In(telligent) Postprocessing Harmony

Second reader tools are seamlessly integrated into clinical care at the University of Munich, resulting in workflow enhancements.

By Kimberley Davidson

The Hospital of Ludwig-Maximilians-University (LMU) in Munich, Germany, is one of the largest in Europe, with 2,300 beds and 9,000 employees. There are two major hospital locations, Großhadern and the Downtown Campus, with 44 specialty clinics, departments, and institutes that cover a wide range of care services and specialties. The Department of Clinical Radiology at LMU Munich provides services to nine hospitals, two outpatient centers, and various conventional and interventional radiology suites. It operates 12 computed tomography (CT) scanners and 11 magnetic resonance imaging (MRI) systems, and has a comprehensive information technology (IT) infrastructure, with three picture archiving and communication systems (PACS) functioning in a heterogeneous, but fully integrated data network.

You can see the gleam of excitement in the eyes of Peter Herzog, MD, chest radiology fellow at the Institute of Clinical Radiology, as he describes the institution's imaging and information technology infrastructure. Herzog heads the Computer-Aided Detection (CAD) group, which is responsible for evaluating new technologies and supporting their transition into clinical care. Consequently, he was excited about the opportunity to install a server-based solution to provide centralized CAD processing for use in the PACS reading workflow.

CAD Integration

Herzog's relationship with CAD began in 2001 and continued as he became involved with the development of tools and techniques. He conducted several scientific studies focusing on clinical evaluation and improvement and presented the results at international congresses, including the Radiological Society of North America (RSNA), European Congress of Radiology (ECR), and the World Congress for Medical Physics and Biomedical Engineering. Over this period of time, he has seen CAD progress steadily. "CAD is unique because it's more than visualization; it's information," says Herzog. "CAD performance has really evolved from prototype level to a question of quality in the tight imaging workflow of today."

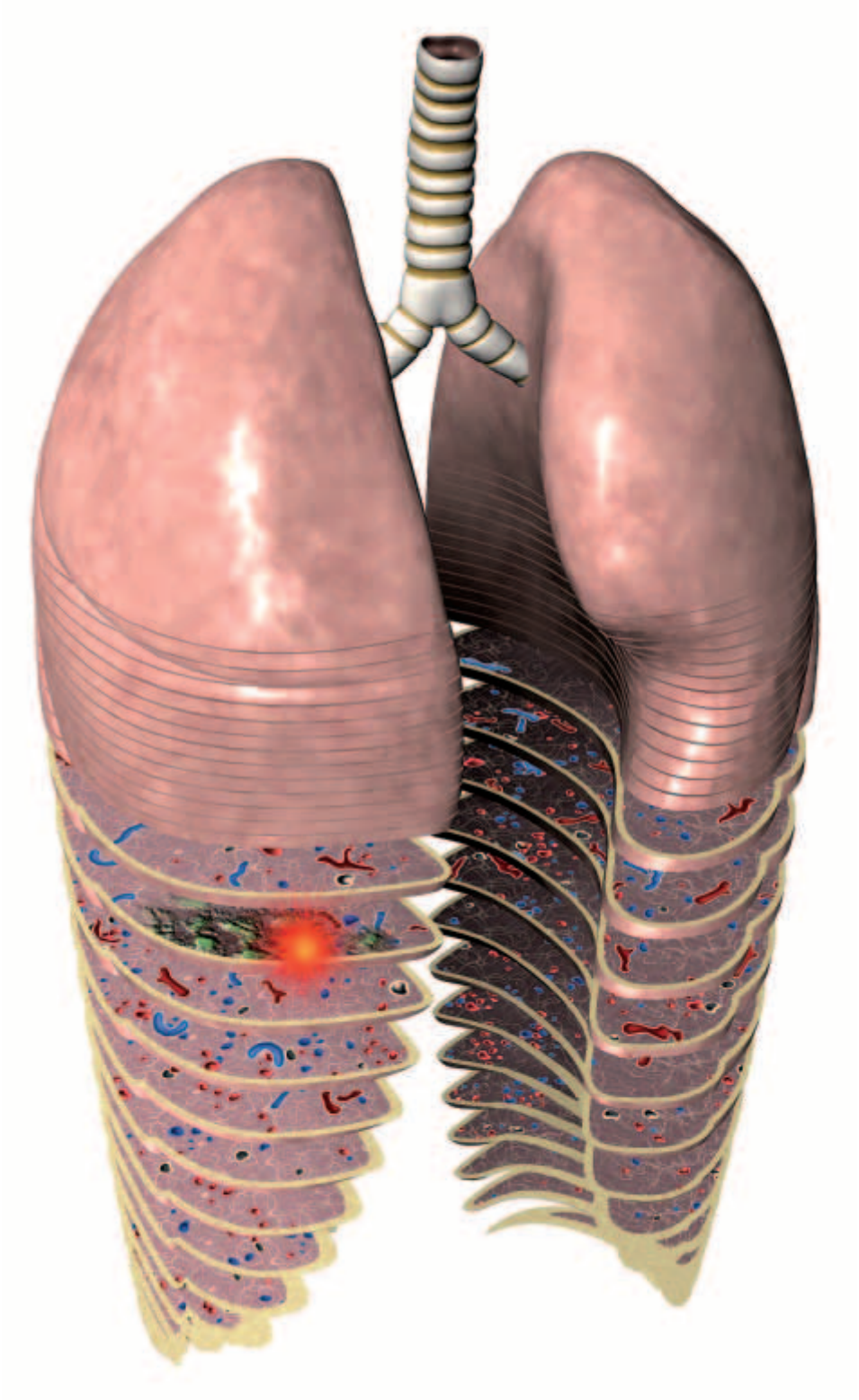
Starting in 2007, the Hospital of LMU Munich successfully integrated two CAD applications, *syngo*® Lung CAD and *syngo* CXR (chest X-ray) CAD[1], into the PACS-based clinical reading workflow. *syngo* Lung CAD is an automated detection software for diagnostic chest CT examinations. It searches for possible solid nodules in the lungs starting from three millimeters in size. *syngo* CXR CAD is used for the analysis of digital radio-

[1] Not available for sale in the U.S.

graphic images of the thorax. The tool helps detect potential nodules from eight to 30 millimeters in diameter.
All chest CT and chest X-ray scans are automatically sent to *syngo* CAD Manager[2], a software platform for CAD processing with *syngo* Lung CAD and *syngo* CXR CAD. After CAD processing is complete, the results are distributed back to the corresponding PACS, where the fully analyzed scan can be retrieved from the image server with the CAD results for display at the PACS workstation. The entire process is fully automated and does not require user interaction before the physician starts reading the case. Adapted display layouts are adjusted so the CAD results do not interfere with the reading workflow, where the radiologist first looks at the study and then at the CAD results. "CAD can now be considered an integral tool in our daily work," Herzog states. "If you read 50 chest CT exams a day, each containing 150 slices or more, you are reviewing 7,500 images. You want to examine every relevant lesion so that it is not overlooked, and with CAD, you can feel more on the safe side."

Complementary Detection Spectrums

The usage of CAD tools can substantially help reduce the number of lesions missed during routine chest CT and X-ray reading, according to Herzog. However, CAD cannot replace the careful review of the exam by the radiologist. "CAD points to a possible finding in an exam, but it's up to the physician to decide which lesions are actionable," says Herzog. "It is important to be aware that CAD also comes up



Second Reader tools and computer-aided detection software facilitate the review of thousands of slice images resulting from a CT scan.

[2] *syngo* CAD Manager is currently considered a non-medical device.

Dr. Peter Herzog can easily upload the reviewed images directly to his PACS workstation.

Summary

Challenge:
- Detection of lung nodules in chest CT and chest X-ray studies

Solution:
- Use of *syngo* Lung CAD and *syngo* CXR (Chest X-ray) CAD in the PACS reading workflow

Result:
- With CAD on PACS, the second reader CAD results are available enterprise-wide shortly after the scan is performed

Further Information

www.siemens.com/CAD

with false positive marks that have to be dismissed by the radiologist." Based on the specifics of the finding as well as on the clinical context, many nodules may not be clinically actionable, but good clinical care still requires looking at each finding and reviewing pulmonary nodules according to relevant guidelines. "We use CAD on every case, because I am not aware of a case where detecting nodules is irrelevant," he says.

"The complementary relationship with CAD is really beneficial," continues Herzog. "For lung CT exams, CAD focuses on small lung nodules, while large lesions that are over two centimeters are easily identifiable by a radiologist. The detection spectrums of the human reader and CAD are complementary and not substitutable." When reviewing chest X-ray, CAD helps identify larger nodules that are partially obscured by superimposed structures, he adds.

The impact on reading time is minimal, especially when using chest X-ray CAD. With CAD for chest CT, the radiologist needs to navigate to the areas detected by CAD, so there is a slight increase in reading time. Generally, the reading time varies based on a number of clinical parameters. For example, if the initial interpretation is done in five to ten minutes, then CAD, with a typical number of findings, may require an additional 30 seconds to one minute. "However, the added diagnostic confidence is well worth the time spent," says Herzog.

He continues to be excited about the advancement of CAD and is closely monitoring its usage in other healthcare fields. "In the future, the use of CAD will be a standard of care in almost all modalities," he says.

Kimberley Davidson *is a communications specialist for Siemens Healthcare and Syracuse University graduate, based in Malvern, Pennsylvania, USA.*