

## Case Study: Dose Control

**One radiology group in Michigan implements a radiation safety program to encourage referring clinicians to order fewer CT scans for at-risk patients.**

By Jenny Jones

### Key Takeaways:

- Lakeland Health's radiologists and the hospital's EHR team partnered to develop a patient-based radiation safety program that uses point-of-order advisories to encourage referring clinicians to order only necessary CT exams for at-risk patients.
- Since the program began in 2012, 115 patients have been enrolled in the program and 69 CT exams have been canceled or changed to imaging exams with a lower radiation dose.
- The program has increased communication between radiologists and referring clinicians, putting radiologists in position to guide and improve patient care. It has also helped educate patients about the impacts of radiation dose.

Referring clinicians, especially time-pressed emergency department (ED) physicians, have ordered a rapidly rising number of imaging exams in recent years. This trend has driven a nearly three-fold increase in the use of CT studies between 1996 and 2010.<sup>1</sup> Today imaging utilization growth is beginning to slow, but radiation dose remains a concern, particularly as it relates to CT and other advanced imaging.<sup>2</sup> Research shows that CT scans, which can use up to 100 times more ionizing radiation than conventional X-rays, might increase a patient's cancer risk. Children and young adults may be at particular risk of developing cancer from the cumulative effects of CT radiation.<sup>3</sup> To reduce these risks, referring physicians should order CT scans only when other imaging studies cannot answer the clinical question. But how can radiologists encourage referring clinicians to select the most appropriate exams (often those with a lower dose) at the point of order?<sup>4</sup>

Radiologists at Lakeland Health in St. Joseph, Mich., in partnership with the hospital's electronic health record (EHR) development team, have answered this question with a patient-based radiation safety program. The program tracks the number of CT scans that patients 40 and younger have of the neck and torso for benign diagnoses. The radiology director enrolls patients who have had five such CT scans into the program by attaching a flag to his or her chart within Lakeland's EHR. This flag triggers a Best Practice Advisory (BPA), an alert that automatically fires whenever a referring clinician orders an additional CT scan for the patient, encouraging the physician to consider a nonionizing imaging exam and/or to consult a radiologist. Additional safety measures are taken for patients who reach 10 CTs.

Lakeland launched the program, which recently received a *Health Imaging* 2015 Patient-Centric Imaging Award, in 2012. Since then, the radiology department has enrolled 115 patients into the program, and 69 CT orders have been canceled or changed to a nonionizing exam for these patients, reducing radiation dose by about 1,178 mSv. Not only



Robert B. Nolan, DO, Lakeland's director of emergency medicine, says the program helps him select the most appropriate imaging exam.

did minimizing the number of unnecessary scans reduce radiation dose, but it also saved patients a total of about \$104,000. Polya Baghelai, MD, Lakeland's medical director of imaging services, says the program has increased awareness about the risks of radiation exposure and amplified the importance of radiology in patient care. "The program has brought the issue of radiation safety to the forefront for the practicing clinician," she explains. "They are no longer reflexive when it comes to ordering imaging. They pause to think about the potential risks and benefits of ordering a CT scan, and they discuss those things with their patients."

### Inspiring Article

Prior to implementing the program, Lakeland's radiologists manually recorded patients' CT scans in a notebook that they kept in the radiology department. Without direct access to those handwritten records, however, referring clinicians couldn't use the information when ordering imaging studies. Realizing this, the radiology department regularly sent letters to Lakeland's ED physicians, who order more than 50 percent of the imaging studies, identifying patients who had multiple CT scans. "But unless the ED physicians had the letters in hand every time they ordered an imaging exam, the information was

ACR  
1891 Preston White Drive  
Reston, VA 20191  
703-648-8900  
www.acr.org/Imaging3

©Copyright 2016  
American College of Radiology

Media contact: pr@acr.org

Continued on next page

## Case Study: Dose Control



Continued from previous page

useless," says Angelica Padilla, MS, RT, Lakeland's clinical director of imaging services.

In 2008, Lakeland's radiologists got the idea to track patients' CT exams electronically, after reading a [JACR article](#) by Steven B. Birnbaum, MD, radiation safety officer at Associated Radiologists, P.A., about the patient-centered radiation safety programs at two southern New Hampshire hospitals.<sup>5</sup> They considered implementing a similar program but didn't have the necessary technology at that time. It wasn't until Lakeland began installing an EHR in 2011 that the radiologists and EHR team partnered to build the automated program. "We identified the need for a BPA, which we deliver through our EHR as part of the ordering process," says Amy Graham, RT, CIIP, EHR senior analyst clinical at Lakeland Health. "Referring clinicians receive the BPA at the point of order, helping them make informed decisions about appropriate imaging."

In addition to partnering with the EHR team, Lakeland's radiologists engaged with the hospital's leadership to develop the program. Lowell G. Hamel, MD, Lakeland's chief medical officer and vice president of medical affairs, says the leadership team fully supported the initiative. "We have an organizational commitment to reduce the unnecessary and preventable harm that sometimes comes to patients," Hamel says. "We look for ways to make each of our service lines gentler, less risky, and less harmful for patients. Radiation exposure is high on the list because its effect is permanent and cumulative and can increase a patient's cancer risk."

### Important Input

The radiology team engaged referring clinicians to establish the program. Robert B. Nolan, DO, Lakeland's director of emergency medicine, championed the program, but he and other providers had some concerns. "The question was, 'What if I think my patient clinically needs a CT, and they come up on this radiation exposure list? Will the system prohibit me from ordering a CT scan?'" Nolan recalls. Radiologists assured referring clinicians that the program wouldn't have a hard stop. "Instead of being a roadblock, our

department chose it to be a speed bump by simply suggesting nonionizing exams, such as ultrasound or MRI, that can provide an answer to the clinical question without the high radiation dose," Baghelai explains.

The program uses three base criteria to identify program candidates: patients must be younger than 40, have benign diagnoses, and have had five or more CT studies of the neck, chest, lumbar spine and abdomen, or abdomen and pelvis. Initially, the program monitored only CTs performed at Lakeland, but now it tracks external CTs, too. "We have a workflow where patients bring in CDs containing their imaging studies from outside institutions and the radiology department's front desk staff imports those studies into our EHR," Graham explains. "We discretely capture and add that data to the total number of CTs a patient has had." The solution also allows referring clinicians to see their patients' complete imaging histories, including their radiological images and reports, through the hospital's EHR.

In addition to tracking CT exams, the EHR automatically runs a weekly report about patients who meet the program's base criteria, including previous CT scan types and dates, past diagnoses, and medical histories. The radiology director uses that information to identify program candidates to present to the Patient-Based Radiation Safety Committee — a group comprising the radiation safety officer, chief radiologist, and radiology director — which ultimately decides whether to enroll a patient in the program. "Every patient has different needs depending on their age, diagnosis, and clinical condition, so it's important to have people involved in reviewing the cases to make sure they are appropriate for flagging," Baghelai says.

### Engaged Consultants

Once a patient is approved for the program, the radiation safety officer mails a letter to the patient's primary care physician, explaining why the patient has been added to the program and encouraging the physician to consult a radiologist before ordering further imaging for the patient. At the same time, the radiology director flags the patient's chart within the EHR, initiating the BPA whenever a provider orders an additional CT for the patient. For instance, when an enrolled patient arrives in the ED with a possible concussion and the ED physician goes to order a head CT, the BPA will appear to encourage the physician to order a nonionizing exam or consult with a radiologist. If a patient reaches 10 CTs, additional safety measures ensue: the radiation safety officer sends a notice to and consults with both the patient and the provider, and the radiologists ask the provider to consult with them before ordering additional imaging for the patient.



A Best Practice Advisory pops up any time a referring physician orders a CT scan for a patient enrolled in the program.

ACR  
1891 Preston White Drive  
Reston, VA 20191  
703-648-8900  
[www.acr.org/Imaging3](http://www.acr.org/Imaging3)

©Copyright 2016  
American College of Radiology

Media contact: [pr@acr.org](mailto:pr@acr.org)

Continued on next page

## Case Study: Dose Control



Continued from previous page

The program has increased communication between radiologists and providers. Referring clinicians who have questions about ordering exams can consult directly with a radiologist. "Several times I've had these cases pop up where I'm not really sure which study I should order," Nolan says. "It's nice to talk through these cases with a radiologist who is an expert in the field." Likewise, radiologists who have questions about an imaging order will call the referring provider. "The program has brought radiologists to the table as full-fledged medical experts, not just doctors who perform and read tests," Hamel notes. "This consultative interaction allows radiologists to use their training, skills, and expertise to help design and deliver perfect patient care."

Baghelai says the program has exceeded expectations all around. "When we began developing the program, there was some concern that it could cause unnecessary alarm among our patients and referring clinicians," she explains. "But in reality, both patients and referring clinicians have accepted the program very well. It's been a positive experience to bring this level of communication and education to the community." Soon the radiology team will expand the program to monitor all patients, regardless of age, who have benign diagnoses and have received five or more CT scans.

### Next Steps

- Partner with your hospital's EHR team to build and attach advisories to patients' medical charts.
- Engage with referring clinicians early in the development process to decide whether the alerts will prohibit them from ordering CT exams and flesh out other program functions.
- Want to start the conversation about appropriate imaging? Visit [www.rscan.org](http://www.rscan.org) and plan a project with your referring clinicians.

### Endnotes

1. Smith-Bindman R, Miglioretti DL, Johnson E, et. al. Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems, 1996-2010. *JAMA*. 2012;307(22):2400-2409.
2. Harvey L. Neiman Health Policy Institute. Medical Imaging: Is the growth boom over? Oct. 2012 <http://bit.ly/1MXQY22>. Accessed Jan. 8, 2016.
3. Pearce MS, Salotti JA, Little MP, et al. Radiation exposure from CT scans in



Radiologists at Lakeland Health led an effort to develop a patient-based radiation safety program.

childhood and subsequent risk of leukemia and brain tumours: a retrospective cohort study. *Lancet*. Aug. 2012;380(9840):499-505.

4. Amis Jr ES, Butler PF, Applegate KE, et. al. American College of Radiology White Paper on Radiation Dose in Medicine. *J Am Coll Radiol* 2007;(4):272-284.

5. Birnbaum S. Radiation safety in the era of helical CT: a patient-based protection program currently in place in two community hospitals in New Hampshire. June 2008;5(6)714-718.e5

### Join the Discussion

Want to join the discussion about how one Michigan radiology group has implemented a radiation safety program to encourage referring clinicians to order fewer CT scans for at risk patients? Let us know your thoughts on Twitter at #imaging3.

Have a case study idea you'd like to share with the radiology community? Please submit your idea to <http://bit.ly/CaseStudyForm>.



Dose Control by American College of Radiology is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/). Based on a work at [www.acr.org/imaging3](http://www.acr.org/imaging3). Permissions beyond the scope of this license may be available at [www.acr.org/Legal](http://www.acr.org/Legal).

ACR  
1891 Preston White Drive  
Reston, VA 20191  
703-648-8900  
[www.acr.org/Imaging3](http://www.acr.org/Imaging3)

©Copyright 2016  
American College of Radiology

Media contact: [pr@acr.org](mailto:pr@acr.org)