



Are we overexposing children to medical radiation? Why you should care and how we can do better.

Pediatric radiation dose exposure is of particular concern because children are more vulnerable to the potentially harmful effects of radiation than adults are. Due to the fundamental mechanisms by which radiation harms living tissue growing organs and tissue are more sensitive to radiation, they undergo significantly more cell division than those of adults which in turn heightens the risk of DNA damage. Exposure to high doses of radiation as a child is well documented to increase an individual's risk of developing cancer later in life as well as negatively impacting growth and development. Radiation risk is understood to be stochastic in nature and, while more difficult to document, even low levels of radiation exposure over time does increase cancer risks. This is why best practices in medical and industrial radiation use all encourage minimizing exposure to as low a level as possible. The acronym ALARA (As Low As Reasonably Achievable) is well known by those who work in this space. This concern and the importance of these practices should be magnified when dealing with children due to their greater risk.

Medical professionals employ several techniques in an effort to minimize the quantity of radiation exposure in children, while still obtaining valuable diagnostic information necessary for the child's overall health. Some techniques used are as follows: Dose reduction, where dose factors are reduced (either manually or algorithmically) to minimum levels required to produce images with diagnostic value. Shielding, where a physical barrier capable of absorbing radiation prevents excess rays outside of the diagnostically necessary area from impacting tissue. Alternative imaging methods, where a lower dose modality like X-ray or a non-radiographic imaging such as an ultrasound are used instead of or prior to a CT exam which involves considerably more radiation exposure. Parents can also play an active role in advocating for their child's safety by asking questions about the necessity of any procedures involving radiation, ensuring that their child is exposed to the lowest possible dose that still serves their diagnostic or treatment needs.

While these practices do exist and many medical professionals carry them out thoughtfully and diligently, there are not universally adhered to standardized practices. Several issues are still pervasive when dealing with the risks of pediatric dose exposure. While many medical professions involved in the radiation space are trained to evaluate these risks, both parents and healthcare providers may not be adequately aware of the risks which are necessary for balancing the risks of exposure with the diagnostic or treatment benefit of the radiation. Providers may fail to properly account for lifetime

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stochastic risk and default to imaging whenever diagnostic value could be gained, and parents who are not fully educated on the matter are inclined to consent to any test suggested by a provider without acute risks. This dynamic can lead to inappropriate and excessive use of radiographic imaging. There is also a dearth of standardized dose levels for pediatric imaging procedures. This leads to significant amounts of variation in the dose children are exposed to - even for the same exam. As a result, some facilities may be using higher than necessary doses due to this lack of standardization. Given the heightened risks involved with children and the general principle of minimizing stochastic risk, this variation should not be acceptable. For practical and numerical reasons healthcare providers may have limited training and practice with pediatric imaging. Children represent a small minority of the patient population with fewer health complications requiring diagnostic imaging and thus are significantly underrepresented among imaging subjects. The subject of lower standard of medical care for underrepresented populations due to a lack of exposure and training is a well-documented phenomenon. This issue has justifiably gained significant traction in recent years, largely focused on racial, ethnic, or sexual minorities, as well as women. In the case of pregnant women, this same dynamic leads to poorly studied and standardized practices with respect to pediatric patients. This should neither be used to blame providers nor excuse poor practices, but rather be is a call to increase focus and education about a group which is particularly at risk.

To address these issues, it is important to raise awareness regarding the risks involved with radiation exposure in children and to promote best and better practices for mitigating these risks including both dose reduction and dose avoidance. Healthcare providers should receive adequate training in pediatric imaging and facilities should establish protocols which properly account for risk and minimize radiation exposure in children. Image Gently, launched in 2007 by the Alliance for Radiation Safety in Pediatric Imaging, is a campaign that advocates for the awareness and practices described above.

Some of their key guidelines and recommendations are as follows:

Justification and optimization of imaging procedures - healthcare providers should ensure all imaging on children is necessary and appropriate for their conditions while using the lowest possible value which still produces images with diagnostic value.

Collaboration and communication - healthcare providers should work collaboratively with radiologists and medical physicists to ensure imaging procedures are designed as safely as possible for pediatric patients, parents should be informed about radiation risks and encouraged to inquire as to both safety and necessity.

Dose reduction techniques - healthcare providers should use dose reduction techniques such as collimation, shields, and adjusting exposure factors in order to minimize radiation exposure in children.

Protocol standardization - imaging protocols for pediatric patients should be standardized across facilities to ensure that the minimal level of radiation dose is consistently used.

Education and training - healthcare providers should receive adequate education and training in pediatric specific imaging and radiation safety.

Tracking and monitoring - facilities should establish systems for tracking radiation dose levels and monitoring exposure in children over time.

In accordance with these principles Imalogix has incorporated the Imalogix Pediatric Performance Report into their product. This report evaluates patients age 0-14 who have undergone CT imaging and highlights areas which may be of concern or need improvement. The report informs the user about certain metrics of particular concern for pediatric patients, such as: the number of pediatric patients imaged using technical parameters which are typically used on adults, and thus may be inappropriately high for pediatric patients. The number of pediatric patients exposed to multi-acquisitions exams, which inherently come with more exposures, more dose, and more risk. These reports account for the pediatric age group, size, and specific protocol invoked. A percentile score is generated based on these categories which compares the user's enterprise with a comparable peer group. Evaluation of this report can glean valuable insight into specific areas of practice which could benefit from remediation.

By following these recommendations healthcare providers can help to minimize pediatric radiation exposure to improve safety and effectiveness of medical imaging procedures. The Image Gently campaign also provides education materials and toolkits in line with these guidelines to healthcare providers, parents, and patients to promote radiation safety in pediatric imaging.

About Imalogix

Imalogix is the first cloud-based end-to-end image management and analytics solution that uncovers where and how to improve imaging, thereby enabling you to optimize clinical and operational performance across your enterprise. Imaging data is transformed into knowledge so you can systematically improve workflow, quality, safety—and lower cost. AI processes fueled by deep learning assess the performance of your technologists, scanners, and protocols. As a result, you can answer how to increase efficiency, improve patient safety, and deliver care more consistently. To learn more, visit www.imalogix.com or call 855.687.9100.