Kid-size Care
‘Image Gently’
Aims To Keep Dose Small

Dose Creep
DANGER

MR Scare in Europe
Be Wise. Adjust For Size.

Let’s *image gently* when we care for kids! The ASRT is a proud supporter of the Image Gently campaign, an initiative of the Alliance for Radiation Safety in Pediatric Imaging. The campaign’s goal is to lower radiation dose in the imaging of children.

**Don’t miss your free Image Gently poster in this issue of ASRT Scanner.** Display the poster in a prominent area as a reminder to keep pediatric imaging child-sized.

For more information about pediatric radiation safety or to ask an expert, visit www.imagegently.org.

Made possible by an unrestricted educational grant from GE Healthcare.
THIS MONTH
Image Gently

The medical community has united and kicks off a campaign to ensure that children get child-size doses of radiation, particularly in CT exams. Who are the driving forces behind this effort, and what role do you play?

Beware of Dose Creep

CT is not the only imaging exam to be mindful of. Radiation dose creep is a possibility in other modalities, too. Think ALARA — as low as reasonably achievable. After all, what’s more important than the safety of your patients?

The Day MR Almost Died

A move in Europe to protect workers from the effects of electromagnetic force nearly crippled the use of magnetic resonance equipment in 27 countries. How did it happen? Could it happen here?

Inequality in Certification?

Is the American Registry for Diagnostic Medical Sonography credential more valid than the American Registry of Radiologic Technologists credential? One sonographer’s workplace battles led her to believe so.
editor’s note

The American Society of Radiologic Technologists is a proud cofounder of the Alliance for Radiation Safety in Pediatric Imaging and its Image Gently campaign, which raises awareness that children need child-size radiation doses, particularly in CT exams.

You are an essential caregiver and your role in administering radiologic exams is crucial to patient health and safety. That’s why the ASRT joined forces with the Society for Pediatric Radiology, the American College of Radiology and the American Association of Physicists in Medicine in creating this important campaign.

A poster-size calendar is attached to this issue of ASRT Scanner to remind you to image children gently. Please display it in your workplace and encourage your colleagues to take its message to heart. The Alliance for Radiation Safety in Pediatric Imaging has created protocol recommendations, worksheets and other resources to help you. Go to www.imagegently.org.

The ASRT has been represented on the Alliance by two executive vice presidents, Chief Knowledge Officer Greg Morrison and Chief Marketing and Communications Officer Nora Tuggle. Their hard work and dedication in this effort reflect your commitment to and diligence in caring for your patients.

Feb. 14, Valentine’s Day, is the day the polls open for the annual ASRT election of national officers and delegates. Vote because it’s your right. Go to www.asrt.org.
Campaign Wants Everyone To Reduce Pediatric Patients’ Radiation Exposure

By Teresa G. Odle, Contributing Writer
Children don’t fit in adult-size shoes, clothes or furniture, at least not without the help of a few phone books underneath them at the family dinner table. Kid-size meals and kid-size bicycles make the world more fun, friendly and safe.

For the most part, medical equipment is not kid-size. CT scanners loom large and are imposing, even to mature patients. Most protocols are based on adult patients’ needs, which not only are less friendly to children, but also can be less safe. Imagine, for instance, giving a child an adult dose of narcotics. Unthinkable, right? Yet in radiology, some children are exposed unnecessarily to higher doses of radiation.

The Alliance for Radiation Safety in Pediatric Imaging recently formed to raise awareness of the need to adjust radiation dose when imaging children. Spearheaded by Marilyn Goske, M.D., Alliance chairman and board chairman of the Society for Pediatric Radiology, the other founding members include the ASRT, the American College of Radiology and the American Association of Physicists in Medicine. The Alliance officially kicked off its “Image Gently” campaign in late January by emphasizing dose in CT scanning. Initial funding for the Image Gently campaign was provided by an unrestricted grant from GE Healthcare.

“We are working to make our imaging approaches as patient-friendly as possible and to minimize the exposure to radiation in children – and adults alike,” Goske said. “CT has revolutionized the care of our pediatric patients and has had a positive impact in many pediatric diseases. However … the effects of pediatric imaging last a lifetime.”

Dr. Donald Frush, chief of Duke University’s pediatric radiology division, has been instrumental in the development of the Image Gently campaign.

Dr. Donald P. Frush, M.D., chief of the division of pediatric radiology at Duke University Medical Center in Durham, N.C., and chairman of the American College of Radiology Pediatric Imaging Commission.
diagnostic quality, meaning unnecessarily high exposures might be used, especially in children’s studies. Children in particular might receive more CT scans during the course of their lifetimes because of an increasing number of indications for CT and rapidly increasing use of the technology. Some reports have argued that the technology is being misused, but Dr. Frush says that’s not necessarily the case. Instead, the technology and our ability to apply it during the past 10 years have made it the examination of choice for many disorders. Utilization is a balancing act that weighs advantages and potential disadvantages. “It’s a really elegant modality, but people can’t assume that just because it’s a great modality, it’s great in all situations,” Dr. Frush said.

“CT has revolutionized the care of our pediatric patients and has had a positive impact in many pediatric diseases,” Dr. Goske said. “However, the campaign’s ‘radiation matters’ theme drives home two fundamental concepts: More imaging or multiphase exams in children are usually not better, and the effects of pediatric imaging last a lifetime.”

While the Alliance will provide protocols and education primarily to radiologists and R.T.s, an additional component is education of and cooperation from referring physicians, physicists and vendors.

Greg Morrison, ASRT chief knowledge officer, said that often when the radiology community addresses such an issue, it’s tackled by each organization in distinct but parallel paths. “This is a path we’ve chosen to travel together. It’s a very concerted effort by a large group of people to ensure the message gets out,” he said.

The message is that radiation matters when imaging children and that what we do now lasts a lifetime. “One reason everyone is focusing on pediatrics is BEIR VII,” said Barry Burns, M.S., R.T.(R), DABR, of the University of North Carolina at Chapel Hill. BEIR, which stands for biologic effects of ionizing radiation, is a series of reports on radiation risk issued by the National Academy of Sciences. Mr. Burns said that the latest version of BEIR, released late in 2006, indicated that children were much more sensitive to radiation than had earlier been believed.

The Alliance’s invitation to the ASRT to participate as a founding organization underscores the fundamental role the technologist plays in affecting dose. “I consider the
Engaging children and putting their parents at ease are essential components to a successful CT exam, says Carolyn Lowry.

technology the primary face of radiology,” said Dr. Frush. “Dr. Frush is right,” said Connie Mitchell, M.A., R.T.(R) (CT), ASRT president, assistant professor of radiography and program director at the University of Nebraska Medical Center in Omaha. “In the radiology department, the patient sees us first. In many ways, we must be the best educated. We provide the patient with appropriate information, attain the correct patient history and provide the safest imaging procedure possible.”

Ensuring safety for pediatric patients undergoing CT scanning requires careful adherence to the as low as reasonably achievable principle through careful attention to technique and protocols. “The R.T. plays a major role in affecting dose,” said Allen Croat, B.S., R.T.(R) (CT), FASRT, of Sanford USD Medical Center in Sioux Falls, S.D., and chairman of the ASRT CT chapter. “It is the R.T. who picks the parameters, as well as the protocol, for all CT exams,” he said.

Tips for Successful CT Scans the First Time

Performing CT scans on wiggling kids is not easy, even in today’s high-speed environment. Gracie Holder, R.T.(R), works with children on a regular basis and knows that shielding and immobilization are important for radiographic and CT exams. “Rapport with the parent or family also is very important,” she said.

Putting parents at ease and letting them know the scan doesn’t hurt is a major step in helping a child feel at ease, say those who specialize in imaging children. Here are a few more tips from experienced pediatric technologists that might help ensure a successful CT exam, one that requires no sedation and no repeat scanning:

- At Children’s Hospital of Philadelphia, the Child Life Team coaches patients before they even enter the exam room. Books and videos about CT scanning educate the patients. Even better, the child can practice by placing a small doll on a wooden model of a CT scanner.
- Once in the room, taking time to let the child explore on his or her own pays off. If the child has a stuffed animal, let him place the animal on the table. Or ask a parent to lie on the table and have the child pretend to perform a scan on mom or dad.
- To help with immobilization, play the statue game or use fun distractions. Provide DVD players, familiar stickers or a light projected on the ceiling that entertains, such as a lava lamp. Give immobilization devices names to make them more child friendly. Call a strap something familiar to a child, such as a seat belt. Prizes for being a “big boy or girl” or for remaining as still as a statue can encourage older children in particular.
- Finally, remember that reasoning doesn’t work with a screaming 2-year-old, but games and distractions might. That’s why the extra effort to make a child comfortable in the imposing environment of the CT scanner can take some time up front, but less than it takes to calm an upset child and less than a repeat exam due to motion. And the repeat exam adds radiation exposure.

Special thanks to CT technologists Carolyn Lowry, of Duke University Medical Center, and Holly Friedman, of the Children’s Hospital of Philadelphia, for sharing their tips.
R.T.s who regularly image children also know that keeping dose low requires a personal touch. “The technologist plays an important role in the success of the examination,” said Ms. Mitchell. “The technologist can make the procedure a positive experience for the patient and family through effective communication and education,” she said.

Customizing Child Protocols

For many years, radiologists and R.T.s used CT scanning parameters that were designed for adults. But they began to realize that the parameters could be changed — with a resulting dose reduction of 50 to 90 percent — without compromising the diagnostic quality of the pediatric CT examination. At many children’s hospitals, a natural focus on pediatrics and the inclusion of pediatric radiologists on the imaging team has led radiology department leaders to establish protocols geared specifically to children and reducing dose.

At the Children’s Hospital of Philadelphia, R.T.s perform about 1,000 pediatric CT examinations per month, said CT scan team leader Holly Friedman, R.T.(R)(CT). In addition to scrupulous attention to shielding, use of dose modulation and low kV protocols for contrast imaging, the CT staff has focused on lowering dose while maintaining quality as evaluated by radiologists. “Working with our physicist, we modified our techniques by taking the manufacturer-recommended protocols and reducing dose by 20 percent,” said Ms. Friedman.

At Duke University Medical Center, Carolyn Lowry, B.S., R.T.(R)(CT), an applications specialist, helped Dr. Frush develop color-coded protocols for pediatric patients who receive CT scans. With nine CT scanners, the hospital performs a high volume of body and neurology scans for its

Opportunity for R.T.s

Affiliate Relations Manager

An affiliate relations manager is needed for a leading national, nonprofit health care association, based in Albuquerque, N.M. Each applicant should be a radiologic technologist, certified by the American Registry of Radiologic Technologists and have three to five years of affiliate experience or membership. The successful candidate must have an understanding of association governance structure, working in a team environment, supervisory experience and detailed work processes. A bachelor’s degree is preferred. This position ensures the quality and accuracy of affiliate relations activities for the American Society of Radiologic Technologists. The affiliate relations manager will be responsible for further development and maintenance of the 54 affiliate charter relationships, maintenance of charter agreements and appropriate recordkeeping. The affiliate relations manager also will be expected to facilitate workgroup activities for an affiliate relations program. The successful candidate must be organized, deadline focused, detail oriented and have a high level of interpersonal skills.

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children’s health center. The first trial run of child-size protocols began in about 2000 with a four-slice scanner. The color coding is based on the Broselaw-Luten Color Coding Kids Hospital system, which was developed to help reduce pediatric medication dosing errors.

“We tried a different method first, then implemented the color-code protocols. We gave a survey to technologists, and they loved them,” said Ms. Lowry. By adopting color codes based on weight, technologists can easily adjust CT scanning protocols to a child’s size. Ms. Lowry also worked with Bracco Diagnostics Inc. to adopt the color coding for oral contrast and contrast injection. Weight works better than age. “Some of these kids have lost so much weight or have health issues. What we’ve found is that you could have a 6-year-old patient who could weigh the same as a 3-year-old,” said Ms. Lowry. Nine colors provide a range of weights from infants to nearly adult size.

“GE [Healthcare] has adopted the protocols for their scanners, and I was able to adapt the colors to the Siemens [Medical Solutions] technology so we can use the color-code mode even on a different scanner. So anybody using any type of scanner can use the protocol, just because of the simplicity,” said Ms. Lowry.

Ms. Lowry and Ms. Friedman said they receive frequent requests from R.T.s across the country for information on their pediatric CT scanning protocols. “Having the [Image Gently] Web site as a resource for those looking for protocols is a wonderful idea,” Ms. Lowry said.

**Sharing Experience**

For those imaging professionals who seldom work with children, the Image Gently Web site offers specific protocols and other information in one place. Karen Williamson, R.T.(R) (CT), of West Penn Allegheny Health System, Forbes Regional Campus, in Monroeville, Pa., has worked in CT scanning for 18 years. Although West Penn has specific protocols for pediatric CT scanning that were

“Most technologists I know are very concerned with the dose given to all patients, but especially to children.”

Karen Williamson, R.T.(R)(CT)
West Penn Allegheny Health System

Karen Williamson

Continued on Page 25
designed by a pediatric radiologist, the R.T.s have limited experience scanning children because there is a children's hospital nearby. Ms. Williamson welcomes the Image Gently campaign. “I think such a Web site would be of tremendous help, especially to those facilities that image few children and do not have the experience working with them,” she said.

Gracie Holder, R.T.(R), supervisor of pediatric radiology in the diagnostic area at Duke, said, “You can spot the technologists who work with children on a regular basis.” It’s not that technologists with less pediatric experience can’t put children and parents at ease or can’t pull off a successful CT examination on a young patient. But many struggle not only with technical factors but also with communication, uncertainties about immobilization and fears of screaming, wiggling toddlers.

Ms. Friedman worked at a hospital that served both children and adults between her stints at Children’s Hospital of Philadelphia. “I’ve explained to those who run to another room when a child shows up that they’re just little people,” she said. Ms. Friedman emphasized making pediatric patients comfortable and getting down to their level (see story on Page 9). “If you’re not used to scanning kids, it can be a scary thing, even though it shouldn’t be,” said Ms. Lowry. “You don’t want to overexpose them; you want to give them a good scan the first time and not have to rescan,” she said.

Parents are an important aspect of the successful pediatric scan as well. “The technologists are the people who are going to get the questions, answer the questions, put the patients at ease and convey to them a sense of expertise,” Dr. Frush said.

Mr. Croat agrees. “When R.T.s cannot answer parents’ or guardians’ questions, they need to be honest about not knowing the answer and then inquire to find the answer,” he said.

Sharing the Message

The Alliance hopes to provide some of the answers, and the ASRT plans to continue its support of the Image Gently message. “The CT chapter is working on a position statement for this issue,” said Mr. Croat. The statement likely will be presented during the next session of the House of Delegates and will focus on the ALARA principle. Mr. Morrison said the ASRT plans to work with applications specialists in the vendor community to ensure that the message of appropriate child-size protocols is taught as part of applications training.

The Society is developing educational products and updating curricula to highlight the issue in the next round of revisions. “I’m proud to serve on the Board of Directors of an organization that would be a founding member of the Alliance,” Ms. Mitchell said. “The Image Gently campaign brings together all of the members of the health care team to improve the practice of pediatric imaging for the public good,” she said.

Ms. Williamson said, “Most technologists I know are very concerned with the dose given to all patients, but especially to children. They also want the best image possible under sometimes trying circumstances.” The Alliance hopes to help technologists keep pediatric doses low and make circumstances less trying. It’s not so tall an order.

As of Dec. 31, 2007, nine organizations have joined the Alliance as affiliate partners. They include:

- American Osteopathic College of Radiology.
- American Registry of Radiologic Technologists.
- American Roentgen Ray Association.
- Association of University Radiologists.
- Conference of Radiation Control Program Directors.
- National Council for Radiation Protection and Measurements.
- Radiological Society of North America.
- Society of Computed Body Tomography and Magnetic Resonance.
During the radiation protection section of your radiologic sciences curriculum, you probably slept fitfully at night with visions of grays, sieverts and bequerels. The reality of your new profession’s responsibility gave you pause, but you vowed to take it seriously and practice with the utmost concern for patient safety. Now in practice, you’re still committed to radiation safety, but when you close your eyes at night, you might dream of massive numbers of patients and concerns about pleasing your managers and radiologists, how to keep up-to-date with new departmental equipment and how to ease your aching feet.

Foremost in the minds of R.T.s is pride in quality of work. Quality often is measured in the visible end product — the image. There’s an inherent give and take between radiation dose and image quality. Any discussion of lowering patient dose also must involve attention to optimizing image quality and vice versa. So it’s back to those basics from initial training — as low as reasonably achievable, exposure factors and the like. “The ALARA principle has been and continues to be a major focus of education in the radiologic sciences,” said Connie Mitchell, M.A., R.T.(R) (CT), ASRT president and assistant professor of radiography and program director at the University of Nebraska Medical Center in Omaha.

Enter Technology

Technology has improved imaging with the introduction of digital radiography — computed radiography and direct radiography. But CR and DR have not reduced dose; in fact, they’ve added to it with a documented phenomenon called “dose creep” or “exposure factor creep.” In conventional radiography, the amount of radiation needed to produce an acceptable image was specific to the film-screen system and processing conditions. But with CR and DR, acquisition and display are separate processes. This allows the digital systems to produce acceptable images...
over a wide range of exposures.

Barry Burns, M.S., R.T.(R), DABR, is a research professor in the division of radiologic sciences at the University of North Carolina at Chapel Hill School of Medicine. In addition to his courses at UNC, Mr. Burns has researched the issue of CR and DR dose creep and taught workshops on how to keep dose in check. “We did an experiment earlier this year and found that we could get the same brightness over a 500-times change in exposure, while with film-screen you had an ideal target in the middle and you could go 30 percent below and 40 percent above it before the image either got too dark or too light.”

Radiographers working with digital imaging know that underexposure results in a grainy or “noisy” image. The radiologist can’t correct this problem at the reading workstation and it usually results in the technologist having to repeat the exam. So they’ve learned that if they overexpose, they stay out of trouble. The radiologist can use workstation features such as window, level and whitening to view the entire image and lighten or darken structures to compensate for image darkness.

“What’s happening today is that, unless the operator makes an almost inconceivable error, the computer program can salvage the image,” said Terry Eastman, R.T.(R), FASRT, director of Radiographic Techniques, a radiology consulting service in Roanoke, Va.

We’ve found, depending on the facility, that 20 percent to 35 percent of patients are overexposed by at least a factor of two.”

Barry Burns, M.S., R.T.(R), DABR, research professor
UNC-Chapel Hill School of Medicine

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Radiation safety: It’s a hot topic in the news today. During the most recent Radiological Society of North America meeting, while hundreds of scientific exhibitors and presentations showcased the wonders of multislice CT, an article in The New England Journal of Medicine targeted the cancer risks associated with CT. In the article, researchers associated with the Center for Radiological Research at Columbia University in New York concluded that the increased use of CT scanning could be responsible for up to 2 percent of cancer cases in the United States.

The American College of Radiology expressed skepticism with the article’s conclusions, however, saying no published research supported the authors’ claim and challenging a correlation made in the research between atomic bomb blast data and controlled exposure to radiation from CT scans. But the media already had picked up on the story, and headlines around the country warned of CT’s harmful effects.

The ACR, the Society for Pediatric Radiology and other societies, as well as regulatory bodies, already have recognized and responded to the increased scrutiny. The Image Gently campaign aims to reduce CT dose in children (see Page 6). The ACR released a white paper on radiation dose in 2007.

With the emphasis on children comes an emphasis on cumulative dose. Not only are the increasingly higher doses of examinations of concern, but also increased use of various imaging examinations. No current practice exists in the United States for tracking cumulative lifetime dose of ionizing radiation from medical imaging procedures, so there is no way to really know how much radiation a given patient receives over his or her lifetime. That’s why every dose counts.

David Gilmore, M.S., R.T.(R)(N), CNMT, NCT, who teaches nuclear medicine at Harvard University’s affiliate hospital in Boston, also makes a point to conduct a radiation safety lecture at nearly every conference he attends. “And constantly at the forefront is to remind technologists that the patients they see are not just coming to nuclear medicine. They’re probably also having a CT scan; they’re probably having radiography procedures and a lot of other imaging. We have to keep in mind that one millicurie does make a difference,” said Mr. Gilmore.
K E E P I N G
CR and DR Dose Free of Creep

Many of the usual radiation protection tools and tips work for CR and DR too. Knowing the dose and using appropriate technique still are crucial. But CR and DR present a few unique challenges that require their own solutions. A study from Spain published in Radiology in May 2007 reported that use of low kVp to increase contrast, as well as using short source-to-skin distances, were typical mistakes made by radiographers, even after training in digital imaging. With proper technique, use of higher kVp settings actually can reduce dose in CR and DR examinations.

Dylan Suttle, B.S., R.T.(R), of Carolinas Medical Center-Mercy in Charlotte, N.C., experimented with stepped-up kVp values on phantoms and measured entrance skin exposure. Mr. Suttle published his findings in Advance for Imaging & Radiation Therapy Professionals. He found negligible changes in contrast and recorded detail but reductions in exposure of 38 to 50 percent.

Barry Burns, M.S., R.T.(R), DABR, of the University of North Carolina at Chapel Hill, Mr. Suttle’s former program director at UNC, said the experiment showed that “a simple step could account for a big reduction in dose. The problem is that we can’t get many technologists to quit thinking in ‘film time.’” As for everyday focus on dose reduction, Mr. Burns teaches students to focus on the exposure indicator. Exposure indicators are traceable, and Mr. Burns knows a radiation safety officer in one hospital who downloads all of the exposure indicators from each reader on a weekly basis.

“She exports the data into a Microsoft Excel spreadsheet that she designed, and looks at the distribution,” said Mr. Burns. The literature shows that incorporating this kind of data into a quality control program helps moderate patient doses. Mr. Burns said the facility with the attentive radiation safety officer saw a drop in overexposures from 37 percent to 2 percent after tracking and including radiation exposure in their staff evaluations.

Mr. Burns also thinks that helping educators become better equipped to teach digital imaging will help filter down the tips and techniques unique to CR and DR. He is planning a special seminar on the topic that provides the tools educators need for their curricula.

Anecdotal and published evidence of resulting overexposures exist. “We’ve found, depending on the facility, that 20 percent to 35 percent of patients are overexposed by at least a factor of two,” said Mr. Burns.

As more and more R.T.s transition from conventional to digital imaging, they must learn to optimize images without compromising exposure. Technologists need help as CR and DR take hold of the radiography market. For example, Mr. Burns said there is no standard nomenclature for expressing receptor exposure in CR and DR systems and no set national ranges for exposure indicators. The American Association of Physicists in Medicine has assigned a task group to develop the nomenclature. Manufacturers must support these efforts, as well as those aimed at developing acceptable ranges of exposure indicators. It’s up to radiologists and managers to either sanction or discourage “when in doubt, burn it out” cultures that lead to overexposure.

Regulatory and educational efforts will continue, and R.T.s can follow practical tips to keep CR and DR dose down (see story at left) and avoid over-relying on technology in the meantime. “If the computer program is used to correct an overexposure, the patient has been overexposed to ionizing radiation. So in a way, we’re back to step one, where the exposure technique that’s used is extremely important to the ALARA concepts,” said Mr. Eastman.

Concerns Across Specialties

Technology has driven the demand for another digital specialty: CT scanning. Increasingly faster multislice scanners mean shorter studies and better displays. Hospitals and imaging centers compete to own the latest and greatest scanners, and the public has joined the demand for advanced technology. Even though CT faces mounting scrutiny from medical researchers and the media for high doses associated with the technology, patients might demand CT no matter what clinical guidelines or appropriateness criteria suggest. “They may even come into the emergency department and say, ‘I read on the Internet that CT is better for appendicitis than ultrasound, so why are you using ultrasound?’” said Donald P. Frush, M.D., chief of the division of pediatric radiology at Duke University Medical Center in Durham, N.C., and chairman of the American College of Radiology Pediatric Imaging Commission. Dr. Frush said that the public is well informed, even if their information is not always in the right context. (See the cover story on Page 6 for more on CT in pediatric imaging.)
CT cardiac studies can deliver high doses, depending on the protocol used. A study by researchers at Duke University and Stanford University Medical Center in Palo Alto, Calif., found that doses from cardiac-gated CT angiography vary and can be as high as 28.4 mSv. Additional research has suggested that alternative modalities not involving ionizing radiation should be considered in place of CTA for evaluation of young individuals, especially women.

Cardiac diagnosis has influenced nuclear medicine too. David Gilmore, M.S., R.T.(R)(N), CNMT, NCT, is program director for nuclear medicine at Beth Israel Deaconess Medical Center in Boston. “Nationwide, about 65 percent of nuclear medicine departments’ business is now cardiac,” said Mr. Gilmore. The most common cardiac study is myocardial perfusion imaging with SPECT. “We perform about 30 a day in my institution,” said Mr. Gilmore. Although the dose per examination for myocardial perfusion imaging is fairly constant, at issue is cumulative dose, said Mr. Gilmore. “We might see the patient year after year to see how their stent is doing, if their angioplasty is working or if they have new symptoms,” he said.

The cardiac studies and increased use of nuclear medicine as a therapeutic tool have made the specialty more complicated for technologists. In addition, many nuclear medicine studies have moved beyond diagnostic to “prognostic,” said Mr. Gilmore. Physicians know a disease is present, but they use the nuclear medicine study to determine extent and severity. Finally, fusion of nuclear medicine with CT means that technologists have to learn the nuances of both technologies. Nuclear medicine programs have lengthened to better prepare students for more complicated procedures. When it comes to teaching about the importance of dose and radiopharmaceuticals, the emphasis on ethics is magnified. “Everyone focuses on ethics, but in nuclear medicine, you preach ethics every day,” he said. Computer programs now measure dose and will automatically record the number in a dosing system. The operator cannot inject an amount outside a 10 percent window. But Mr. Gilmore said that controlling dose comes down to the technologist’s accurate recording. He said some facilities rotate technologists, alternating who talks to the patient and who injects. And he points out the importance of the radiation safety committee, a requirement for any facility with a nuclear license.

The Society for Pediatric Radiology also has met to address and issue a white paper on the ALARA concept in interventional and fluoroscopic imaging. The 2006 report cited a wide variation in dose, largely because of the number of professionals other than pediatric radiologists operating the fluoroscope. Pediatric patients receive a high number of fluoroscopic procedures such as voiding cystourethrography and upper GI examinations. Digital and pulsed fluoroscopy are some of the advances that help minimize dose. Studies also emphasize the need to reduce foot pedal time. “We do a lot of last image storage in fluoroscopy,” said Gracie Holder, R.T.(R), supervisor of pediatric radiology in the diagnostic area at Duke. “The last image on the screen can be held and there is no extra radiation used to take that picture. It’s not the same as stepping on the pedal and taking a complete exposure,” said Ms. Holder.

A number of tips can reduce fluoroscopy time during cardiac catheterization procedures, including obtaining prior diagnostic information noninvasively, planning projections in advance and placing the patient in the isocenter and straight on the table.

No matter the modality or specialty, imaging children and other high-risk patients such as pregnant women or potentially pregnant women places a greater responsibility on the R.T. to remember the fundamentals of radiation safety — identifying those at risk and using appropriate shielding, coning, centering and mA and kVp technique. Mr. Eastman, who spent two terms on the ASRT Radiation Safety Committee, helped work on the Society’s resolution recommending the availability of radiographic technique charts in facilities. “We have to be frank enough to put this on the table. If we don’t address it, there might be consequences; that’s what I’m hoping to prevent,” said Mr. Eastman.

“Everyone focuses on ethics, but in nuclear medicine, you preach ethics every day.”

David Gilmore, M.S., R.T.(R)(N), CNMT, NCT, program director for nuclear medicine, Beth Israel