to discuss any problems or worries you may have. It may help to make a list beforehand so that you don't forget anything important.

If you have any problems, or notice any new symptoms in between these times, let your doctor know as soon as possible. You don't have to wait until your next scheduled appointment – just ask for an earlier one.

Many people find that they get very anxious for a while before their appointments. This is natural and it may help to get support from family, friends or a support organisation.

Emotional effects

Sometimes the hardest time to cope with is when treatment is finished and you, and everyone else, see this as the time to get back to normal. Recovery time varies, and no one can say for sure how long you will take to get over the physical and emotional side effects.

The end of the visits to hospital for treatment can leave you feeling alone and neglected. Many people find that they feel very low and emotional at this time, when they had expected to be able to put the cancer and the treatment behind them. This may be the time when you need most support.

General side effects of external radiotherapy

While radiotherapy can destroy cancer cells, it can also have an effect on some of the surrounding normal cells. The side effects that may occur are described in the following pages. It's important to remember that most people will have only a few of them, and for many people they will be mild. There have been huge improvements in radiotherapy machines and severe side effects are very rare.

As radiotherapy affects people in different ways, it's difficult to predict exactly how you will react to your treatment. Before you start, the staff will discuss with you any likely side effects of the particular treatment you're having. They can also give tips on how to deal with them and how they can be treated. Being aware of side effects in advance can help you to cope with any that may occur.

Most side effects of radiotherapy disappear gradually once the course of treatment is over. For some people however, they may continue for a few weeks.

Some issues pertaining to the general side effects are

- Tiredness
- Eating and drinking
- Skin care
- Avoiding the sun
- Clothing
- Hair loss
- Changes in your blood
- Smoking
- Long-term side effects

Tiredness

You may feel very tired during your radiotherapy. This can often be made worse by having to travel to hospital each day. Listen to your body, and if necessary allow yourself extra time to rest, perhaps by taking a nap. It may help if you spread chores out over the week, sit down to do them wherever possible, and accept any offers of help. Tiredness can be a problem for some months after your treatment has finished.

Eating and drinking

As always during treatment of any kind, it's important to maintain a healthy diet and drink plenty of fluids. At times you probably won't feel like eating, or you may find that your eating habits change. It may be easier to have small snacks throughout the day rather than large meals. It's not unusual to lose a little weight during radiotherapy, but if you're having any problems with eating it is important to tell the radiotherapy staff. They can arrange for you to talk to the dietitian at the hospital.

Skin care

Some people develop a skin reaction while having external radiotherapy. If this affects you, it will normally happen after 3–4 weeks. People with pale skin may find that the skin in the treatment area becomes red and sore or itchy. People with darker skin may find that their skin becomes darker and can have a blue or black tinge. The amount of the reaction depends on the area being treated and the individual's skin. Some people have no skin problems at all. Your radiographers will be looking for these reactions, but you should also let them know as soon as you notice any soreness or change in skin colour.

It's important not to use any creams or dressings unless they have been prescribed or recommended by your specialist or the radiographer.

Occasionally, if your skin gets very sore, your treatment may have to be delayed for a short time to allow the area to recover.

Staff at the radiotherapy department will be able to give you advice on how to look after your skin in the area being treated. This will vary according to the part of the body that is being treated and the dose of radiotherapy.

You may be advised to use only tepid water and unperfumed soaps to wash the area, and not to soak too long in the bath. You can dry your skin by patting it gently with a soft towel, but you shouldn't rub the area as this may make it sore.

Perfumed soaps, talcum powder, deodorants and perfumes may also make your skin sore and should not be used. The staff at the hospital may suggest that you gently apply plain moisturisers, such as E45 cream or aqueous cream, to the area. After your treatment, plain soap and plain moisturisers are often recommended. Aloe vera cream or arnica cream can sometimes help the skin to heal. Always check with the radiotherapy staff before applying anything to your skin. It is very important that any marks put on your skin to show the treatment area are not removed. If the marks do fade or disappear, don't try to replace them yourself but let the radiotherapy staff know.

Men who are having radiotherapy to the head and neck may be advised not to shave the area, or to use an electric razor rather than wet-shaving.

These restrictions apply only to the treatment area, and the rest of your skin can be treated normally. Your skin may peel after the redness has faded, but it will gradually heal. Changes in the skin usually settle down two to four weeks after the treatment has finished, but the area may stay slightly darker than the surrounding skin.

Avoiding the sun

Your skin in the treated area is very sensitive and needs protecting from the sun or cold winds. If you're having radiotherapy to your head or neck, try wearing a hat or a silk or cotton scarf when you go outside.

For at least the first year after your radiotherapy, it's very important to cover the treated area if you go out in strong sunshine. Wear clothes made of cotton or natural fibres, which have a closer weave and offer more protection against the sun. Even after this time the area of treated skin will be more delicate than normal, so take extra care. Use a sun-cream (of at least factor 15) and cover the area with a hat or close-weave clothing. It's important to remember that you can burn even through clothing if you are out in hot sun for a long time.

You can swim as soon as any skin reaction has settled down, usually within a month of finishing treatment. If you are swimming outdoors however, don't stay in the water too long, and remember to use a waterproof sun-cream.

Clothing

Loose-fitting clothes, preferably in natural fibres rather than man-made materials, are more comfortable and less irritating to the skin. Avoid tight collars and ties if you're having radiotherapy to your neck.

Shoulder straps and bra straps can also cause irritation if they rub against treated skin. If your breast area is being treated, you may be more comfortable not wearing a bra or wearing a cropped top or vest.

Hair loss

With radiotherapy you lose hair within the treatment area, but it can also happen where the radiation beam leaves the body (for example, on the back of the neck), as well as where it enters the body. Ask your clinical oncologist or radiographer to show you exactly where your hair will fall out. The hair usually begins to fall out after two to three weeks. Hair should grow back after treatment is finished, although this depends on the dose of radiotherapy you have. Your radiographer can explain if your hair loss is likely to be permanent.

You may need to find ways of covering up the hair loss and there are several ways of doing this. You can find out more in the section on coping with hair loss.

Changes in your blood

Radiotherapy to some parts of the body may affect the bone marrow, which is where the different types of blood cells are made. If the doctors think this might happen to you, you will have regular blood tests during your treatment to check the number of cells in your blood (your blood count). If your blood count is low, you may feel tired and run down. If your blood count becomes very low (which is unlikely), it may be necessary to have a short rest from treatment so that your blood cell levels can return to normal. You may also need to have a blood transfusion.

It is very important to let your doctors know if you feel very unwell, if your temperature goes above 38°C (100.4°F), or if you start feeling cold and shaky.

Smoking

Stopping smoking during and after radiotherapy is very worthwhile. Research has shown that it may make the radiotherapy more effective as well as reducing the side effects. It will also improve your general health and reduce your risk of developing other cancers.

Stopping smoking or even cutting down at such a stressful time can be very difficult, but do your best. If you want help or advice you can talk to your specialist, GP or a specialist nurse, who will be able to suggest ways of stopping. Organisations such as QUIT also offer advice and valuable support.

Long-term side effects

All cancer treatments (including surgery, chemotherapy and radiotherapy) can result in long-term side effects. Modern ways of giving radiotherapy are designed to limit the chance of permanent side effects as much as possible and very few people develop long-term effects nowadays. If you are concerned about the risk of developing particular side effects from radiotherapy, it's best to speak to your specialist before treatment starts.

Possible long-term side effects

Below are some of the long-term side effects that can occur, but they will depend upon the part of the body that was treated (so you won't necessarily experience all of them). The long-term side effects can take months and sometimes years to develop.

- Hair loss can sometimes be permanent or new hair growth may be a different colour or texture.
- The skin can feel different or may be darker than before.
- Infertility – if the ovaries or testicles are within the treatment area.
- Swelling in a limb or on the body (lymphoedema) because lymph nodes are damaged.
- Red 'spidery' marks (telangiectasia) may appear on the skin because small blood vessels are damaged.
- Shortness of breath – radiotherapy can make the lungs less stretchy.
- Narrowing of the vagina.
- Difficulty swallowing due to a narrowing of the gullet (oesophagus) or reduced amounts of saliva.
- Frequency passing urine because the bladder can become less stretchy after radiotherapy.

Second cancers

Radiotherapy can cause cancer and a small number of people will develop a second cancer because of the treatment they have had. However, the chance of a second cancer developing is so small that the risks of having radiotherapy are far out-weighted by the benefits. If you are concerned about your risk of developing a second cancer you should discuss your worries with your specialist.

Side effects of radiotherapy to specific areas of the body

This section gives information about the side effects of external radiotherapy to different areas of the body. As radiotherapy treats only the part of the body affected by the cancer, you only need to read the section that relates to your treatment area. See the cancer type section for more information about how radiotherapy is given for specific cancers.

- Radiotherapy to the head and neck
- Radiotherapy to the chest (thorax)
- Radiotherapy to the stomach and pelvis

Radiotherapy to the head and neck

Mouth care

Your mouth may become sore during treatment because the cells that line the mouth are very sensitive to radiation. This can happen after 2–3 weeks of radiotherapy and may be more severe if you are having chemotherapy as well. The treatment may also make you more likely to develop mouth infections such as thrush, and you may find that you are producing sticky mucus.

It's very important to take care of your mouth while you are having treatment; the radiotherapy staff or a dental hygienist will show you how to do this. Regular mouthwashes, lozenges and painkillers will be prescribed for you when necessary.

Eating

As your mouth will be more sensitive than usual, try to avoid hot, spicy or very cold food or drink. Also avoid hard foods such as toast. Use only the mouthwashes prescribed for you by the radiotherapy department, as mouthwashes bought from a shop or chemist are usually alcohol-based and can make the soreness worse.

Taste changes

Your taste buds may be affected by treatment and you may notice changes in the way your food tastes. Some people say food has a metallic taste, while others say that all foods taste the same. As the effects of the treatment fade away your sense of taste will probably return to normal, but it may take over a year for this to happen. The radiotherapy staff can arrange for you to talk to a dietitian for advice on adapting your diet to overcome any taste changes.

Alcohol (particularly spirits) and tobacco can irritate the lining of the mouth and it's best to avoid them during your treatment and for a few weeks afterwards. Your specialist may advise you to stop altogether if you can.

Dry mouth

The glands that produce saliva may be affected by the treatment, making you produce less saliva or none at all. This can make it uncomfortable to chew or swallow. The dryness in your mouth may last for several months after treatment and for some people it may be permanent. These side effects can be difficult to cope with at first, but there are ways to help. Your specialist can prescribe different treatments to help keep your mouth moist.

Loss of appetite and weight loss

The above side effects in your mouth may cause a loss of appetite and weight loss. Food supplements, such as high-calorie drinks, will be recommended until your mouth feels better. If you are having problems with eating, talk to your radiographers or the nursing staff, who will be able to help. You may be referred to a dietitian for specific advice. Our section on eating well also has some useful tips.

If eating and drinking become too painful, a thin, flexible tube, called a nasogastric (NG) tube, may be passed up your nose and down into your stomach. Liquid foods can be given through the NG tube. Another way of giving liquid foods is by passing a tube (a PEG or RIG tube) through the wall of your abdomen and into the stomach. This can be done while you are under general anaesthetic, usually when you are having surgery for the cancer. Being fed for a time through a feeding tube may be the best way to make sure you keep up your strength during your treatment.

Voice changes

If you are having treatment to your voice box (larynx), you may notice that your voice becomes hoarse or husky and may disappear completely at times. These changes are only temporary and it should go back to normal a few weeks after your treatment is over.

Tooth decay

Radiotherapy to the mouth can make you more likely to get tooth decay and you will need more frequent check-ups at the dentist. Fluoride treatment can often help to protect your teeth against the effects of radiotherapy, and your clinical oncologist may refer you for special dental treatment before your radiotherapy starts.

Gently brushing your teeth with a soft toothbrush and high-fluoride toothpaste as many as five or six times a day will help. It is important to tell your dentist that you have had radiotherapy before having any dental work later on.

Radiotherapy to the chest (thorax)

Difficulty swallowing

About two to three weeks (but sometimes only a few days) after radiotherapy to the chest has started, you might notice that your chest feels tight, which makes it difficult to swallow solid foods. This is a common reaction to treatment. It may help to try a soft, plain diet supplemented by high-calorie drinks such as Build-Up® and Complian®. By trying different foods, you'll find out which ones are easiest to swallow. Your specialist may prescribe painkillers or liquid medicines (such as Asilone®, Maalox® or Altacite Plus®) to be taken before meals to make eating less uncomfortable. The discomfort will usually get better on its own in about five to eight weeks.

Feeling sick

Some people find that their treatment makes them feel sick (nauseated), and sometimes they may actually be sick (vomit). This is most common when the treatment area is near the stomach. Your specialist can prescribe anti-sickness drugs (anti-emetics) if this happens, and may prescribe them anyway, as a precaution. They are usually very effective.

Tell your specialist if you have any nausea or vomiting, and remember that it usually stops once treatment is over.

Weight loss

If you are having problems with eating or sickness, you may begin to lose weight. This can make you feel tired and weak. At times you may not feel like eating. The dietitian or your specialist will be able to give you advice if eating is a problem, and our section on eating well gives helpful advice on dealing with this.

Breathlessness

After radiotherapy to the chest you may notice that you develop a dry cough and breathlessness. This side effect may not occur until several months after your treatment. Whenever it happens you should report it to your doctor, who may treat it with a course of steroids and possibly antibiotics. It is important to let your doctor know if you notice any changes in your breathing at any time during and after your treatment.

Radiotherapy to the stomach and pelvis

Diarrhoea

This is a fairly common side effect of treatment to this area, and stomach cramps and wind may also occur. As well as being unpleasant, diarrhoea can make you feel weak and tired. Your specialist can prescribe anti-diarrhoea drugs for you. If a large area of the abdomen or pelvis is being treated, you may be advised to drink lots of fluid. You will generally be advised to eat a normal healthy diet. The diarrhoea may continue for some weeks after your treatment. If it doesn't seem to be getting better over time, contact the radiotherapy department or your doctor.

Discomfort around the back passage

Your rectum (back passage) may become irritated by the radiotherapy if the area being treated is in the lower pelvis; such as radiotherapy for womb, prostate, rectal or bladder cancer. If this is likely you may be advised to follow a high-fibre diet to avoid becoming constipated, as constipation can make the irritation of the back passage (proctitis) worse.

If you already have piles, they may become more irritating, and local anaesthetic, steroid creams or suppositories may be prescribed to ease any discomfort. Sometimes, after radiotherapy to the pelvic area, there may be a mucus discharge or some bleeding from the back passage. Let your specialist know if you have any of these problems.

Feeling sick

Some people find that their treatment makes them feel sick (nauseated) and they may actually be sick (vomit). Your specialist can prescribe anti-sickness drugs (anti-emetics) for you. Any feeling of sickness usually stops once your treatment is over.

Loss of appetite and weight loss

These side effects may occur as a result of diarrhoea and nausea. At times you may not feel like eating, and the idea of preparing food may make you feel sick. If you can, ask someone else to prepare your meals for you. You may find it easier to eat little and often – having small, more frequent meals or snacks rather than conventional larger meals at set times.

Food supplements, such as Build-Up® and Complan®, can be used in place of meals to add necessary calories. Your dietitian or specialist can give you advice if eating becomes a problem for you.

Our booklets on eating well may be helpful. Occasionally, if you continue to lose weight, you may need to spend a short time in hospital so that you can be fed in other ways. Liquid food can be

given into a vein (intravenously) or by a tube through your nose and into your stomach (a nasogastric or NG tube) until you are able to eat properly again.

Pain while passing urine

Inflammation of the bladder (cystitis) may develop during radiotherapy to the lower abdomen, usually after several treatments have been given. You may notice a burning sensation or discomfort when you pass urine, and feel that you need to pass water more often than usual, including during the night.

Drinking more fluids will help to relieve these symptoms, but try to avoid coffee, tea, alcohol and acidic fruit juices such as orange juice, as these irritate the bladder and will make the symptoms worse. Some people find that cranberry juice or lemon barley water help to reduce the symptoms. If necessary, medicines can be given to treat these symptoms.

See our detailed information about how to cope with the [Side effects of pelvic radiotherapy in women and men](#).

Also see the [Effects of pelvic radiotherapy on fertility and sexuality](#).

Radiotherapy and complementary therapies

Complementary therapies can help to improve your quality of life and wellbeing and can sometimes help to reduce the side effects of radiotherapy. Many people find that complementary therapies or practices can help them to feel stronger and more confident in dealing with radiotherapy. These therapies can be used alongside conventional treatments and medicines. Some complementary therapies, such as meditation or visualisation, can be done by the person with cancer themselves and can help to reduce anxiety. Other therapies, such as gentle massage, can be carried out by relatives or carers and can help them to support the person with cancer.

Physical contact and touch can be among the most powerful forms of support for people who are faced with uncertainty, fear or pain, whether emotional or physical. Touching someone gently can express how much you care about them.

Some hospitals offer complementary therapies alongside conventional care. These may include:

- aromatherapy
- art therapy
- colour and sound therapy
- massage
- reflexology
- relaxation, visualisation or guided imagery techniques
- acupuncture.

Relaxation

Deep relaxation is a skill which can be learned. It can be used to help:

- release muscle tension
- relieve stress
- reduce tiredness and pain
- improve sleep and peace of mind
- regain control of emotions.

Relaxation is not simply 'taking it easy', but involves making time to reflect on problems or anxieties and, hopefully, develop a positive mental outlook.

There are several different relaxation techniques which can be self-taught from books or tapes. You can get these from your local library, bookshop and some chemists. Therapists and groups throughout the country also teach particular relaxation methods.

Effects of radiotherapy on sexuality

Radiotherapy can sometimes cause physical changes that may affect your sex life. If you are having problems, it may help to talk these over with your partner and your medical team. Although it can be embarrassing to talk to health professionals about such intimate things, remember that they are used to dealing with these issues and can suggest things that will help you. You can also get advice and support from the British Association of Sexual and Relationship Therapy. You may also wish to phone our cancer support specialists.

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For women

External and internal radiotherapy to the pelvis usually affects the ovaries. Radiotherapy to the ovaries will cause the menopause. This may happen gradually over a few months. The normal signs of the menopause will develop, such as hot flushes, dry skin and dryness in the vagina. This can be very distressing, particularly for younger women who are not prepared for the menopause. Depending on your type of tumour, your doctor may prescribe hormone replacement therapy, which can help to overcome these problems. Occasionally – for example, when treating some types of cancer called lymphomas – the ovaries may be moved out of the treatment area and into the upper part of the abdomen. This is done by an operation before the radiotherapy treatment. Your specialist can tell you more about this.

Radiotherapy to the vaginal area can occasionally make the vagina narrower. The radiotherapy staff will show you how to use vaginal dilators and a lubricant to keep your vagina supple once you have finished treatment.

At first you may find sex uncomfortable, and it may be helpful to use a lubricant such as KY Jelly®, which you can buy at your local chemist. Regular sex may help to prevent narrowing of the vagina, but many women will not feel ready to return to a regular sex life while they have the side effects of radiotherapy. This is very natural; your interest in sex will usually come back as the effects of treatment wear off. In the meantime, using a dilator is an effective way of keeping your vagina healthy.

Our JASCAP booklet on [Sexuality and cancer](#) offers useful information.

For men

Men who have radiotherapy may have some problems with sex. It may be that you lose interest in sex or become temporarily unable to have an erection (impotent) because of your anxiety about your illness, or worries about the future, or because the treatment is making you too tired to think about sex. These effects may last for a few weeks after radiotherapy has finished, and can be very distressing.

Radiotherapy to the pelvis to treat bladder, rectal or prostate cancer may cause impotence, which may develop months or years after your radiotherapy is finished. Talking openly to your partner about your problems may help, and you can ask the radiotherapy staff about any problems that you have. There are practical ways to overcome impotence and these are discussed in detail in our section on sexuality and cancer.

Contraception

It is very important for women of childbearing age to use effective contraception throughout their radiotherapy treatment. Radiotherapy could cause a miscarriage or cause a child to be born with abnormalities. If you think that you may be pregnant when you are told that you are to have radiotherapy treatment, it's extremely important to let your clinical oncologist know. The oncologist will discuss with you whether the treatment can be delayed until the baby is born.

Effects of radiotherapy on fertility

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- In men
- Information about fertility
- Sperm banking and egg storage
- Contraception
- Feelings about sexuality and infertility

In women

Most radiotherapy treatment has no effect on your ability to have children, unless the ovaries are included in the radiotherapy treatment area.

Many healthy babies have been born to parents who have had radiotherapy, and the risk of having a baby with health problems is not increased if you have had treatment in the past. Many specialists recommend that women wait for about two years after having radiotherapy before trying to get pregnant, to give the body a chance to get over the effects of the cancer and its treatment. If radiotherapy treatment is given for cancer of the cervix or ovary and includes the ovaries, temporary or permanent infertility is likely. This can be very difficult to come to terms with.

In men

In men, sperm production can be reduced if the testicles are in the area being treated, and this can lead to temporary or permanent infertility. Fortunately, it is usually possible to avoid giving radiotherapy to the testicles as part of treatment for the cancers that are most common in younger men. Radiotherapy for prostate or bladder cancers is likely to cause permanently low sperm counts.

Information about fertility

Before you have radiotherapy, your specialist should discuss with you the possibility that it may lead to infertility, and will normally ask you to sign a form consenting to treatment. Understandably, this can be a traumatic time, particularly for young people who were planning to have children. If you have a partner, they will be encouraged to join in this meeting, giving both of you a chance to discuss any worries you may have and talk them through.

Sperm banking and egg storage

Sometimes it may be possible for men to store sperm before they have radiotherapy. The sperm are frozen and can be stored for several years until the couple are ready to have children. This is known as sperm banking.

Before treatment starts women may be able to store fertilised eggs (embryos) using sperm from a partner. It can take between 4–6 weeks to collect the eggs and won't be possible if treatment

needs to start straight away. It is now sometimes possible to store a woman's unfertilised eggs as well, although this is still at a very early, experimental stage and the service is not widely available. See also our [Fertility and cancer](#) booklet.

Contraception

Even if your treatment is likely to make you infertile, you may be strongly advised to use a reliable form of birth control. If pregnancy occurs during or shortly after radiotherapy, there is a possibility of damage to the baby.

Feelings about sexuality and infertility

It is not easy to come to terms with the prospect of infertility, or any of the side effects of your treatment. It will take a while for you to sort out your emotions and be able to talk about them. When you're ready, it may help you to talk openly to your partner or a friend about these feelings. If they can understand how you feel it will probably be easier for them to offer help and support. Some people prefer to talk to someone they don't know. Support groups offer you the chance to talk to other people who have been through a similar experience. Another possibility is to talk things over with a counsellor. Your hospital may offer a counselling service. Our information nurses can give you details of how to find counsellors in your local area or see our list of counselling organisations.

Your emotions and radiotherapy

'During my radiotherapy I became very emotional. I would start crying for no reason.' This is how one woman felt. Another described herself as being 'very weepy', not during the treatment but a couple of weeks afterwards. These emotions are shared by many people who have radiotherapy, or any treatment for cancer. It can be very difficult to try to come to terms not only with the illness itself but also with the treatments and possible side effects.

Many people who have radiotherapy will already have had some cancer treatment; for others this may be the beginning of a long treatment period. Radiotherapy can bring about physical changes which are very distressing, such as the menopause or hair loss.

We all have our own ways of coping with difficulties. Some people have a close network of family and friends who give emotional support. Others would rather seek help from people who are not involved in their illness. Either way it is important to know that support is available if you need it. You can ask at your treatment hospital if help is available locally.

You will also find useful advice in the following booklets:

- [Talking to someone with cancer](#) - for relatives and friends of people with cancer. It looks at some of the difficulties people may have when talking about cancer, and suggests ways of overcoming them.
- [Talking about your cancer](#) - suggests simple, practical ways to help you talk about your needs and feelings.
- [The emotional effects of cancer](#) - discusses the different emotions that may occur and has tips on dealing with them.
- [Talking to children about cancer](#) - a guide for parents with cancer.

The nurses at our cancer support service can give you information on all aspects of cancer and its treatment, and on the practical and emotional problems of living with the illness. Some people find it helpful to talk through their feelings with a trained counsellor.

NOTE: JASCAP has booklets on each of the above subjects.