X-RAY-GUIDED INTERVENTIONS IN CHILDREN

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. 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.

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.

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

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.

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.

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.

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 and also in 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.

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