

How much radiation is used?

The amount of radiation from X-ray guided interventions is usually higher than for traditional radiography (e.g. chest X-ray), depending on the quality of the image needed, the child's size, and the time needed to perform the procedure. The goal is always to deliver the minimum amount of radiation safely and accurately, to obtain images for the desired purpose. There are many ways to reduce dose in pediatric interventions.

Potential harm from X-ray guided interventions includes procedure-related risks from the intervention, which are usually much greater than the radiation risks. The benefit of a justified intervention is greater than all of the risks.

Paediatric procedure	Equivalent period of exposure to natural radiation	Increase in the risk of cancer in future
CT fluoroscopy-guided bone biopsy	1.5 year	Very low (much less than 1%)
Fluoroscopy-guided cardiac interventions	Median 2.5 years (range 5 months to 15 years, depending on the type of intervention)	Low (less than 1%)

When these exams are needed, their benefit is very high, and much greater than the risks

What questions might we ask?

- ✓ **IS THIS INTERVENTION NEEDED? IS IT NEEDED NOW?**
- ✓ **WHAT ARE THE RISKS OF THIS PROCEDURE? HOW CAN THEY BE MINIMIZED?**
- ✓ **HOW WILL THIS PROCEDURE HELP? WHAT ARE THE RISKS OF NOT HAVING IT?**
- ✓ **IS THERE A SUBSTITUTE PROCEDURE AVAILABLE?**
- ✓ **WILL YOU DO THE PROCEDURE BASED ON MY CHILD'S SIZE AND AGE?**
- ✓ **ARE THERE ANY PRECAUTIONS TO TAKE BEFORE OR AFTER THE PROCEDURE?**

Fluoroscopy and CT are extremely useful procedures that allow for the study of organs and sometimes other structures inside the body, and the proper placement of medical devices. When the X-ray guided intervention is needed, it provides far more benefit than any potential for harm.

Additional Resources



This leaflet was developed as a complementary tool to the WHO report [Communicating Radiation Risks in Paediatric Imaging](#), where you can find more detailed information.

Further useful information is available at Image Gently <http://www.imagegentlyparents.org>

X-RAY-GUIDED INTERVENTIONS IN CHILDREN



What do we need to know?



World Health Organization

Medical imaging for children

Medical imaging is often necessary and is essential in diagnosis and treatment of pediatric illness and injury. In some cases, an imaging exam that depends on ionizing radiation, such as a fluoroscopy exam, is the best option for the medical care of a child. Ensuring that an imaging exam will do more good than harm is called “**justification**” and delivering the minimum amount of radiation needed to achieve the desired clinical purpose is called “**optimization**”: both are part of responsible and ethical medical practice.

How much do you know about radiation?

Radiation is energy that travels in the form of waves or particles. Radiation is part of our everyday environment. People are exposed to cosmic radiation from outer space, as well as to natural radioactive materials found in the soil, water, food, air and also in the body. The use of radiation in medicine is the largest artificial source of radiation exposure today.

An important fact about radiation

There are two types of radiation: **ionizing** and **non-ionizing radiation**.

Ionizing radiation can remove electrons from atoms. Medical and dental conventional radiography, computed tomography (CT), nuclear medicine and fluoroscopy are examples of exams that use **ionizing radiation**.

In contrast, **non-ionizing radiation** can make atoms vibrate, but does not have enough energy to remove electrons. Ultrasound and magnetic resonance imaging (MRI) are examples of exams that use **non-ionizing radiation**.

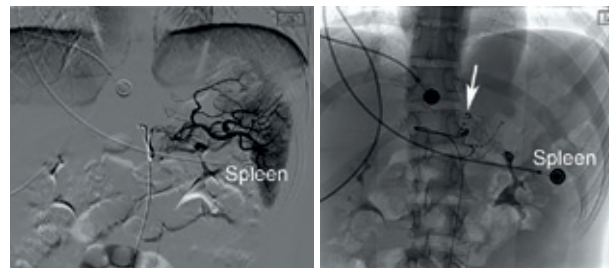
Depending on the specific procedure, ultrasound, fluoroscopy, CT or MRI may be used for performing image-guided interventional procedures in children.

X-ray guided interventions can save children’s lives

A boy born with an abnormal heart had surgery at age 3, but the surgery could not repair all of the abnormalities. He developed heart failure after surgery. A fluoroscopy-guided interventional procedure was performed to close an abnormal blood vessel. The patient was able to go home a week later.

X-ray guided interventions in children can avoid major surgery

A 17-year-old boy was injured in a car accident. A CT scan in the emergency department showed an injury to the spleen causing life-threatening bleeding. The interventional radiologist placed blocking material (“coils”) through a temporary catheter into the artery to the spleen, and the bleeding was stopped. Spleen function was preserved. If the interventional procedure had not been performed, he would have needed surgery to remove his spleen.



During the fluoroscopy-guided intervention, X-ray dye (i.e. “contrast”) was injected through the artery into the spleen (left), to help identify the bleeding. After coil placement (right) the bleeding was stopped. The small coils are barely visible (arrow).

X-ray guided interventions in children

Today, many pediatric conditions that in the past would have required surgery can be diagnosed and treated by less invasive procedures with lower risks and quicker recovery time compared to surgery. Pediatric X-ray guided interventional procedures may require sedation or general anesthesia, depending on the patient’s age and type of procedure. X-ray guided interventions are used in children for a variety of procedures, including performing biopsies, placing tubes, performing fluid drainage, inserting catheters in arteries and veins and treating a number of pediatric conditions such as heart problems, blood clots, tumors, trauma, liver illness and kidney diseases. These interventions may be guided by ultrasound, fluoroscopy, CT or MRI, at almost any location in the body.

Fluoroscopy is like a video that uses X-ray pulses to show organ motion within the body. Fluoroscopy shows in real-time liquid X-ray dyes (i.e. “contrast”) passing through different organs and/or objects moving within the body.

CT scans provide cross-sectional (2D) and 3D images showing organs and internal details which may not be seen with fluoroscopy.

Complex interventions may be lengthy and may result in relatively high radiation doses. Patients and family members should seek advice from health care professionals especially regarding signs of possible adverse effects which may require a follow-up consultation.