

Case Study: Striking a Balance



The ACR Dose Index Registry helps hospitals retain scan quality while successfully lowering radiation dose.

By Amena Hassan

Key Takeaways:

- ACR's Dose Index Registry® (DIR) allows facilities to compare their CT dose indices against national and regional benchmarks.
- With the DIR, hospitals have created a more specific, results-driven method for achieving high-quality patient care by successfully managing their CT dose.
- Two leading hospitals are using the DIR in unique ways to strike a balance between radiation dose and image quality for pediatric and adult patients.

There can be a fine line between maintaining the quality of an image and lowering radiation dose for patients, and ACR's Dose Index Registry® (DIR) is allowing radiologists to do just that. With the help of DIR, this delicate yet achievable balance has been accomplished by radiology practices as well as by medical imaging departments in hospitals across the United States. Facilities using the DIR can compare their CT dose indices to regional and national values. Information related to dose indices for all CT exams is collected, sent to the ACR, and stored in a database. Institutions then receive semi-annual reports comparing their results by exam type to aggregate results. Data collected from the registry is used to establish national benchmarks for CT dose indices.

By utilizing the DIR, hospitals have created a more focused method for achieving high-quality patient care while successfully managing their CT dose. Two hospitals — Women's & Children's Hospital of Buffalo, the regional center in Western New York for specialized pediatric care and part of the Kaleida Health System, and St. Dominic-Jackson Memorial Hospital in Jackson, Miss. — are each using DIR in unique ways to strike a balance between dose and quality.

Pediatric Radiation Safety

Kaleida Health, the largest health-care provider network in Western New York, has taken a major step forward in ensuring pediatric patients receive the lowest radiation dose possible, while still providing high-quality scans. Valerie Cronin, manager of imaging services for Women's & Children's Hospital of Buffalo, believes that pediatric radiation safety is a critical mandate for the entire radiology community. "There is a lot of literature stressing the importance of dose reduction in pediatric patients," says Cronin. "Radiation safety is particularly important for children because they have a lifetime of potentially needing imaging in front of them."

Until the advent of DIR, however, optimizing pediatric CT radiation dose presented a significant challenge because hospitals were not able to compare their dose indices to those of other children's hospitals across the United States. When Women's & Children's Hospital of



Buffalo learned about DIR, they quickly signed on to participate and began submitting their CT dose data to the directory. They also formed a Dose Reduction Committee to evaluate the DIR reports and compare their hospital's dose indices to national standards.

Taking this team approach to dose reduction brought different perspectives and background levels of expertise into the same room, Cronin observes. The committee includes a lead CT technologist, radiation safety officer, quality radiologist, quality technologist, medical physicist, and manager of the department — all backed by the support of an administrative unit. Each committee member is able to contribute a unique perspective to tackling a shared problem. In particular, the facility realized that the inclusion of the medical physicist was important to bring the technical expertise required to optimize CT protocols.

Optimizing CT Scans

The committee's first assessment of comparative information was enlightening. After a review of DIR reports for the period June–December 2011, they quickly recognized that their hospital's radiation dose

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indices for CTs of the abdomen for pediatric patients were higher than national standards. And they took immediate steps to optimize radiation dose including both protocol changes and implementation of new technology.

The group discovered that the dose reduction software tool installed on their scanner was not being used optimally, which was the hospital's most immediate opportunity for dose reduction. After an extensive discussion with the staff physicist, the committee recommended that the hospital implement optimized protocols. A second step in the process was to standardize protocols and train all staff members on the changes to procedures.

Cronin emphasizes the importance of a phased approach to making changes. "The plan of action was to review the DIR data as soon as it became available, to identify our outliers to national standards (such as CT scans of the abdomen), and not to change too much too fast," she states. "If you do that then you don't know what contributed to the reduction. You don't know if it was the implementation of dose reduction software or the changing of the protocols." However, a sense of urgency informed the process due to the critically important nature of the change to be made.

Measuring the Results

After implementing the software and revamping protocols, Women's & Children's Hospital of Buffalo has used DIR to assess the results of the initiative. They submitted data for 2 years (2011–2013), and the results show a decrease in CTDIvol of >75 percent for CT Abd Pelvis with IV contrast in the age category of 3–6 year olds. Another example was a reduction of 50 percent in CT Head Angio with IV contrast in the age category of 11–14 year olds. The committee was successful in achieving the lowest radiation dose for patients overall, while still ensuring high image quality for radiologist interpretation. They will now focus on another procedure identified in the most recent data and the impact of ongoing dose reduction software upgrades on all the protocols.

Going forward, Cronin emphasizes the continuing use of the DIR comparison data to achieve its goals. "We want to be recognized for having the lowest dose for pediatric patients in our area and to market ourselves as providing the most responsible imaging of pediatric patients," she says. "If a child needs a CT scan, parents should choose our hospital because they can receive the safest and most advanced care available."



Another DIR Success Story

St. Dominic-Jackson Memorial Hospital in Jackson, Miss., is another participant in the DIR. Since 2011, the hospital has been submitting data from over 26,000 CT exams to the registry. Its imaging staff's successful management of patient dose offers another persuasive example of how the DIR is helping to improve patient care.

According to CT supervisor Ashley Smith, St. Dominic's had numerous challenges for optimizing radiation dose prior to participating in the DIR. "Previously, we relied almost exclusively on vendor education, physics evaluations, and radiologist protocols to establish radiation dose. But we had no true analytical data to set goals for lowering dose," he explains. "Our radiologists have always been good at questioning re-scans, and they are also good about viewing the patient dose reports. However, there was no way to track radiation dose outliers. We were also unsure of the true dose savings that the new image reconstruction algorithms offered." Smith adds that CT vendors now offer software that can reduce dose up to 40 percent. The only way St. Dominic's could validate dose savings was by observing the difference between one of their sites with the software and another site without it.

Like Kaleida Health, St. Dominic's benefited by working as a team to optimize radiation dose, which included Smith, a radiology director, a physicist, and other committee members. Smith recognized the advantage of this type of collaboration early in the process. "The main benefit of the committee approach is that it offers a level of accountability to actually use the aggregate data," he points out. "Our committee also comprises a body imaging radiologist, musculoskeletal radiologist, and a neuroradiologist, which helps whenever protocol changes are necessary." The committee has quarterly

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meetings to evaluate DIR data, and the information is then sent to St. Dominic's hospital's radiation safety committee, which focuses mostly on nuclear medicine.

Taking Action

Smith now uses the DIR data on an almost daily basis to search for radiation dose outliers. The data has allowed him and his staff to study graphical data more frequently and to develop obtainable dose reduction goals for their patients. Smith notes how comparing data from various facilities has also given St. Dominic's an edge in lowering dose. "With DIR's help, we were able to improve all of our protocols across the board by viewing the aggregate data," he observes. "We now have a tool to help manage dose, and that is the greatest opportunity that the DIR offers. Most of our protocols are now well below the national average, and we are able to sustain excellent image quality with the dose changes."

From Smith's perspective, a phased implementation approach was important. "Our physicist states it best: Do not reduce the dose so much that image quality is compromised," he emphasizes. "I would suggest making subtle dose reduction changes at first. It is important to track all changes made and to create a CT protocol spreadsheet." On the spreadsheet, each protocol lists the most important dose parameters. If any protocol is changed, St. Dominic's notifies a group comprising radiologists and other important administrators, and updates the spreadsheet. Smith is currently in the process of creating a database for this information.

He says despite the immediate benefits of the DIR registry, it is important to stay persistent and maintain an eye for detail while dealing with implementation challenges. "There are many minute details in the CT world that can go by unnoticed, and it is crucial to have someone that is keenly aware of every aspect of CT protocols," Smith observes. He adds: "Be patient and as accurate as possible when tagging studies." Smith explains how every exam that is sent to the DIR is "tagged," so the DIR has a common language for exam comparison. For example, St. Dominic's may label a pancreas CT a "CT Pancreas," whereas another facility may label a pancreas CT a "CT Abd." "The DIR gives guidance along the way. If I had any questions, the ACR DIR staff was an email or a phone call away, and this made things go much smoother. Do not be afraid to send every scan to the DIR. If you are truly serious about quality and safety, this allows you to be transparent and accountable."

Since St. Dominic's has been using the DIR data, Smith says the hospital has stopped performing delayed scans of the kidneys on patients 18 and younger—those who are at greatest risk for radiation. Before

the DIR, these additional images were standard for all Abdomen/Pelvis CT scans. In addition, staff radiologists verify that their dose-saving reconstruction algorithms have reduced dose by 30 to 40 percent, while maintaining image quality. Their staff drastically reduced the CTA Head and CTA Neck studies after they noticed in their aggregate data that the dose for these specific studies was slightly above the national average. They made it their goal to decrease the dose because of the particularly high number of these exams performed at St. Dominic's.

The DIR has given technologists and radiologists a keen understanding of how they can use the DIR as an indispensable tool for achieving a status of As Low As Reasonably Achievable (ALARA) for their images. "ALARA should be the goal for any facility that uses ionizing radiation," states Smith. "Before the DIR, we did not have any data to support our campaign to reduce radiation, but now with the DIR's aggregate data, daily boxplots, and other graphical data, it gives us a platform to market our dose savings to the community we serve."

A Driving Force for Radiation Safety

Although the DIR provides a powerful tool for protecting patients by comparing results with national standards, the commitment to participate ultimately lies with radiologists. "The radiologist must drive the process," Smith concludes. "All radiologists should feel responsibility for limiting radiation dose while maintaining image quality, and we must remain vigilant about the radiation exposure that affects our communities. DIR helps us achieve that momentous goal."

In order to demonstrate their commitment to radiation safety, radiologists can also join the [Image Gently®](#) and [Image Wisely®](#) campaigns. "Because our population is pediatric, we rely on the Image Gently program in order to promote radiation protection in the imaging of children," Cronin states. Smith adds, "We are partnered with Image Gently and Image Wisely, and these certificates are posted in our radiology waiting rooms. These two programs offer imaging facilities the chance to commit to radiation safety and quality with adults and pediatric patients."

With its systematic approach to CT dose management, the DIR provides a crucial framework for radiologists as they strive for the highest quality and standard of care for their patients. A detailed explanation of the DIR, including registration information, can be found at <http://bit.ly/ACRDoseIndexRegistry>. Facilities interested in joining can also call the NRDR information line at 1-800-227-5463, extension 3535, or send an email to nrdr@acr.org.

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