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Low Dose, High Quality Possible

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The year was 1908, and the use of radiation for both medical and recreational purposes was expanding rapidly. Circuses used the rays to guess the content of women's bags. Shoe stores had fluoroscopy machines to help customers fit shoes. Wealthy individuals had x-ray units in their homes to entertain guests. As time progressed, the consequences to individuals became apparent. Yet, even as scientists began documenting eye and skin ailments, the abuse of radiation continued.

The problem was that these rays could not be seen, tasted, touched, smelled or heard. It was difficult for the public to understand the dangers. Not until well into the 1950s did the many harmful practices finally cease. Even then, the effort was geared mainly toward protecting those who worked with x-rays.

Fast forward 100 years. The year is 2008. Today, a career using x-rays is absolutely safe. Technologists can enjoy the benefits of protective devices such as lead shielding and radiation monitoring. Yet concern still remains: What about the patients?

The rapid spread of multislice computed tomography (CT) scans, plus computed radiography (CR) and direct radiography (DR) in general radiography, has been great for our profession. However, these new technologies have resulted in a rapid and dangerous increase in radiation dose to patients.[1] The American College of Radiology developed appropriateness criteria, recognizing that there is an immediate need to develop a nationally accepted system to assist radiologists and referring physicians in making the correct imaging decision for a given patient.[2] It is hoped that, if implemented, these guidelines will protect patients by addressing one aspect of the problem — namely physicians.

However, the solution also must address technologists. CR and DR both offer a unique advantage: the ability to correct for under- or overexposure. Unfortunately, this feature is abused often. Most technologists soon realize that the correction for overexposure is greater than the correction for any underexposed image. The result is the routine and deliberate use of technical factors well above what is necessary. An example is the use of 60 kVp at 60 mAs to image the posteroanterior hand!

CT use involves larger radiation doses than general conventional imaging. With the increased use of multislice CT scanners, the fear is that the associated radiation doses will result in a significant risk of radiation-induced cancer in the future. A CT of the abdomen can result in a dose 50 times

higher than a routine radiograph of the abdomen. These high dose rates can be significant, especially when a child is involved. Yet many CT technologists do not adjust the protocols routinely or take age, size and organ of interest into consideration.[3–5]

Digital imaging unfortunately came with a price: It de-emphasized radiation safety and patient protection. Some technologists have lost the experience of manipulating technical factors, resulting in an inability to control patient dose.

The U.S. Food and Drug Administration has published a Public Health Notification warning of the radiation risk from CT scans to pediatric and small adult patients. Its suggestions include optimizing CT settings based on patient weight and anatomic region of interest, reducing multiple scans with contrast and eliminating inappropriate referrals for CT.[1] Manufacturers of CR and DR units also should get involved.

The probability of negative effects occurring due to radiation exposure increases with cumulative lifetime dose. With this fact in mind, even if corrected, overexposed and underexposed radiographs should be flagged clearly and permanently. Controlling under- or overexposure and properly monitoring CT imaging during radiographic tests should be incorporated into every imaging department's continuous quality improvement or quality assurance program. All technologists need to remember the most important principle in radiation protection: ALARA, "as low as reasonably achievable." Only then will our patients be assured of high-quality testing using the lowest possible radiation dose.

Footnotes

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