



## CT Scans for Children: Information for Referrers

In Australia there are now over 80 000<sup>1</sup> computed tomography (CT) scans performed on children and young people under the age of 20 every year. CT is a valuable investigative technique because it provides a low risk, non-invasive, fast and accurate method of diagnosing serious injury and illness. However, all these benefits come with an increased exposure to ionising radiation which has been linked to an increased risk of cancer.

### What is a CT scan?

CT scans are X-ray procedures where multiple images are rapidly taken and compiled into complete cross-sectional 'slices' of soft tissue, bone and blood vessels. CT scans can show parts of the body that are obscured by other tissues on a standard X-ray image. Therefore, CT scans often result in earlier diagnosis and more successful treatment of many diseases such as intracranial injury and cancer.

These benefits come at the cost of a small additional cancer risk. For example a single chest X-ray exposes a patient to around 0.02 mSv which is equivalent to approximately five days of natural background radiation<sup>2</sup>; whereas a head CT delivers approximately 2 mSv which is equivalent to more than one year of natural background radiation. The table below further illustrates differences in dose levels.

Ultrasound and MRI do not involve any ionising radiation, but may involve other risks and may not be appropriate for all patients or conditions.

### What are the risks associated with radiation exposure for children?

Radiation exposure is a concern in both adults and children because of an increased risk of cancer, however there are two unique considerations in children:

1. They are growing rapidly and more cells are dividing, providing a greater opportunity for radiation to disrupt cell development.
2. Children have a longer life expectancy, giving a longer time for the effects of any radiation damage, if present, to influence long term health.

### Typical radiation doses from various sources (for patients aged 0 – 10 years)

Source of Exposure	Effective dose (mSv)
Average dose to Australians from natural background radiation per year	1 – 2
Extremities X-ray	0.005 – 0.05
Chest X-ray (2 views)	0.03 – 0.08
Head CT	1.5 – 2.5
Chest CT	1 – 2.5
Abdomen CT	4 – 6
Ultrasound	0
Magnetic resonance imaging (MRI)	0

Recent studies indicate that the statistical risk of developing cancer from a CT scan is about one in a thousand, however our knowledge is still evolving about the extent of the risk. This risk varies with age, size of the child and the part of the body scanned.

## How can I minimise radiation exposure from CT scans in children?

Referrers should assess the use of CT on a case-by-case basis. Scans should be justified: the benefits of the procedures must outweigh the risks. In some cases this may require collaboration between doctors, parents and radiologists before referral.

## To help ensure that a CT scan is justified referrers can ask the following questions:

- **Have I taken a history, performed a physical examination and come to a provisional diagnosis?**
- **Is imaging required?**  
Will it: Change my diagnosis? Affect the patient's management? Do more harm than good?
- **Are the investigations needed now?**  
Avoid undertaking investigations too early. Sometimes clinicians order tests before the condition has progressed or before the results could influence treatment.
- **Am I duplicating recent tests?**  
Previous relevant images or reports may avoid repeating the investigation.
- **If imaging is indicated, what is the best option?**  
Imaging techniques undergo rapid change; it may be useful to discuss with a radiologist the alternatives available that minimise or do not use ionising radiation before ordering an imaging procedure.
- **Have I sought consent and adequately communicated the risks and benefits of the imaging procedure to my patients/parents, before ordering the investigation?**  
A companion Fact Sheet for Parents is located at CT Scans for Children [[www.arpansa.gov.au/RadiationProtection/Factsheets/is\\_CTScansForChildren.cfm](http://www.arpansa.gov.au/RadiationProtection/Factsheets/is_CTScansForChildren.cfm)].
- **If an imaging investigation is required, have I defined the clinical problem adequately on the request form?**  
The best patient outcomes occur when referrers provide appropriate information, allowing the imaging team to focus on the clinical problem and write a targeted report.

## Where can I find more information?

*Diagnostic Imaging Pathways* (DIP) is an Australian decision support tool that is available to help clinicians assess the indications for imaging, including CT. DIP is located at: [www.imagingpathways.health.wa.gov.au](http://www.imagingpathways.health.wa.gov.au)

*Inside Radiology* is an Australian information website for patients and referrers developed by the Royal Australian and New Zealand College of Radiologists. The information can be found at: [www.insideradiology.com.au](http://www.insideradiology.com.au)

The European Commission Directorate-General for the Environment has published, '*Referral Guidelines for Imaging*'. This comprehensive guide can be found at: [http://ec.europa.eu/energy/nuclear/radioprotection/publication/doc/118\\_en.pdf](http://ec.europa.eu/energy/nuclear/radioprotection/publication/doc/118_en.pdf)

The International Atomic Energy Agency has published comprehensive information to help health professionals achieve safer use of radiation in medicine for the benefit of patients: <https://rpop.iaea.org/RPoP/RPoP/Content/index.htm>

<sup>1</sup> Based on 2014 Medicare data and does not include patients imaged as public inpatients

<sup>2</sup> Natural background radiation is the term used to refer to the sources of ionising radiation that we are unavoidably exposed to in our daily lives that provides each of us with a continuous, small ionising radiation dose: [www.arpansa.gov.au/radiationprotection/basics/understand.cfm](http://www.arpansa.gov.au/radiationprotection/basics/understand.cfm).