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**DR. FINN MATHIESEN
STAYS POSITIVE ON
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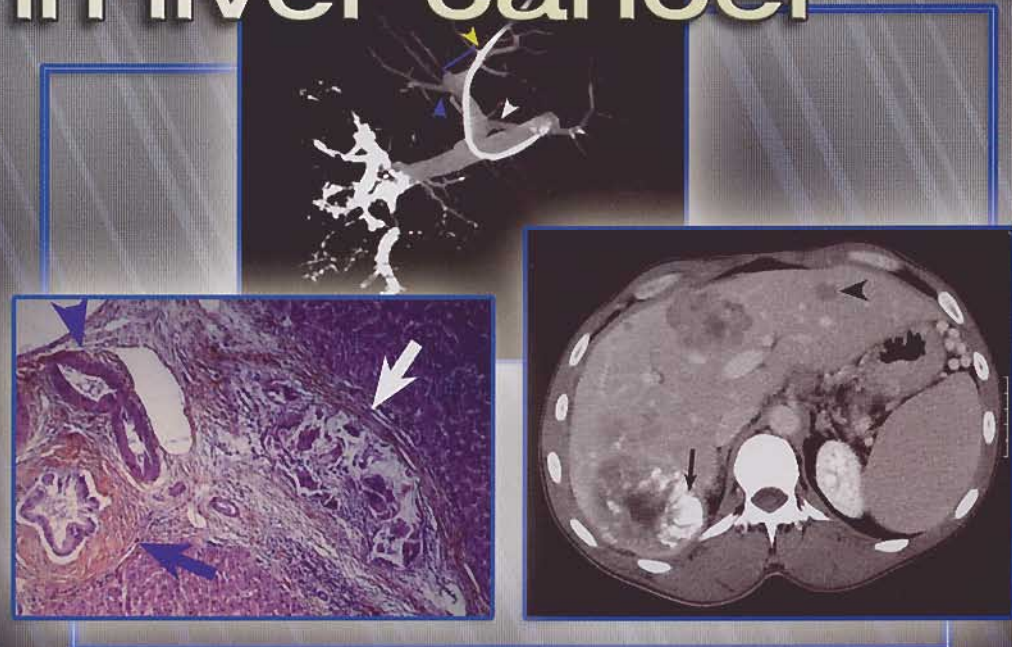
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ONLINE REPORTING BRINGS DANISH RADIOLOGISTS UP TO SPEED

Voice recognition expedites reports without need for tape transcription

Near-paperless communication and streamlined workflow have made same-day reporting a central part of routine practice at Vejle County Hospital in Denmark.

A switch to electronic requests and reporting, along with installation of speech recognition technology, has made it possible for 98% of radiology reports to be delivered the same day as the imaging examination. Reports relating to in-house patients are generally delivered to their electronic record before the patients have even returned to their wards.

"We have online reporting," said Dr. Finn Mathiesen, vice chair of radiology. "The image is available immediately, so the report must be as fast; otherwise, clinicians will decide what is on the image themselves."

A radiology department can be viewed as a simple black box, providing answers to clinical questions. The black box processing time—the period between a clinician's request (input) and a radiologic report (output)—should be kept to a minimum. This is achieved by reducing the total number of steps involved in generating and interpreting radiologic images, Mathiesen said at a symposium on PACS integration at the annual European Society of Gastrointestinal and Abdominal Radiology meeting in May.

A 1994 analysis of hospital workflow by the Danish Institute of Healthcare revealed that 18 separate steps, 35 people, and 101 minutes of hospital time were required to generate a

chest x-ray and report following the decision to request the examination. The new electronic regime at Vejle County has helped simplify the administration of this process.

"We are down to five steps now and just 10 minutes' work time," Mathiesen said at the meeting in Florence, Italy.

The switch to online reporting required five key elements: a common system for identifying patients, a standard for data transfer, access to secure networking, a simplified request-to-report workflow, and a method of speeding up reporting times.

The first of these criteria could be satisfied easily, due to the widespread

use of so-called central personal registration numbers (CPR) in Nordic countries. Every Danish citizen has a CPR that comprises their date of birth and a four- or five-digit number. These numbers are used widely in a variety of public documents, such as pension records and drivers' licenses. They also provide hospitals, primary-care practices, and pharmacies a means of identifying patients.

Secure electronic communication is also available to public healthcare professionals throughout Denmark through a closed electronic network known as DanNet. The National Board for Healthcare Communication (MedCom) has additionally developed a standard for communicating requests and reports, based on the internationally recognized EDIFACT standard for electronic data interchange. About 80% of clinical depart-



Same-day reporting has become a reality for Dr. Finn Mathiesen and colleagues at Vejle County Hospital.

ments in Denmark's six county hospitals now use this standard for placing requests to a radiology information system or returning a report.

The only paper remaining in the Vejle County Hospital radiologic workflow is a letter requesting patients to appear for their examination. Patients who need conventional x-ray examinations, which account for 80% of the radiology department's annual workload, are not sent these letters. They can simply show up at a time convenient to them.

"We could send booking invitations out by fax, SMS (cell phone text message), or e-mail, but we couldn't be sure that the patient would receive it, so we send letters," Mathiesen said.

Each electronic imaging request is read first by a radiologist to assess its appropriateness, optimal imaging strategy, and urgency. Secretaries handle the booking and associated invitation paperwork. Patients arriving for their scans check in with a receptionist and then undergo imaging by the radiography staff. The images are stored in the PACS for interpretation by a radiologist.

The final reporting stage is much faster following integration of Danish-language speech recognition technology in the RIS, according to Mathiesen. Radiologists can dictate, check, and sign off each report without waiting for tapes to be transcribed. The finished report should reach the referring physician within a minute of signing off.

The Vejle County radiology department is open five days a week, staffed by a 68-strong team that includes 12 radiologists, three residents, and eight office staff. About 110,000 imaging examinations are performed at the site each year.

"We have a lean workflow, we have a paperless department, and in most cases, same-day reporting," he said.

Images are also available for discussion. An autorouting feature directs current images and relevant

prior to the file folder of the next appropriate specialty conference. Radiologists can delete images to ensure that discussion focuses on only the most pertinent examples.

Potential users should not underestimate the challenges posed by the technology, however.

"In 20 years as a department chairman, voice recognition has been the hardest technology to implement and the most controversial among staff radiologists," Prof. James Thrall, radiologist-in-chief at Massachusetts General Hospital in Boston, U.S., told attendees at ECR 2005. "It is also the technology that has had the greatest simultaneous impact on reducing costs and improving quality of care and service. It is worth the time and effort."

Errors that occur in speech recognition usually differ from those resulting from manual transcription. Computers do not recognize some obvious errors, and although words are spelled correctly, they may not be the correct words. In addition, a radiologist who may already be overworked is asked to perform a function previously assigned to a secretary, he said.

Because some systems are complex and require substantial training, generating reports may initially take longer and render no immediate benefits to radiologists. A lack of integration between the speech recognition system and the RIS, as well as ergonomics considerations, are other important issues.

Thrall urged radiologists to make reports shorter, avoid words and phrases that can cause difficulties, and use simple, declarative statements. He stressed the need to limit vocabulary to the specific application; neuroradiology, for instance, has a different vocabulary than thoracic radiology.

Simplified language modeling improves accuracy, he said. ■

—By Paula Gould and Philip Ward

64-slice CT proves superior to 16-slice CT in virtual colonoscopy

CT colonography performed on a 64-slice scanner produces superior image quality and lesion delineation compared with examinations performed on a 16-slice machine. The newer technology's faster scan time also reduces motion artifacts, according to a scientific exhibit at the European Society of Gastrointestinal and Abdominal Radiology meeting in Italy in May.

Dr. Anno Graser and colleagues at the Ludwig-Maximilians University Munich screened 30 individuals in the prone and supine positions using a 16-slice scanner at a collimation of 0.75 mm, and 30 patients on a 64-slice system at 0.6-mm collimation.

Two independent expert readers using endoluminal views rated image quality on a five-point confidence scale. They assessed visibility, delineation of lesions, and anatomic details in four colonic segments: sigmoid, descending, transverse, and ascending.

The average examination time was cut by nearly 50% using the 64-slice protocol, from 15.5 seconds to eight seconds. The newer scanner produced no motion artifacts, while five were



Impressive results can be achieved with modern virtual colonoscopy systems. 3D endoluminal virtual colonoscopy display shows a pedunculate 9-mm polyp. (Provided by Dr. Perry Pickhardt University of Wisconsin, Madison)