



Paediatric imaging in Poland

An interview with Elżbieta Jurkiewicz, Associate Professor and Head of the Department of Diagnostic Imaging at the Children's Memorial Health Institute in Warsaw.

European Society of Radiology: What is paediatric imaging? How is it different from regular imaging, and what ages are the patients?

Elżbieta Jurkiewicz: Paediatric radiology is a special field of diagnostic imaging; a child is not simply a small adult. Therefore, examinations, especially in small children, are drastically different than in adults. In the paediatric age groups, we can find specific pathologies, which should be investigated and appropriately diagnosed. Paediatric radiology, however, includes children from newborn babies to adolescents, meaning we are dealing with patients weighing less than 500g (preterm babies) and patients whose height and weight are similar to the values observed after reaching adulthood.

Depending on the imaging method, and especially on the patients' age, the manner of conducting examinations can differ. Younger and non-cooperating children sometimes require sedation or general anaesthesia. On the other hand, newborn babies can be diagnosed while sleeping after appropriate preparation. The diversity of diseases specific to particular age groups is enormous. Different ailments can be observed in newborn babies, younger children and teenagers.

A young child can be a difficult patient. Children are usually lively, anxious, and sometimes are afraid of big machines and new environments that are alien to them. It is vital for success that the medical staff gain the children and parents' trust. Therefore, it is imperative to explain the course and purpose of the examination to the parents or guardians, and to establish friendly and warm contact with the child.

Consequently, the examination process is much more time-consuming than with adult patients. The correct course of treatment requires cooperation between the parents, the child and the doctors and technicians who are carrying out the examination. The younger the child, the greater the parents' role. Good relations in the staff-child-parent triangle are very important.

The right environmental conditions in the diagnostic facility are also fundamental. The environment should be child-friendly, with colourful decorations, a place to play and toys suitable for the age of young patients.

In addition to extensive clinical know-how, the knowledge of correct images and awareness that they change in different periods of a child's development are also a must. This is yet another thing that differentiates paediatric diagnostics from adult imaging.

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

EJ: Paediatric radiology emerged fairly early on as one of the radiological subspecialties. In 1899 the Children's Hospital Medical Center Boston introduced x-ray equipment dedicated to paediatric patients and personnel to work exclusively with children; the Hospital for Sick Children in Toronto did the same in 1900. In Europe, the first x-ray device was installed in a children's hospital in 1897 in Graz. The first large children's diagnostic centres were established in France in the form of large paediatric hospitals. In Poland, the first x-ray photographs were taken in May 1901 in Warsaw, and the first stationary x-ray generator was installed in a children's hospital in 1908.

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

EJ: Paediatric radiology employs the same imaging modalities as for adult patients. However, due to the age of the patients, the selection of the appropriate examination method is very important. The utilisation of an appropriate method, in addition to reasonable justification, should also take into account diagnostic process optimisation, which means the assessment of the risks and benefits of the conducted imaging examination. Ultrasound imaging should be the most often used method in paediatric radiology. Conventional x-rays, especially chest radiographs, are still very popular methods of examination. In the latter, the effective dose is one of the smallest.

The role of the paediatric radiologist is very important when it comes to making decisions, together with a clinician, regarding choosing an appropriate examination – with appropriate meaning such examinations that will provide the most information, making it possible to make a diagnosis and prescribe suitable treatment, and that do minimal harm and pose a minimal threat to the child.

Ultrasound imaging is usually the first-line method, which is selected due to its accessibility and the ease and safety of the procedure. The second method that is free of ionising radiation is magnetic resonance imaging (MRI). Other methods should be used very carefully, only in selected situations, and in line with recommendations.

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?

EJ: It is common knowledge that ionising radiation, especially used often and in large doses, poses the risk of developing a neoplastic disease (cancer) in the future. We should bear this in mind when it comes to examining children, as their young organs are especially sensitive, and they still have their whole lives ahead of them.

Nowadays, the outstanding advances in medical physics and medical equipment, including devices using ionising radiation, makes it possible to substantially reduce radiation doses without compromising the quality of the images, which allows us to use x-ray and CT imaging even in the case of small children. However, we should remember that these are still risky examinations and should be carefully prescribed.

It should again be emphasised that it is recommended to employ diagnostic procedures that reasonably eliminate the use of x-ray-based examinations, or to replace them with ultrasound or MRI, which are free of harmful ionising radiation.

If the selected diagnostic method is based on ionising radiation, we are obliged to proceed in line with the ALARA (As Low As Reasonably Achievable) principle, which is associated with the use of smaller doses, appropriate shields, and test protocols suitable for the paediatric age group. This is especially important in computed tomography imaging. The further education of radiologists and technicians, however, is equally important. Radiologists should continually further their knowledge in the field of selecting the appropriate imaging methods, and technicians should do the same in respect to the correct conduct of examinations. Further education also applies to clinicians who refer children to diagnostic examinations.

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

EJ: Diagnostic tests using ionising radiation and procedures in the field of interventional radiology are performed in a way that guarantees the achievement of the desired result, while using the lowest possible doses of ionising radiation. In Poland, the relevant regulation in force is the Regulation of the Ministry of Health of 18 February 2011 on the safe use of ionising radiation for all types of medical exposure. Working procedures that specify conditions for good practice have also been prepared. Our role is to observe these directives and make sure that other people abide by them as well.

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

EJ: Knowledge and awareness of the risks associated with the use of ionising radiation is becoming more and more widespread, as parents are gaining wider and wider access to scientific publications on the internet. The second source of information is social networking websites, where parents can exchange their opinions and thoughts. There are advantages and disadvantages to these situations, as knowledge passed from one parent to another might be incomplete or even false, which stems from the lack of medical background. Therefore, continuous social education, in the form of accessible articles published in mass media and direct talks with parents and guardians, is very important. Such talks should be held by clinicians in hospital wards and outpatient clinics, as well as by radiologists in diagnostic units. It is also of key importance to devote enough time to such talks. We should bear in mind that the parents of sick patients are often irritated, even terrified by the situation in which they find themselves. However, their fears can be minimised by providing them with accurate information on what will happen to the child during the examination.

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?

EJ: I think that the most important thing is talking to the child. Children are curious by nature, so it is not a difficult task to persuade them to agree to have the examination conducted. Talking to parents or guardians is, however, no less important. Their standpoint, level of calm, and understanding of the necessity to conduct the examination greatly impact on the behaviour of their children.

MRI indeed takes a long time to be carried out compared to other imaging examinations, and the additional requirement of staying motionless can be a problem, especially for hyperactive patients. An experienced team of technicians and physicians can, however, cope with this problem. In very difficult situations, it is also possible to carry out examinations in several stages to allow children to acquaint themselves with the situation. Patience and empathy are very important in our work.

Diagnostic equipment and examination rooms should be friendly and colourful, with pictures and characters from fairytales and video games. An additional feature that helps young patients to remain still during the examination is the possibility of listening to music or stories on earphones. Some MRI laboratories are equipped with special devices that make it possible to watch cartoons and films during the examination.

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

EJ: Hospitals in Poland are well equipped, and centres that offer adult and paediatric diagnostics give a special degree of thought to adapting equipment to the given group of patients.

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

EJ: Enormous progress has been made in the field of imaging. This can perhaps be reflected in the change of name of the specialty – from x-ray diagnostics to diagnostic imaging. This is because the role of the methods using x-rays has greatly diminished in favour of safe methods, based on completely different technologies. New diagnostic methods have been introduced, including magnetic resonance, which, as we can say, has revolutionised diagnostic imaging and over the years has been extended with such options as functional MRI and magnetic resonance spectroscopy, enabling us to obtain additional information on metabolic processes and the functioning of the brain. Other medical equipment has also been greatly improved, ionising radiation doses have been reduced, digital radiography has been introduced and ultrasonographs have been modernised (3D and 4D options have been introduced). The objective of every imaging method is to achieve the best quality with the least possible harm to patients; even now that we achieve great results, improvement is still ongoing. All these actions have brought about progress in the fields of surgery, cardiac surgery, neurosurgery, neurology, etc., as the vast expansion in diagnostic capacities has contributed to a substantial improvement in treatment.

Awareness of the necessity of radiation protection has also been raised considerably in medical staff, as well as in patients themselves. The examination rules and regulations have been tightened.

Nowadays, we are focusing on the aforementioned ALARA principles. I think, in my field, this is especially worth highlighting, as children constitute a special group of patients, whom we should protect from unnecessary exposure to ionising radiation.

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

EJ: Progress is focusing on achieving better and better image quality with smaller and smaller doses of ionising radiation, when it comes to x-ray machines and computed tomography, and smaller and smaller sequence times in magnetic resonance imaging, and also developing new options that will make it possible to expand the possibilities of understanding the work of the brain, heart, etc. The development of new technologies is indeed impressive and I am therefore certain that there is still much for us to see in the field of imaging.

In my field of work, I would like to expand the scope of educational activities in respect to diagnosing children's diseases. Much has been done, but I think that training, especially in the field of anatomical differences between newborns, infants and small children, and childhood pathologies, still poses a challenge to paediatric radiologists and clinicians dealing with this patient age group.

The development of IT makes it more and more easy to exchange our experiences and consult on difficult cases, which is of great value in itself, as it allows us to make quicker and more accurate diagnosis, and thereby start the appropriate treatment earlier.

There are still many challenges ahead, but this also makes paediatric radiology such a fascinating field of science.

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Dr. Jurkiewicz is a member of the Polish Medical Society of Radiology and the European Society of Radiology. She is the head of the Section of Paediatric Radiology of the Polish Medical Society of Radiology and was also nominated as the Provincial Consultant in Radiology.