



A lifetime of specialist care

Information about radiation for patients undergoing scans

What is a nuclear medicine scan?

This is a way of using radiation to produce pictures. Instead of using an X-ray machine, a small amount of radioactive material (isotope) is injected into a vein (occasionally it is swallowed or inhaled).

The radioactive material concentrates in a particular organ or tissue, for example in the heart for a heart scan. It emits gamma rays, which are a type of radiation that behaves like X-rays. A special camera detects the gamma rays coming out of your body and builds up a picture of what is happening inside you.

The radioactivity in your body falls to insignificant levels in a few days.

Don't forget the benefits

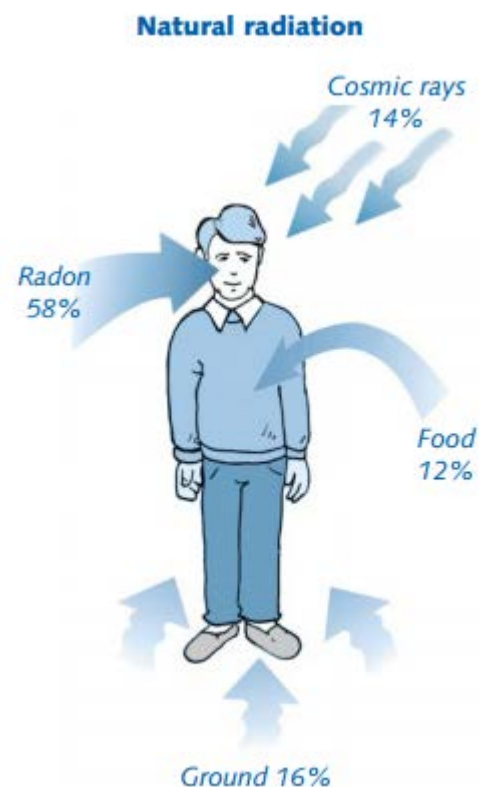
Many methods of medical imaging can bring very real benefits to patients. The overriding concern of your doctor and the nuclear medicine department is to ensure that when radiation is used, the benefits from making the right diagnosis, and consequently giving you the right treatment, outweigh any small risk involved. If, after reading this leaflet, you are still concerned about the possible risks from having an examination, ask your doctor how the information gained will help to improve your treatment. If treatment decisions depend on the findings, then the risk to your health from not having the examination is likely to be much greater than that from the radiation itself.

Radiation doses in perspective

We are all exposed to natural background radiation every day of our lives. This comes from the ground and building materials around us, the air we breathe, the food we eat and even from outer space (cosmic rays). In most of the UK the largest contribution is from radon gas which seeps out of the ground and accumulates in our houses.

Each medical X-ray or nuclear medicine examination gives us a small additional dose on top of this natural background radiation. The level of dose varies with the type of examination, ranging from the equivalent of a few days of natural background radiation to a few years, as shown in the table below.

The most common X-ray examinations are those of the teeth, the



chest and the limbs. These involve exceedingly small doses that are equivalent to only a few days of natural background radiation.

Examinations involving fluoroscopy, CT scans of the body or nuclear medicine scans tend to involve slightly higher doses. Even these represent only a fraction of our lifetime dose from natural radiation.

What are the effects of radiation?

The radiation doses used for X-ray examinations or nuclear medicine scans are many thousands of times too low to produce immediate harmful effects, such as skin burns or radiation sickness. The only effect on the patient that is known to be possible at these low doses is a very slight increase in the chance of cancer occurring many years or even decades after the exposure.

Approximate estimates of the chance or risk that a particular examination or scan might result in a radiation-induced cancer later in the lifetime of the patient are shown in the last column of the table.

Broad levels of risk for common X-ray and nuclear medicine scans

X-ray or nuclear medicine scan	Equivalent period of natural background radiation	Lifetime additional risk of cancer per examination*
Chest	A few days	NEGLIGIBLE RISK Less than 1 in 1,000,000
Skull	A few weeks	MINIMAL RISK 1 in 1,000,000 to 1 in 100,000
Pelvis CT scan of head Kidney scan (nuclear medicine)	A few months to a year	VERY LOW RISK 1 in 100,000 to 1 in 10,000
CT scan of chest CT scan of abdomen Heart scan (nuclear medicine) Lung ventilation perfusion scan (nuclear medicine) Bone scan (nuclear medicine)	A few years	LOW RISK 1 in 10,000 to 1 in 1,000
*These risk levels represent very small additions to the 1 in 3 chance we all have of getting cancer		

Radiation risks in perspective

Just about everything we do in our daily lives carries some level of risk. We tend to regard activities as being “safe” when the risk of something unpleasant happening falls below a certain level.

The lower the level of risk, the ‘safer’ the activity becomes. For example, most people would regard activities involving a risk of below 1 in 1,000,000 as exceedingly safe.

The radiation risks for simple X-ray examinations of the chest can be seen to fall into this negligible risk category (less than 1 in 1,000,000 risk). More complicated examinations carry a minimal to low risk.

Examinations such as nuclear medicine heart scans (myocardial perfusion studies) fall into the low risk category (1 in 10,000 to 1 in 1,000 risk). As we all have a 1 in 3 chance of getting cancer even if we never have exposure to radiation, these examinations still represent a very small addition to this underlying cancer risk from all causes.

The benefits from any X-ray examination or nuclear medicine scan should outweigh these small radiation risks.

Radiation risks for older and younger patients

Radiation risks for older people are lower than those shown in the table on page 2. This is because there is less time for a radiation-induced cancer to develop, so the chances of it happening are greatly reduced.

Children, however, with most of their life still ahead of them, may have higher risk from the same X-ray or nuclear medicine examination. Particular attention is paid to ensuring that there is a clear medical benefit for every child who is exposed to medical radiation. The radiation dose is kept as low as possible without detracting from the information the examination can provide.

A baby in the womb may also be more sensitive to radiation than an adult, so we are particularly careful about X-rays and nuclear medicine studies during pregnancy. Special precautions are required for examinations where the womb is in, or near, the beam of radiation, or for nuclear medicine scans where the radioactive material could reach the baby through the mother’s circulating blood.

Also if you are breastfeeding, small amounts of radioactivity could be transferred to the feeding child.

If you are about to have such a nuclear medicine examination and are a woman of childbearing age, the radiographer or doctor will ask you if there is any chance of you being pregnant.



Airline flights are very safe with the risk of a crash being well below 1 in 1,000,000. Incidentally, a four hour flight exposes you to the same radiation dose (from cosmic rays) as a chest X-ray



If this is a possibility, your case will be discussed with the doctors looking after you to decide whether or not to recommend postponing the investigation. There will be occasions when diagnosing and treating your illness is essential for your health and your unborn child. When this health benefit clearly outweighs the small radiation risks, the scan may go ahead after discussing all the options with you.

Similarly if you are a woman of childbearing age, the radiographer or doctor will ask you if you are breastfeeding and will discuss any feeding restrictions with you before your scan.

Important points to remember

- Every effort is made to keep radiation doses as low as possible in order to give the doctor the information required.
- The radiation doses from X-ray examinations or nuclear medicine scans are small in relation to those we receive from natural background radiation, ranging from the equivalent of a few days' worth to a few years.
- The health risks from these doses are very small in relation to the underlying risks of cancer, but are not entirely negligible for some procedures.
- **You should make your doctor aware of any other recent X-rays or scans you may have had, in case they make further examinations unnecessary.**
- The risks are much lower for older people and a little higher for children and unborn babies, so extra care is taken with young, pregnant and breastfeeding patients. **You should make your doctor aware if you are possibly or definitely pregnant or breastfeeding.**
- If you are concerned about the possible risks from an investigation using radiation, you can ask your radiographer or doctor for further information.