

# How much radiation is used in Nuclear Medicine?

The amount of radiation in NM exams depends on the type of exam, and the size of the child. Most of the common NM exams in children deliver very low radiation doses. The length of time it takes the radioactivity used in a NM exam to disappear from the body depends on the type of radioactive tracer used in the exam. Radiation from the child is not a risk for others, but family members can seek advice from health professionals, if they are concerned.



Paediatric NM exam	Equivalent period of exposure to natural radiation	Increase in the risk of cancer in the future
NM cystogram (bladder exam)	1 month	Minimal (very much less than 1%)
NM bone scan	2.5 years	Very low (much less than 1%)
PET-CT exam	6 years	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 NM EXAM NEEDED?
- ✓ HOW WILL THIS NM EXAM HELP MY CHILD?
- ✓ WHAT ARE THE RISKS OF NOT HAVING THIS NM EXAM?
- ✓ HOW WILL THIS NM EXAM TEST BE DONE?
- ✓ WHAT ARE THE POTENTIAL RISKS FOR MY CHILD DURING AND AFTER THIS NM EXAM?
- ✓ ARE THERE RISKS FROM THE RADIOACTIVE TRACER FOR FAMILY MEMBERS? ANY PRECAUTIONS WE SHOULD TAKE?
- ✓ HOW DOES THE IMAGING FACILITY DECIDE THE RIGHT AMOUNT OF RADIOACTIVITY FOR MY CHILD?

When NM exams are necessary and an appropriate dose is used, they provide far more benefit than potential harm.

There are many ways to be sure the amount of radioactivity is right.

The risk of not having necessary NM exams is much greater than the radiation risk.

## 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>

# NUCLEAR MEDICINE (NM) EXAMS IN CHILDREN



# What do we need to know?



World Health Organization

## Nuclear Medicine exams for children

We should be sure that an imaging test will do more good than harm (doctors call this “**justification**”). It is important to deliver the smallest amount of radiation needed to obtain images for the desired purpose (doctors call this “**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**.

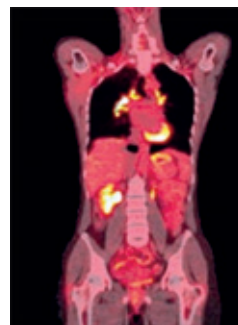
## Nuclear Medicine exams use ionizing radiation

## What are nuclear medicine exams?

These exams are called “nuclear” simply because of the type of substance used in them.

### Nuclear medicine (NM)

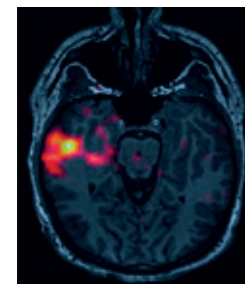
exams look at how parts of the body work using small amounts of a radioactive tracer, usually in a vein (through an IV). Pediatric NM provides information that is not available from other imaging exams. Once the tracer is given, pictures are taken with a special camera that show tracer distribution in the body.



A **single-photon emission computed tomography (SPECT)** is a NM exam that uses another special camera to create **3-dimensional** pictures of the body.

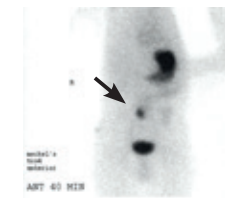
### Positron emission tomography (PET)

is a NM exam that looks for areas of abnormal activity. NM exams can be combined with other exams and this is called “**hybrid**” imaging. For example SPECT and PET can be combined with computed tomography (CT) or magnetic resonance imaging (MRI).



## Nuclear medicine exams are useful in pediatrics

This child had abdominal pain and bleeding from the bowel. Using only a small amount of a radioactive tracer, the NM exam showed a bowel condition which some children are born with called Meckel's diverticulum.



The NM exam and surgery led to complete recovery.

*This NM scan shows abnormal accumulation of the radiotracer in the bowel (see arrow)*

## Pediatric Nuclear Medicine exams save lives

NM is a safe and non-surgical imaging modality. Hydrocephalus is a very serious condition in which cerebrospinal fluid (CSF) — the clear, watery fluid that surrounds and cushions the brain and spinal cord — can't drain well from the brain. This causes fluid to collect and pressure on the brain. If it's not treated, hydrocephalus can cause brain damage. A “shunt procedure” is when a thin, flexible tube is placed from the brain to the abdomen to drain the buildup of fluid on the brain (Fig 1). Following a head injury, an 8-year-old boy needed a shunt procedure. A NM exam showed that the shunt was draining properly. The radioactive tracer (dark blue in the abdomen) allowed physicians to follow the normal function of the path of CSF away from the brain (Fig 2).

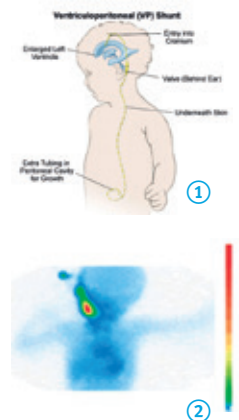


Fig. 1: tube placed from the brain to the abdomen

Fig. 2: image of the shunt obtained by a NM exam