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Dose Performance Made Transparent

At "Krankenhaus der Augustinerinnen" in Cologne, Germany, dose standardization and optimization are key. As a result, dose management is becoming increasingly important. Frank Schellhammer, MD, Chief of Radiology, describes how the hospital is keeping X-ray doses as low as reasonably achievable.

Text: **Wiebke Kathmann, PhD,** Photos: **Sandra Stein**

The "Krankenhaus der Augustinerinnen" in Cologne enjoys a good reputation offering a broad spectrum of medical examinations.

As a Catholic hospital whose values are shaped by the rules of St. Augustine, "Krankenhaus der Augustinerinnen" focuses on the human being as a whole. Optimal medical and pastoral care of the patient are a top priority, and the hospital enjoys a good reputation offering a broad spectrum of medical examinations. Even though it is a regional clinic with just 300 beds, it is known for its convincing performance in surgery, internal medicine, as well as in gynecology, oncology, orthopedic surgery, and radiology. The department of radiology takes great pains to adhere to the ALARA principle that states X-ray doses should be "as low as reasonably achievable."

Frank Schellhammer, MD, Chief of Radiology and a neuroradiologist by training, is proud that his department is able to offer a broad radiological portfolio. He and his team perform oncological imaging, including tumor staging before and after chemotherapy, as well as image-guided tumor interventions such as liver embolization, thorax, and orthopedic or gynecological exams. For Schellhammer, a key goal is dose optimization over the complete radiology portfolio. And teamplay from Siemens provides a tool to support him and his team in reaching this dose management goal by offering clear and intuitive dose performance graphics.

Intuitive graphical user interface

Schellhammer considers teamplay a valuable add-on which he has come to rely on to quickly evaluate the dose performance of all CT scans in his department. He has developed a habit of looking over the past weeks' images before leaving his office on a Friday night. With teamplay, it only takes him a couple of seconds. The first screen gives a graphical representation of where he stands regarding dose. It tells him what percentage of the CT scans are within the dose limits of the national reference values. More important for Frank Schellhammer, however, are the dose limits he has defined for his institution. These institutional reference values are lower than the German national reference values and therefore have a better impact on patient care. "One glance tells me whether or not I

need to be nervous." Going one step further, he finds the information on when and why the scan was performed. He quickly finds all the data needed to evaluate a particular scan (organ, type of examination, individual scan, indication) and the answer as to why a specific scan required more radiation than normal.

Data transparency

Schellhammer uses teamplay in two ways: First, to rapidly identify any dose outliers and then retrieve specific exams for closer inspection. In the case of a retrieval, he can connect his PACS (picture archiving and communication system) via teamplay with the so-called PACS call-up functionality. With teamplay Dose, the right patient data is automatically detected and opened in PACS. This allows for factors such as patient shape and image quality to be checked and adjusted if necessary. "As we have a reputation for HIV-associated issues of lung function and we advertise low-dose CT scans of the thorax, I regularly use teamplay to check whether we are where we want to be in regard to the results of our low-dose protocols. teamplay lets me know how I perform in any given CT exam. It gives substance to my feeling about the performance based on true data filed from PACS and converts it into a graphic that is easy to grasp." As Schellhammer points out, teamplay's data-mining function is especially helpful as it uses real data from the modality itself. "It isn't calculated data and is therefore very reliable," he says.

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Frank Schellhammer, MD,
"Krankenhaus der Augustinerinnen",
Cologne, Germany

For Frank Schellhammer, MD, the dose limits he has defined for his institution are crucial. These institutional reference values are lower than the German national reference values.

teamplay Images is designed to offer a secure environment for clinical image exchange among peers for research and education.

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Frank Schellhammer, MD,
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Cologne, Germany

In terms of quality management, Schellhammer sees an immense advantage for patients in teamplay Dose. "We have a tool that objectifies our work. Quality management is no longer a report on a pile of paper archived in some folder. It is vivid and accessible, depicted in a graph representing information that has real substance and that I can base meaningful decisions on."

Of the various apps that teamplay offers, the radiology team in Cologne currently uses mainly 'Dose' and 'Usage'. Given that dose monitoring is essential for Frank Schellhammer, he uses teamplay Dose regularly and finds teamplay Usage especially valuable for larger institutions with more scanners as it then can be used for efficiency management. In general, teamplay Usage provides an overview of whether there are times during the day or week when the scanner is hardly used and thereby helps to organize usage more efficiently – critical in times of enormous budget pressures.

As the teamplay platform is constantly expanding, Frank Schellhammer is looking forward to using the latest 'Images' app.[1] teamplay Images is designed to offer a secure environment for clinical image exchange among peers for research and education. "At the moment, I can see a potential advantage in making it easier to share clinical images with colleagues at my institution and beyond," Schellhammer comments.

Clinical cases

Schellhammer illustrates three cases of teamplay as used in clinical routine in Cologne:

Case 1
This case describes backtracking an outlier: "While the national reference value[2] for a head CT scan in Germany is $CTDI_{vol}$ 60 mGy, our examination used $CTDI_{vol}$ 108 mGy," Schellhammer explains. "To justify this value, we need

to find the root cause," he continues. "When checking the clinical data, I saw that we actually did three scans (a native CT scan, a CT angiogram, and another scan post-contrast) to clarify the clinical situation. I can go deeper into the issue and double-check the indication. The issue here was impaired perfusion of the brainstem in a patient not suitable for MRI. Therefore, we fulfilled the goal of the CT scans to exclude relevant ischemia or vessel occlusion. Considering there were three examinations, we did well regarding dose."

Case 2

"Last week we performed a head CT scan on someone who had been involved in a fight. As we are located in the center of town with bars all around, we see quite a few emergency cases. In this instance, the patient was agitated and moved around quite a bit. Motion artifacts can be recognized during the helical scan and the double contour signs. Therefore, we had to rescan the patient several times in order to exclude a hematoma of the brain. In the end, he had three scans instead of one. The only other options would have been not to put him into the CT scanner and have him rest for two hours or to administer sedation, which was not really an alternative. We needed to make a clinical decision. Taking this into account, the dose outlier needed no further analysis."

1 Performing a lung biopsy assisted by CT imaging necessitated a further rotation to access the structure (case 3).

teamplay Dose provides easy access to current data and allows further analysis e.g., by modality and body part for continuous dose management.

Case 3

"The national reference level[2] for a general CT scan of the thorax in Germany is $CTDI_{vol}$ 10 mGy, regardless of the examination. It comes as no surprise that we were over the reference value when performing a biopsy of a conspicuous structure in the lung, a circular lung focus. Such an intervention can only be partially calculated: A further rotation may be needed to access the structure. Therefore, we were fine with an increase in dose in this case. It was more important to hit the structure and confirm the pathology than to comply with dose hygiene."

Today, teamplay is an extremely welcome and valuable tool in Schellhammer's daily routine. So far, he is not being compelled to undertake dose management to the extent he currently does. Most likely this will change in the near future. Yet, Schellhammer considers his responsibilities for dose standardization and optimization as part of his professional ethics – and does this gladly. ■

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Frank Schellhammer, MD,
"Krankenhaus der Augustinerinnen",
Cologne, Germany

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[1] Preliminary information. This product is not yet released for diagnostic use.
[2] Bundesamt für Strahlenschutz (Bekanntmachung der aktualisierten diagnostischen Referenzwerte für diagnotische und interventionelle Röntgenuntersuchungen), https://www.bfs.de

The statements by Siemens' customers described herein are based on results that were achieved inthe customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

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