

## Information for Patients

# X-rays and other types of medical radiation

X-rays are a type of radiation. Radiation can also come from radioactive substances.

There are lots of natural sources of radiation in the world, for example certain types of rocks, water and some of our food, including bananas, nuts and potatoes. Radiation also comes from space, but usually the atmosphere protects us, so this radiation mostly affects people who live on high mountains or travel in airplanes.

When we measure radiation doses, we use the measurement millisievert (abbreviated as mSv). In the UK, the average amount of radiation that people are exposed to each year is a little over 2 mSv. That means that over a lifetime, people could receive as much as 200 mSv of radiation exposure. The exact amount depends on where you live, what you do and how far you travel by airplane.

## Why and how do we use medical radiation?

Using medical radiation can be the best way to find out what is wrong with someone or whether a condition has changed. Each request for an X-ray or scan is assessed by an expert who makes sure that it is the most appropriate test for you. They may recommend a different test, if they think it would be more helpful. Whatever decision is made, your X-ray or scan will be done with the smallest amount of radiation that is necessary to produce the correct images. If your doctor is sending you for an X-ray or scan, you can ask:

- What information do you hope to get from it?
- Is it really necessary?
- Is there an alternative that doesn't use radiation that might be suitable instead?

You should mention if you have had any other X-rays or scans recently. The information from these might be useful too.

Different types of machine use X-rays in different ways.

- **Radiography**, which used to be called 'plain film', is the most common. This type of imaging can be used to look for broken bones, problems with your chest and lungs or your teeth. Once you have been positioned in the correct place the X-rays are turned on for less than 1 second to produce the image.

- **Fluoroscopy, or screening**, uses X-rays to produce moving pictures. These pictures might be used to guide a catheter through your blood vessels or look at the way special dye moves through your body. Screening examinations take between a few minutes and a few hours depending on how complicated the procedure is.
- **CT or CAT scans** use X-rays to provide very detailed pictures of the inside of the body. The body part or area can be examined slice by slice or reconstructed into a 3-D picture. Sometimes injections or drinks are used to make the pictures clearer. Once positioned on the scan table, the CT scan is quite quick. The X-rays are on for less than a minute, but you may need to spend time in the department preparing before your scan.
- **Nuclear medicine or Radionuclide Imaging** involves placing radioactive substances (tracers) inside the body. These tracers follow various processes in the body. We can detect the small amount of radiation given off by these tracers outside the body using sensitive gamma cameras and positron emission tomography (PET) scanners. We use this information to create maps of how well that process is working. Larger doses of certain types of tracer can also be used to treat disease.

The tracer can be injected, swallowed or breathed in a few minutes or a few hours before the scan, depending on the type of test you are having.

You will need to lie still under the camera/scanner for a few minutes for us to collect enough information to create the map(s) mentioned above.

We will give you more information in the department about your specific scan if you need to take extra precautions afterwards.

## Medical radiation and the law

Medical exposure to radiation is strictly controlled. In the UK, the Ionising Radiation (Medical Exposure) Regulations, also known as IRMER, set out the requirements for diagnosis and treatment.

There are five steps in the imaging process:

1. **Request:** Your doctor or another approved health care professional discusses your symptoms with you and decides to ask for an X-ray or scan to help with diagnosing the problem.
2. **Justification:** An X-ray expert (a radiologist or a radiographer) looks at the information that your doctor has sent and decides whether that is the best way to diagnose your condition.
3. **Examination/procedure:** A radiologist, radiographer, nuclear medicine technologist or an assistant practitioner takes the images.

4. **Evaluation:** A radiologist or radiographer studies the images. They look for anything that shouldn't be there or any changes that might be the cause of your symptoms.
5. **Report:** The radiologist or radiographer writes a report about your examination. This is then sent to the person who requested the images/test.

## Who are the people involved

**Referrer:** This is your doctor (or sometimes a nurse, physiotherapist or other healthcare professional) who has asked for the X-ray.

**Radiologist:** A doctor who specialises in X-rays and other types of medical images.

**Radiographer:** A healthcare professional who specialises in X-rays and other types of medical images.

**Nuclear Medicine Technician:** A healthcare professional who specialises in undertaking Nuclear Medicine Scans.

**Radiation Protection Adviser and Medical Physics Expert:** A scientist who advises the hospital on the safest ways to use X-ray equipment.

**You:** It is important that you tell your doctor everything about your condition.

- Remind them if you have had a similar X-ray or scan in the past.
- Feel free to talk to any of the healthcare professionals involved, especially if something is happening that you were not expecting. For example, if you thought the X-ray was going to be of your left foot, but you have been asked to remove your right shoe.
- If you are a female between 12 and 55 years of age, depending on the area of your body that we are going to image, we may ask you about the possibility of you being pregnant. We understand that this can be an embarrassing question, but it is the law that we must do this.

## Why do we have to think about medical radiation safety?

Medical radiation mostly passes through the body to allow us to take the picture of what is inside your body to see what is wrong with you. Sometimes the radiation causes changes to the cells in our body. In almost all cases, these changes are repaired naturally by the body. Very rarely the repair doesn't work properly and the cell starts to misbehave. Over a long time (many years, or even decades) this misbehaving cell can lead to a cancer forming. It is completely random but the chances of this happening because of medical radiation are very small. To help you think about this, the natural chance for developing cancer is 1 in 2. The additional risk from having a chest x-ray examination is one in a

million. We have no way of knowing when a repair might go wrong so to reduce the chances even further, we only use medical radiation when it is necessary and we use the smallest amount possible.

Because the changes caused by radiation can take so long to show up, older people have an even smaller risk than younger people. That is why the healthcare professional taking the images will ask patients if they might be pregnant and why extra care is taken when using medical radiation on children.

For more information, please visit <https://www.rcr.ac.uk/posts/new-patient-information-posters-benefits-and-risks-imaging>

