



Paediatric imaging in the Netherlands

An interview with Rick R. van Rijn, paediatric radiologist at the Emma Children's Hospital – AMC Amsterdam.

European Society of Radiology: What is paediatric imaging? What age are the patients, and how is it different from regular imaging?

Rick van Rijn: Paediatric radiology is that part of radiology that deals with patients under the age of 18 years. The differences are reflected by a change in disease pattern during the development of a child. Abdominal pain in a premature neonate has a significantly different differential diagnosis compared to an adolescent. Also, patient approach changes with the developmental stage of the child. As paediatric radiology is very much a hands-on specialty, paediatric radiologists have a lot of patient contact. This makes them visible in daily clinical routine and as a result they are recognised by the children and parents as doctors who are part of the treating medical team. Finally, the paediatric radiologist is involved in nearly all aspects of paediatrics; in contrast to other subspecialties, most paediatric radiologists will cover all organ systems from head to toe. This makes paediatric radiology a diverse, interesting, in fact and of course in my opinion, the most interesting field of radiology.

ESR: Since when has paediatric imaging been a specialty in its own right?

RvR: The Dutch Radiological Society was founded in Rotterdam on April 14, 1901. At that time, there was no specific attention to paediatric radiology. The first true paediatric radiologist started working in the Juliana Children's Hospital, The Hague, in 1967. Other paediatric radiologists soon started working in the Sophia Children's Hospital, Rotterdam, Wilhelmina Children's Hospital, Utrecht, and the Emma Children's Hospital, Amsterdam. The first official meeting of the paediatric subcommittee of the Dutch Radiological Society was held on November 27, 1973. With this meeting the first subspecialty committee of our national society was created. With the introduction of a new radiological curriculum in 2007, specific paediatric radiology fellowships became available in the Netherlands. This is in keeping with the European Training Curriculum for Radiology from the European Society of Radiology.

However, as in most countries around the world, most imaging studies in children are performed by general radiologists in non-paediatric hospitals. As paediatric radiologists, we therefore feel that more attention should be given to paediatric radiology in the general radiological curriculum.

ESR: Which imaging modalities are usually used to examine paediatric patients? Does this change depending on the age of the patient?

RvR: Paediatric radiology uses the full breadth of radiological techniques, although the emphasis is on conventional radiology and ultrasonography. Young children, due to their body proportions, are excellent candidates for ultrasonography. In many cases where in adults computed tomography (CT) or magnetic resonance imaging (MRI) would be mandatory, the diagnosis can safely be made with ultrasonography. As is the case in most European countries, paediatric neuroradiology is mostly performed by adult neuroradiologists; the same holds true for interventional radiology.

ESR: Some imaging techniques, like x-ray and CT, use ionising radiation. What risk does this radiation pose to paediatric patients? What kind of safety measures are in place to protect children?

RvR: Radiation protection is a very important aspect of paediatric radiology. Compared to adults, children are more sensitive to radiation exposure. In the last decade, much attention internationally has been focused on the 'as low as reasonably achievable' (ALARA) principle. Dutch paediatric radiologists have been active in both the *EuroSafe Imaging* campaign as well as the *Image Gently* campaign, to promote radiation protection.

ESR: Do general radiologists always use lower radiation doses when imaging children; are there any guidelines to follow?

RvR: Through national education, paediatric radiologists have underscored the importance of the ALARA principle in children and most radiology departments now have specific paediatric imaging protocols for e.g. computed tomography. In the past years we've seen more attention paid to radiation dose in outside studies, i.e. those studies performed by general radiologists. No longer do we see studies that use adult exposure rates in young children.

ESR: How aware are parents and relatives about the risks of radiation exposure? How do you address the issue with them?

RvR: Parents are increasingly aware of the radiation risks. This is reflected in the fact that parents specifically ask for the use of techniques other than CT, which is rightly seen as a relatively high dose study. Although there is no national guideline, radiology departments have flyers explaining the use of radiation. And of course radiologists can be approached by parents and answer questions related to the risks of radiation exposure.

ESR: Undergoing an imaging examination, especially a long procedure like MRI, can be an uncomfortable and sometimes frightening experience for some children. How can it be made more bearable?

RvR: In paediatric hospitals, specific attention to the child's wellbeing and anxiety is part of daily routine. To create an atmosphere where a child feels safe, dedicated waiting and examination rooms are created where specific attention is focused on children. This can be achieved with the use of mural paintings, play areas, and children's furniture, for example. To prepare them for examinations that take more time or are seen as more intimidating, we provide children and their parents with information leaflets, books and relevant websites. Some paediatric radiology departments have a mock MRI machine for children to play with to prepare them for this examination.

ESR: How many imaging exams are performed on paediatric patients in the Netherlands each year?

RvR: There is no national registration available which specifically addresses the number of children who are subjected to imaging exams. In the Netherlands, in 2012 approximately 9.03 million conventional studies and 1.29 million CT scans were performed, yielding a total of approximately 10.32 million imaging exams (excluding nuclear imaging). The majority of these exams are performed on patients over the age of 40 and, as shown in the graph, paediatric studies form a minority of all studies.

ESR: Access to modern imaging equipment is important for paediatric imaging. Are hospitals in the Netherlands equipped to provide the necessary exams?

RvR: In general, the quality of radiological systems in Dutch hospitals is up to date and can be seen as state-of-the-art. Although the equipment is available, appropriate paediatric radiological knowledge is not always available. This does lead to unnecessary repeated examinations in children.

ESR: What has changed in paediatric radiology during your lifetime?

RvR: As in general radiology, there has been an increase in the use of CT and MRI. The implementation of picture archiving and communications systems (PACS) throughout the Netherlands has made it possible to efficiently give expert advice on outside studies. However, and more importantly, more attention is given to the role and position of the patient and their parents. This is in keeping with the changing position of the patient in medical care in general. Although

paediatric radiology has always been focused on the patient and their family, this is now increasingly becoming part of standard protocols.

ESR: Where do you see the next developments in your field?

RvR: Some future developments will be based on the implementation of advanced imaging techniques such as hybrid imaging techniques. As in other fields of radiology, the combination of anatomy and function, leading to personalised medicine, will be the next big step forward. A second change will be the increasing centralisation of patient care. For example, in the Netherlands, paediatric oncology will be centralised in the Princess Maxima Centre for Paediatric Oncology. As a result, paediatric radiological oncological care will also be centralised. In my opinion, it will also be the case for more rare diseases and will therefore lead to increasing subspecialisation within paediatric radiology.

Graph:

Imaging frequency by age for all studies using ionising radiation in the Netherlands in 2002 (Source: National Institute for Public Health and the Environment, RIVM 'Leeftijds- en geslachtsverdeling van patiënten voor röntgenverrichtingen' available at:

http://www.rivm.nl/Onderwerpen/M/Medische_Stralingstoepassingen/Trends_en_stand_van_zaken/Diagnostiek/R%C3%B6ntgen_exclusief_CT/Leeftijds_en_geslachtsverdeling_van_pati%C3%ABnten_voor_r%C3%B6ntgenverrichtingen



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Prof. van Rijn graduated as a medical doctor at the Erasmus Medical University Rotterdam in 1994 and obtained his PhD at the same university in 1998. In 2002 he finished his training as a radiologist at the Erasmus Medical Centre in Rotterdam under the supervision of Prof. G.P. Krestin and at the Academic Medical Centre in Amsterdam under the supervision of Prof. J.S. Laméris.

He has more than 125 peer-reviewed publications to his name, and has co-authored multiple book chapters and co-edited three paediatric radiology books.



Figure A.

Fifteen-year-old boy with abdominal pain and fever. Panoramic ultrasonography clearly shows an infected urachal cyst with stone formation. Note the inflammation of the abdominal wall.

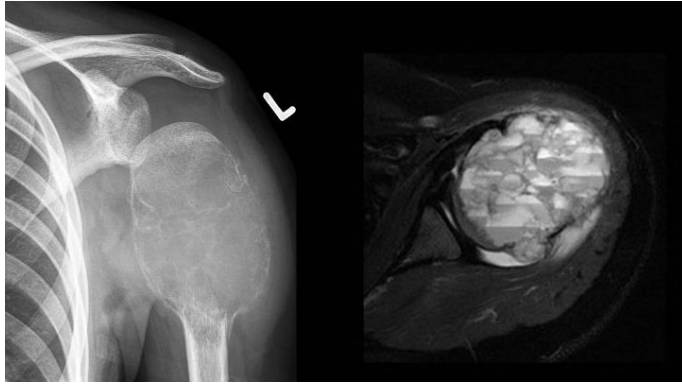


Figure B.

Fourteen-year-old girl with limited range of motion of the left shoulder and a palpable mass. Conventional radiograph shows a well-circumscribed expansive lytic lesion of the proximal humeral metaphysis. Axial T2-weighted MRI of the humerus shows a circumscribed multicystic lesion with multiple fluid-fluid levels. No solid lesions were seen and a diagnosis of an aneurysmal bone cyst was

made. This diagnosis was proven on histology.

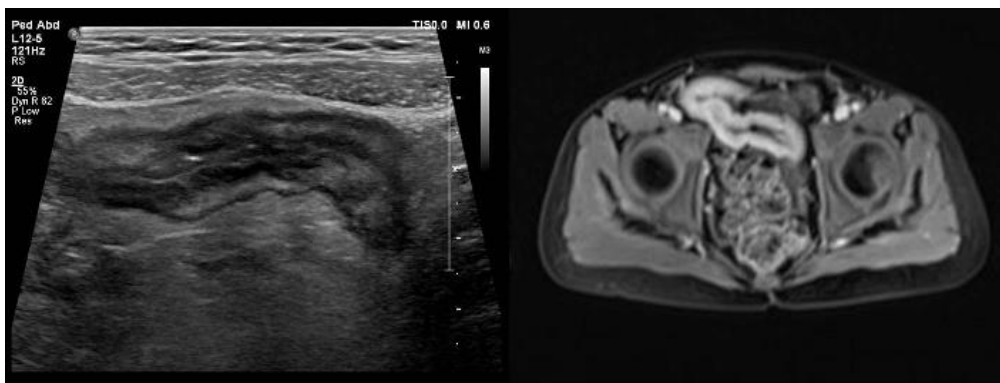


Figure C.

Twelve-year-old boy with known Crohn's disease.

Ultrasonography shows significant bowel wall thickening of the distal ileum and infiltration of the surrounding fat. Contrast-enhanced T1-weighted coronal MRI clearly shows enhancement of the distal ileum and thus the extent of disease.