Seattle Children’s Hospital Radiology Department

Statement regarding radiation exposure related to computed tomography (CT) exams

Computed tomography (CT) scanners use radiation in the form of X-rays to image the body. Generally speaking, a certain amount of radiation is required to produce an image. Using more radiation produces a “clearer” picture, but may not in actuality improve the diagnostic quality of an exam. Therefore, there is a balance between radiation exposure and image quality sufficient to make a diagnosis. Achieving this balance requires expertise, knowledge and effort. At Seattle Children’s Hospital CT department, our radiologists and technologists have optimized the various factors that influence radiation exposure to our pediatric patients. Some of these factors include:

1. **Development and use of pediatric specific protocols.** Smaller body sizes require less radiation to produce diagnostic quality images. Our team uses weight-based protocols that were developed to
accommodate the smallest infant to the adult-sized child. Using these protocols, our radiation doses are consistently lower than those recommended by the American College of Radiology guidelines.

2. **Use of shielding.** Shielding pertains primarily to the superficial tissues such as female breast, thyroid, and eye that are included in the CT imaging field of view. Shielding devices are particularly important in children as their tissues are inherently more sensitive than adults to the effects of radiation. At Seattle Children’s CT Department, we use shielding when appropriate, and when it won’t adversely affect an examination’s diagnostic quality.

3. **Use of dose modulation.** Our scanners have the capability to modulate the strength of the X-ray beam in response to the density of the tissues being imaged. This can reduce radiation dose up to 50% compared to scanners without this technical capability, since those scanners must scan at a higher, uniform level to penetrate the densest part of the body in that particular scan.

4. **Motion reduction techniques.** Medical imaging is similar to photography in that it is subject to image degradation from patient
motion. If a patient moves during an exam, it may need to be repeated. Motion is a particular challenge in the young child. We incorporate many strategies to minimize this issue:

a. **Fast scanners.** Our state-of-the-art scanners cover a large area in a very short time.

b. **Distraction techniques.** Age-appropriate visual and audible devices are used to distract children during the exam.

c. **Child Life.** Our radiology department includes a Child Life specialist who is educated and trained in using techniques to guide children through the exam, to achieve the most cooperative patient.

d. **Anesthesia.** Some patients require use of anesthesia to achieve an adequate examination. Seattle Children’s Hospital anesthesiologists provide sedation for children with short-acting anesthetics.

5. **Exam appropriateness screening.** Our technologists and radiologists review each order to identify those patients in which another modality, such as ultrasound or magnetic resonance imaging
(MRI), may answer the clinical question without the use of ionizing radiation.

6. **Staff expertise.** Kids are not small adults. Our radiologists and technologists are pediatric experts. They spend their careers training and perfecting the art of imaging children. Their focus is to achieve the best possible exam in the safest way, and as such, radiation exposure is always considered. Furthermore, our staff is continually researching the latest technology and methods available to further reduce radiation exposure.

Suggestions to parents of children undergoing a CT examination:

1. **Ask questions.** Discuss CT radiation dose with the referring physician when the decision is being made to order a CT exam for the child, so that the risks and benefits can be weighed, and potential alternatives to CT can be considered. After the decision to perform a CT has been made, the technologist or radiologist may answer the patient’s and parents’ questions regarding radiation dose prior to
imaging, and will tailor the CT protocol to the individual patient to minimize radiation exposure.

2. Visit the Image Gently Web site. Reducing medical radiation doses to children has been identified as a top priority among health professionals, and, in particular, among pediatric radiologists with respects to computed tomography (CT), as the number of CT exams performed on children in the United States continues to grow. The importance of this issue is reflected in the formation of the Alliance for Radiation Safety in Pediatric Imaging by 13 top medical societies, agencies, and regulatory groups in 2007. The Alliance launched the Image Gently campaign to educate and bring awareness to radiologists, technologists, referring physicians, and parents regarding the need for “child size” CT doses. The Image Gently Web site (http://www.pedrad.org/associations/5364/ig/) provides numerous, easily accessible tools and resources available to medical professionals and the layman regarding this issue.

3. Keep track of your child’s medical radiation exposure. We advocate use of the My Child’s Medical Imaging Record, which can be found
on the Image Gently Web site. This method is similar to a vaccination record. The benefit of using this method of tracking is that parents can record all types of exams that use ionizing radiation, not just CT exams, regardless of whether they are performed at one or multiple institutions.

References