

Pediatric Nuclear Medicine

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What is Pediatric Nuclear Medicine?

Nuclear medicine is a subspecialty within radiology that utilizes radioactive substances to create images of body anatomy and function. The images are developed based on the detection of energy emitted from the radioactive substance given to the patient. Pediatric nuclear medicine refers to these types of examinations in babies, young children and teenagers.

What are some common uses of Pediatric Nuclear Medicine?

Pediatric nuclear medicine is used in the diagnostic workup of many childhood disorders that are congenital (present at birth) or acquired later. It helps in the evaluation of different organ systems, including the kidneys, liver, heart, lungs and bones. Examples of how nuclear medicine may be used in children include the diagnosis of urinary blockage in the kidney, infections and trauma in the bones, gastrointestinal bleeding, and various tumors and their sites of spread in the body.

How should my child be prepared for a Pediatric Nuclear Medicine procedure?

Most studies will involve an intravenous injection. Parents or legal guardians are urged to speak with their child, depending on the child's age, before the procedure and tell them they will be getting a "shot." For infants and toddlers, if sedation is anticipated, such as for a bone scan, instructions for your child regarding eating and drinking will be given at the time the appointment is made. Also, reassure your child that you will be able to be in the room with them during the procedure (except in case of pregnancy).

If the procedure involves examination of the stomach, your child will have to fast for a certain period of time before the test. If the procedure involves examination of the kidneys, your child should drink plenty of water before the test.

What does the Pediatric Nuclear Medicine equipment look like?

During most nuclear medicine examinations, the child lies on a scanning table. The gamma camera is enclosed in a metallic housing designed to facilitate imaging of specific parts of the body. The camera is usually beneath the table, out of view. Sometimes, when it is placed over the table it can look like a large round metallic apparatus suspended from a tall, moveable post, or a sleek one-piece metal arm that hangs over the examination table. The camera can also be located within a large, doughnut-shaped scanner similar in appearance to a computed tomography (CT) scanner.

A nearby computer console, usually in the same room, develops the images from the data obtained by the camera.



Nuclear scan of child in progress.

How does the Pediatric Nuclear Medicine procedure work?

With regular x-rays, an image of the body is made by applying radiation to the body part from the outside by an x-ray machine. However, with nuclear medicine, a radioactive substance, called a "radiopharmaceutical" or "radiotracer," is introduced into the body, usually intravenously or sometimes orally. This radiotracer localizes in a certain body part(s), which gives off

gamma rays that are then detected by a gamma camera. The gamma camera works in conjunction with a computer to develop an image. The type of radiotracer used depends on the specific body part being studied. The amount given is determined according to the child's body weight. Depending on the type of scan, it may take several seconds to several days for the substance to travel through the body and accumulate in the organs under study; thus, a wide range in scanning times is possible. The most commonly used radiopharmaceutical loses its radioactivity generally over 24 hours. It passes out of the body in the urine or stool.

How is Pediatric Nuclear Medicine performed?

The child is taken into the scanning room by a nuclear medicine technologist. Next, the child is positioned on the scanning table. Then, a radiopharmaceutical is administered by injection into a vein. Depending on which type of scan is being performed, the imaging will be done either immediately or a few hours or even two days after the injection. Scanning time varies, generally from 20 to 45 minutes.

The gamma camera moves slowly along or around the child to obtain images of the part of the body being examined. Sometimes sequential images are obtained to show how an organ functions over time—for example, the kidneys.

Immediately after the procedure, a physician with specialized training in nuclear medicine—a nuclear medicine physician—checks the quality of the images to ensure that an optimal diagnostic study has been performed.

The same procedure will be followed if the radiopharmaceutical is given orally.

What will my child experience during the Pediatric Nuclear Medicine procedure?

Some discomfort during a nuclear medicine procedure may arise from the intravenous injection, which is usually done with a small needle. With some exams, a catheter may be placed into the bladder, which may cause some temporary discomfort. Lying still on the examining table may be unpleasant for some patients.

Unfortunately, many children fear any visit to a medical center. This fear is sometimes made worse when they see strange machinery and do not understand how it works. Most healthcare personnel who deal extensively with children know how to calm a child's fears. Many imaging suites have

videotapes or toys on hand to help a child pass the time. Often, a child can bring a favorite toy to the examination room. Parents are encouraged to stay with the child to help calm the child and decrease the child's motion during imaging.

Sedation may be needed in children younger than 4 years of age for specific studies that take 30 to 45 minutes to complete or for which body motion may severely degrade the images. The sedation is usually oral, however may be intravenous, depending on the child's weight. Unless the child has been sedated, daily activities can be resumed after the nuclear medicine examination.

Who interprets the results of Pediatric Nuclear Medicine and how do we get them?

Most children undergo a nuclear medicine examination because a referring physician, often the primary care physician, has recommended it. The nuclear medicine physician will interpret the images and forward a report to the referring physician. It usually takes one to three days to interpret, report and deliver the results.

What are the benefits vs. risks of Pediatric Nuclear Medicine?

- The functional information provided by nuclear medicine examinations is unique and currently unattainable by using other imaging procedures. For certain diseases, nuclear medicine studies yield the most useful information needed to make a diagnosis.
- Pediatric nuclear medicine procedures will result in exposure of the child to a small dose of radiation. However, the doses of radiopharmaceutical administered are the smallest needed to perform the examination. Nuclear medicine has been used in newborns and children for more than three decades, and there are no known long-term adverse effects from such low-dose studies.
- Allergic reactions to the radiopharmaceutical may occur, but are extremely rare.

What are the limitations of Pediatric Nuclear Medicine?

Nuclear medicine procedures can be time-consuming. They involve administering a radiotracer, waiting for it to settle in the body part, and then obtaining the images. In some studies, imaging times may be lengthy,

requiring sedation for young patients. However, new gamma cameras have been introduced that can cut down imaging time.

The resolution of structures of the body with nuclear medicine may not be as clear as with other imaging techniques, such as CT or MRI. However, the functional information gained from nuclear medicine is unequalled in other imaging techniques.