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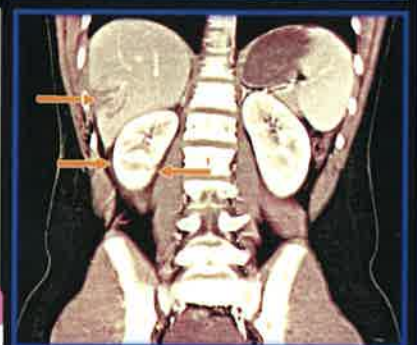


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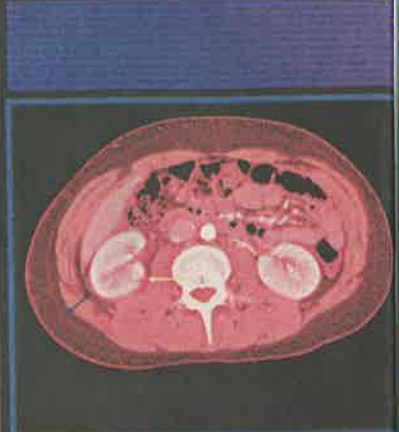
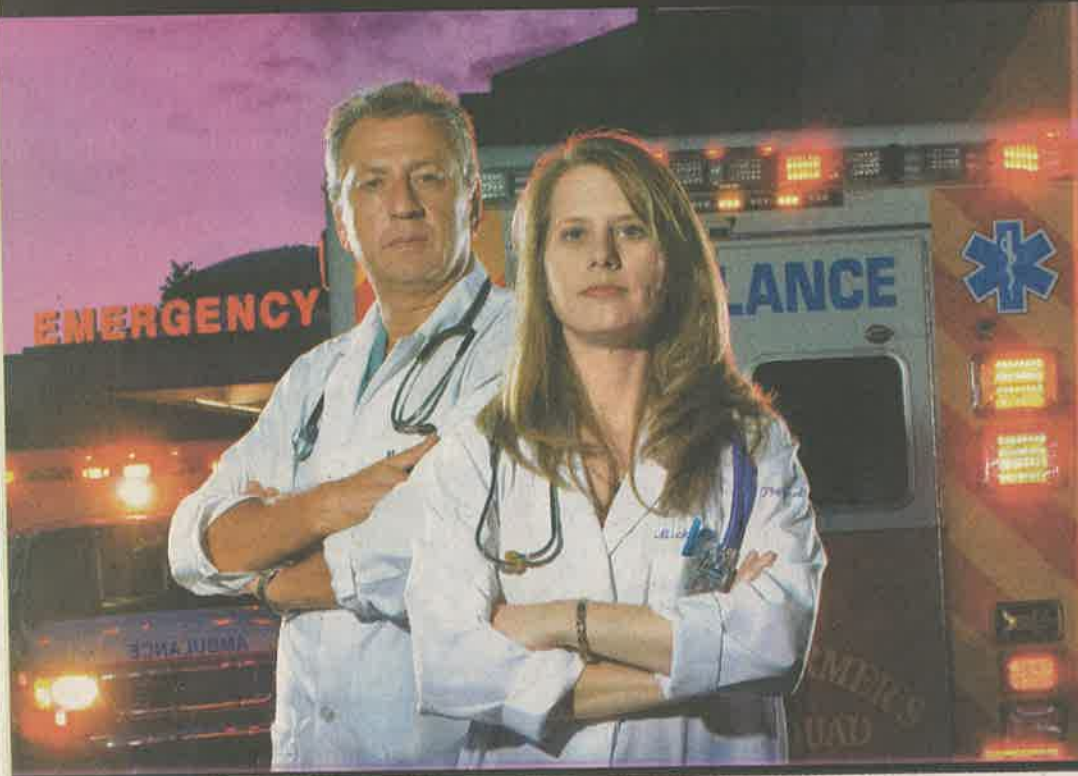
Imaging STAT!

CT and Sonography Rule
In the Emergency Room



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IMAGING, STAT!

A recent study finds that CT and sonography are the go-to modalities in the emergency department

By Heather Simons



In a single year, 111 million Americans visit the emergency department (ED), an increase of nearly 20 percent in the past decade, according to the U.S. Centers for Disease Control and Prevention. Forty-four percent of those patients—almost 49 million—undergo imaging studies.

The *Journal of the American College of Radiology* recently published a study, *Emergency Department Imaging: Current Practice*, in which John Thomas, MD, and fellow researchers evaluated the demographics and imaging practices of radiologists providing coverage for EDs across the United States. During a period of nine months, 678 surveys were emailed to radiologists.

The survey asked questions in three general categories—radiology group demographics, types of imaging studies performed, and imaging equipment physically located in the ED—and provided space for free comments at the end.

The results confirmed Dr. Thomas' suspicions. "They all said, 'We're getting busier,'" he stated, referring to radiology groups in both private practices and academic centers.

Of the 192 responses, 114 came from academic teaching hospitals, while the other 78 originated from private practices. More than half of the private practices surveyed perform 100,000 to 300,000 studies annually, while almost all of the academic centers perform at least 100,000 examinations, with about half exceeding 300,000 examinations per year.

The imaging equipment reported to be used most commonly in EDs are CT scanners (40 percent) and ultrasound scanners (27 percent). Speed was identified as a major advantage of having CT available in the ED—respondents reported shorter examination times, regardless of the number or type of body parts scanned.

SONOGRAPHY SURPRISE

One unexpected finding of the study was the high percentage of ED physicians who reported performing focused assessment with sonography for trauma (FAST) scans. The study revealed that 66 percent of ED physicians perform FAST scans in patients with blunt abdominal trauma. This finding surprised researchers, who expected that radiology still performed most FAST scans.

"There are an increasing number of ED physicians doing ultrasound on their own," confirmed Dr. Thomas.

With regard to treating pregnant patients, the study found that the majority of first-trimester obstetrical ultrasound scans are performed by radiology rather than ED or obstetrics department staff. Diagnosing acute appendicitis in pregnant patients presented what the study called a "clinical challenge"—no consensus emerged, Dr. Thomas said. While 35 percent of respondents said they prefer CT as the initial modality in such cases, 30 percent reported a preference for ultrasound, followed by CT if necessary; and 24 percent reported relying solely on ultrasound.

CONCERNS ABOUT CT

Interestingly, the free comments collected in the study focused mainly on a lack of thorough understanding and overuse of CT

scanning by ED physicians, as well as concern that imaging is often replacing physical examination.

The use of oral contrast in CT has ignited debates between ED physicians and radiologists for years—according to the study, some argue that it increases the risk for aspiration, delays patient scanning and is unnecessary in the evaluation of blunt abdominal trauma. Dr. Thomas said he was pleased with the survey's results, which found that almost half of the groups evaluated blunt trauma without oral contrast.

"It was heartening to see that most centers were not using oral contrast for the blunt trauma cases," he said, adding that recently published articles deem it unnecessary for that purpose.

The study found that only 28 groups (15 percent) ask for written consent prior to administering non-contrast CT or MR imaging scans, and 90 groups (47 percent) require written consent before performing the same scans with contrast-enhancement. Radiologic technologists are most likely to inform patients about the possible risks of CT scanning, while ordering physicians are more likely to inform patients of the purpose of CT scans, according to the study.

One current trend in the ED is the use of reformatted CT images. Forty-four percent of the groups surveyed used reformatted CT

images instead of conventional radiographs in the workup of cervical spine trauma, and 35 percent used them in thoracic and lumbar spine trauma. Within Level I trauma centers, those numbers rose to 78 percent and 82 percent, respectively.

"That's a big change," said Dr. Thomas. "Those things were not even on the horizon in the old surveys."

Dr. Thomas said he thinks the number of patients in the ED requiring imaging scans is likely to continue to swell. "A significant chunk of imaging does come through the ED," he said. "There is no

"A significant chunk of imaging does come through the ED. There is no question that technologists are going to be busier."

—John Thomas, MD

question that technologists are going to be busier." ■

In the following article, Senior Technical Editor Joyce Ward explores the use of 64-slice CT in evaluating pediatric trauma cases at Brenner Children's Hospital in Winston-Salem, N.C. And in a complementary feature on the ADVANCE website (www.advancweb.com/rad) Contributing Editor Stacy Stanislaw explores the growing popularity of ultrasound in the emergency department.

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TRAUMA IMAGING

On a Higher Plane

Sixty-four-slice CT is proving invaluable in the evaluation of trauma cases at a North Carolina children's hospital

By Joyce Ward, CNMT, RT(N)

sedation. While the detector rows cover at least 4 centimeters per rotation, children are typically imaged at a pitch of about 1.3, which allows coverage of 5-6 centimeters for every 0.4- to 0.5-second rotation. This pitch also permits uniform enhancement of vascular system injuries, he said.

MORE THAN ONE PLANE

The detailed volumes generated by 64-slice CT can be manipulated and reformatted into 2D slices into coronal, longitudinal, sagittal and other orientations. For instance, a physician looking for fractures in the spine would find it helpful to view data in the sagittal plane.

"Likewise, with a solid organ injury—liver, spleen or kidney-type injury—looking at it in the longitudinal plane ... sometimes really helps give a better feel for relationships with other structures," Dr. Barnes said, adding that CT can reveal how a rib fracture might be related to adjacent liver and renal injuries as well as the direction and force of the trauma.

"By being able to identify those different injuries, it also gives you an idea of where you might begin to look for other injuries that might be a little more subtle," he said.

In addition, some anatomy is better perceived in different planes. For example, the spine is better perceived in the sagittal plane than in the axial, while vascular structures such as the aorta are better seen in the sagittal and coronal planes, which reveal their relationship to other vessels, he explained.

Volume rendering (3D reprocessing) also helps provide information on the extent and relationship of injuries, as well as the age of fractures—an important ability in suspected child abuse cases—Dr. Barnes said, noting that the 64-slice CT's advanced capabilities help in grading severity of injuries to solid organs and helping physicians to decide whether liver, spleen, kidney or pancreas injuries can be managed conservatively or require more immediate intervention, he said.

"In large part, it is because of the CT that [physicians] can man-

When Brenner Children's Hospital upgraded from a four-slice CT to a 64-slice system in 2005, pediatric radiologist Craig Barnes, MD, was not sure his department would need so many detectors.

Indeed, 64-slice CT is considered most useful for cardiology imaging. For pediatric trauma cases, the less expensive but still powerful 16-slice CT is generally considered sufficient. But once Dr. Barnes and his three fellow pediatric radiologists began using the VCT made by GE Medical Systems, they found it to be highly useful.

As part of Wake Forest University Baptist Medical Center in Winston-Salem, N.C., Brenner is the region's only pediatric emergency and trauma center with equipment designed and sized specifically for children. The facility serves western North Carolina and surrounding areas in Tennessee and Virginia.

Vehicle accidents cause most of the pediatric and adult trauma cases that arrive at the hospital. For these patients, .65-millimeter isometric data from the system can be reformatted into highly detailed 2D and 3D images that provide increased confidence in image interpretation, said Dr. Barnes, also an assistant professor at the facility.

In addition, the system's speed reduces motion and respiratory artifacts, as child trauma patients are generally imaged without

age many of those injuries conservatively," Dr. Barnes said. "When we were blind to what was going on in the abdomen, it was not as easy to feel confident that you could sit on this one, as opposed to intervene more acutely with the other one."

ADAPTING DOSES

To reduce the dose in CT—always a concern in children—scanning is performed according to weight rather than age, using lower doses for lower weights. The mA is also modulated as the system rotates around the patient and adjusted for different parts of the body. For example, different parameters are used for the lungs than for the abdomen. In pediatric patients, the abdomen is imaged in a single pass unless reason exists to suspect injuries or leakage in the kidneys or urinary tract, in which case delayed images are taken.

Because of its ability to render data in different parameters, CT could potentially substitute for X-rays in some cases, Dr. Barnes said.

"Sometimes you can take the information and look at the spine



Three-dimensional volume-rendered posterior view clearly shows right renal laceration and right rib fractures on a single image. *courtesy Craig Barnes, MD*

or pelvis or other structures without additional radiation, if you take advantage of the volume dataset available from the CT," he said. This is one advantage of not only having the CT scanner

but also being able to manipulate the data on the fly using a thin-client server, he said.

All the images are available on the hospital's PACS system and the thin-client server, making them accessible to other physicians and surgeons for follow-up treatment. ■

Joyce Ward is the senior technical editor at ADVANCE. She can be reached at jward@advanceweb.com.

[REFLECTIONS]

REFLECTIONS *continued from page 9*

83 minutes in the control group and a 12-minute lag time to surgical intervention in the patients that received sonograms versus 90 minutes for controls.

Still, one cannot forget the potential limitations of non-imaging professionals performing sonography studies. There will always be patients who present with symptoms that don't fit the "textbook presentation" of a particular problem. In those instances, having only basic training in the use of a scanner for targeted applications could severely limit the diagnostic potential of the exam. In such cases the patient likely should be referred to imaging specialists who can perform a more thorough diagnostic sonogram and/or determine if another imaging study should be performed.

Sonography has had a major impact on patient care and workflow in the ED by changing the patient evaluation paradigm. Point-of-care imaging at the bedside performed by ED physicians permits safer and more cost-effective, more expedient care of patients and ultimately saves lives. ■

REFERENCE

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