

Medical Imaging and Radiation

Adult and Child/Young Person | Informed consent: patient information

What is radiation?

Radiation is a general term for energy that can travel through the environment. Radiation we come across in our daily lives includes visible light, ultraviolet light (which can cause sunburn), microwaves and radio waves.

Ionising radiation is higher energy radiation that can interact with the material it is travelling through, for example the human body. Background ionising radiation comes from the sun, soil, buildings, food, water, the air we breathe and even our own bodies. This natural background radiation surrounds us every day.

What is medical radiation?

Ionising radiation has two very different uses in medicine.

- **Radiation therapy:** high levels of radiation are used to kill cancer cells, for example breast or prostate cancer.
- **Medical imaging:** lower levels of radiation are used to image structures and processes inside the body.

What are the different types of medical imaging scans?

Medical imaging procedures are grouped by the type of technology we use to create the images. These include:

- **X-ray:** uses x-rays to produce images of the inside of the body. X-ray procedures use very low amounts of radiation.
- **OPG (Orthopantomogram):** uses x-rays to take an image of the teeth and jaw. This procedure uses a very low amount of radiation.
- **CT (Computed Tomography):** uses a series of x-rays taken from different angles around the patient to create a series of images (slices) through the body. CT scans use higher amounts of radiation than x-ray procedures.
- **Fluoroscopy:** uses a series of x-rays to create moving images the biochemical function of an organ or tissue, sometimes during operating theatre procedures. The amount of radiation in these procedures is variable and can be very low or similar to CT.
- **Nuclear medicine and PET (Positron Emission Tomography):** use a radioactive tracer (source of radiation) which can be injected, swallowed or inhaled to create images of the biochemical function of your body. Total radiation is similar to CT, however unlike CT the radiation is delivered inside the body. This means the body will be a source of radiation for a short amount of time. The time your body will be a source of radiation depends on the type of scan and radioisotope. Staff will advise if any precautions need to be taken after the scan.



Image 1: A patient lies down, awaiting an X-ray, while a radiographer prepares the machine.

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Image 2: A patient stands with his mouth and jaw in an OPG machine.

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Image 3: A patient lies down, awaiting a CT scan, and receives instructions from a radiographer.

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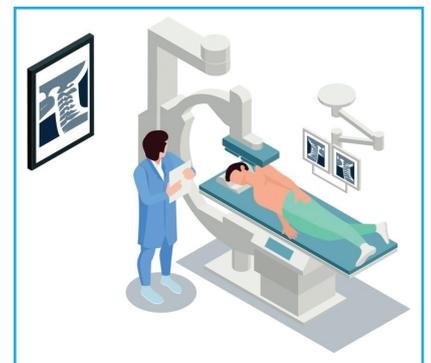


Image 4: A patient lies on a fluoroscopy machine awaiting a scan, and receives instructions from a radiographer.

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- **Mammography:** uses x-rays to specifically image breast tissue. The radiation dose is similar to x-rays.
- **BMD (Bone Mineral Densitometry):** uses very low energy x-rays to determine bone composition. BMD uses very low levels of radiation, even lower than x-rays.

Magnetic Resonance Imaging (MRI) and Ultrasound (US) are also used in medical imaging but do not use ionising radiation and therefore do not have the same risks.

What is the radiation exposure from medical imaging?

The radiation exposure from medical imaging procedures can be compared with the amount of natural background radiation we all receive, just by living in Australia. The table below shows the radiation exposure and equivalent background radiation time associated with common imaging techniques, as well as some everyday items/events associated with radiation exposure.

Event	Radiation exposure (measured in mSv)	Equivalent natural background radiation time
Eating a Brazil nut (30 grams)	0.001	5 hours
Having a dental x-ray	0.01	2 days
Having a chest x-ray	0.05	4 days
Taking a 20 hour plane flight	0.1	22 days
Living in Australia for a year (natural background radiation)	1.7	1 year
Having a CT scan of the abdomen	10	6 years

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Ionising radiation in our everyday environment www.arpansa.gov.au

What are the risks of medical radiation to me?

Radiation exposure may cause a slight increase in the risk of cancer to you over your lifetime. The risks of radiation exposure need to be compared to the risks of your condition not being treated.

Despite the low risk, all medical imaging procedures are designed to keep the amount of radiation to patients as low as possible. In recommending a medical imaging procedure, the referring clinician believes the benefits to the patient from having this procedure exceed the small radiation risk involved. There is **no radiation exposure limit for patients** as all medical imaging is justified for the individual if there is a benefit to you.

Radiation and children

Medical imaging procedures involving radiation are only performed on children when there is no alternative option. This is because children are more sensitive to medical radiation as their bodies are growing at a faster rate than adults. One of the risks associated with medical radiation is it can disrupt the healthy cells of a growing child, which can increase their lifetime cancer risk. Risks vary depending on the age and size of the child as well as the part of the body and imaging modality used.



Image 5: A doctor discusses medical imaging results with a patient and parent/adult. ID: 2253234565. www.shutterstock.com

For this reason, the benefit of the procedure must always outweigh the risks.

Medical Imaging department staff will make every effort to keep the amount of radiation as low as possible.

Please note: the increased lifetime cancer risk in children from medical radiation is **very low** compared to the risk of cancer from other causes.

Radiation and pregnancy

It is important to tell Medical Imaging department staff if you think there is any chance you could be pregnant. This is because an unborn child is more sensitive to medical radiation than an adult. In recommending a procedure involving radiation during your pregnancy, your doctor has determined that the risks of not having the radiation exposure outweigh the risks to you and your unborn baby. Your doctor/clinician should give you personalised information about the risk to you and your unborn baby.

For more information on this please read the information sheet *Ionising Radiation During Pregnancy*. If you do not have one of these information sheets, please ask for one.



Image 6: A pregnant patient holds an x-ray image of a chest.
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Some questions you might like to ask your doctor

Questions you may like to ask the referring doctor include:

- Why is the scan needed?
- What questions will be answered by having this scan?
- What alternative procedures are there, if any, that do not involve ionising radiation that could also answer these questions?