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Benefits and risks of having examinations or procedures that use X-rays

Department of Radiology

Information for Patients

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Introduction

This leaflet tells you about the benefits and risks of having examinations or procedures that use X-rays.

X-rays are a type of radiation used to see what is going on inside your body.

They are many types of examinations or procedures that use X-rays. These include:

- ordinary X-rays like the ones you have at the dentist or to look for broken bones.
- CT scans.
- special screening procedures and treatments called fluoroscopy.

What are the benefits of using X-rays?

X-ray examinations are a quick way to find out what is happening inside your body. It allows us to see your bones, organs or blood vessels. The X-ray pictures are looked at by trained health care professionals, doctors and consultants. They can help find a cause for your medical problem, or rule out a serious problem. The results will help us to provide the care and treatment that you may need.

X-rays can also be used to guide doctors during certain medical procedures. In the past some of these procedures would have needed surgery, or would not have been possible at all.

You cannot see X-rays and you will not feel them during an X-ray examination.

What are the risks from X-rays?

The main risk from having X-rays is an increase in the risk of getting a cancer in the future. This risk is thought to be very small.

In the general population around half (50%) of people will get cancer at some point in their lifetime. The additional risk from having an X-ray is between 1 in a million (0.0001%) for low dose examinations, and 1 in a thousand (0.1%) for higher dose examinations.

Examples of low dose examinations include X-rays of the chest, arms and legs. Examples of higher dose examinations include CT scans of the chest or stomach (abdomen).

The risks from X-rays are a little higher for babies and children than they are for adults. This is because children are still growing and developing and have a long life ahead of them. Extra care is taken with young patients to keep the amount of X-rays they receive as low as possible.

By training our staff and looking after equipment, we work to keep this risk as small as possible.

If you have any worries or concerns you can ask the person who referred you for the X-ray, or you can talk to hospital staff.

Natural background radiation

Many things can affect our risk of getting a cancer. This includes our family history, what we eat and the natural background radiation where we live.

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 breath, the food we eat, and even from outer space.

Each X-ray examination gives us a small extra dose on top of this natural background radiation. We can compare the radiation dose from different X-ray examinations with the amount of natural background radiation:

- **Low dose X-ray examinations** give you a radiation dose about the same as only a few days of natural background radiation. This includes X-rays of the teeth, chest and limbs.
- **Higher dose X-ray examinations** give you a radiation dose about the same as a few months or a few years of natural background radiation. This includes examinations involving many X-ray pictures, a fluoroscopy and CT scans. However even these examinations represent only a fraction of our lifetime dose from natural radiation.

Do the benefits of an X-ray examination outweigh the risks?

X-ray examinations are ‘prescribed’ by doctors and specially trained healthcare professionals in much the same way that medicines are prescribed by your GP. This means that only people who have had training can prescribe an X-ray examination. This helps to protect you from having X-rays you do not need.

X-ray examinations are prescribed when they are needed to help decide if and how your medical problem should be treated. You should only be prescribed an X-ray examination if the benefits of having it outweigh the risks of not having that examination.

If your medical problem can be diagnosed and treated without an X-ray, then there may be no benefit in having it.

If an X-ray examination is needed to help your doctor decide on the best treatment, the benefits are likely to outweigh any potential risk. The risks from not having the examination could be greater. We will keep the amount of X-rays you receive as low possible.

Radiation risks for an unborn baby

The risks from radiation are slightly higher for an unborn baby. Because of this we need to be very careful about use of X-rays during pregnancy or when a patient may be pregnant.

If you are having an X-ray examination near the womb, the person taking the X-ray may need to ask you about your menstrual periods and if there is any chance that you may be pregnant.

If you are pregnant or if there is any chance that you could be pregnant, your case will be discussed with the doctor looking after you:

- **If the examination is needed urgently** so you can have treatment essential for your health, and the health of your unborn child, the doctor may decide that the benefits from having the examination outweigh the risks.
- **If the examination is not needed urgently** the doctor may decide to delay it until later in your pregnancy, or until after you have given birth.

For X-ray examinations away from the womb, such as of the head, chest, arms and lower legs the radiation does not go near the womb, so the risks to an unborn baby are lower.

Sometimes there may be other options for tests which can be done to diagnose your illness. The decision on which test is safest to do may depend on how many weeks pregnant you are. If the health benefit to you clearly outweighs a small radiation risk to your baby, the X-ray examination may go ahead after all other options have been discussed with you.

How much more is my risk of getting cancer if I have an X-ray examination?

The most common X-ray examinations are those of the teeth, chest and limbs. These give very small doses of radiation. Examinations that take many X-ray pictures, a fluoroscopy (e.g. complex X-ray treatments) or CT scans of the body, give higher doses.

In the general population, around half of people will get cancer at some point in their lifetime. This means our risk of getting a cancer is about 50%.

The table on the next page shows the lifetime extra risk of getting a cancer from common diagnostic X-rays.

Typical doses for adults from common diagnostic X-rays:

Type of X-ray examination	Equivalent time of average natural background radiation	Lifetime extra risk of getting a cancer	
CT scan of the body	A few years	0.1%	Low
CT scan of the head	A few months to a year	0.1%	Low
Pelvis X-ray	A few months to a year	0.01%	Very low
Lumbar spine X-ray	A few months to a year	0.01%	Very low
Abdomen X-ray	A few months to a year	0.01%	Very low
Chest X-ray	A few days	Less than 0.0001%	Negligible
Arms or legs X-ray	A few days	Less than 0.0001%	Negligible
Hands and feet X-ray	A few days	Less than 0.0001%	Negligible

References and further information

- International Atomic Energy Agency (IAEA) - What patients need to know, 2020
  https://www.iaea.org/resources/rpop/patients-and-public/children
- Public Health England (PHE) - Ionising radiation: how we are exposed to it, 2008
  https://www.gov.uk/government/publications/ionising-radiation-how-we-are-exposed-to-it
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- World Healh Organization (WHO) - Communicating radiation risks in paediatric imaging, 2016
  https://www.who.int/ionizing_radiation/pub_meet/radiation-risks-paediatric-imaging/en/

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