Simplified radiographic imaging with myExam IQ

Getting diagnostic image quality faster and more consistently

The current challenges in radiology are especially apparent in radiography. That's why the Martha-Maria Hospital in Nuremberg, Germany, chose the innovative YSIO X.pree digital radiography system with myExam IQ that ensures diagnostic image quality and standardized images even under difficult conditions.

Conventional radiography is still the most common form of diagnostic imaging. Radiography is used more than twice as often as ultrasound examinations and more than four times as often as CT scans.[1] This also applies to the Martha-Maria Hospital in Nuremberg, Germany. The University of Erlangen teaching hospital doesn't have a trauma center, but its clinic for orthopedics and trauma surgery generates a very large number of orthopedic radiographic images.

In addition to the large number of exams in the daily routine, radiographic imaging also places high demands on the technologists who perform them. "This is definitely the most challenging branch of radiology," emphasizes Professor Wolfgang Wüst, MD, Head of the Institute of Radiology at Martha-Maria Hospital. "It's not like computed tomography, where you have a volume dataset from which you can pick the image and projection you need. And radiographic exams are often very difficult to perform: for example, when a patient can't stand properly or is in pain."

New challenges calling for new solutions

Another challenge is a general trend in orthopedics: Postoperative imaging is now performed much sooner than in the past. "We used to acquire images of a newly implanted prosthesis five or six days after surgery. Now we often see patients after just two or three days," explains Marco Gottschalk, Deputy Head of the technologists at Martha-Maria Hospital. "That's why the patients usually can't stand for very long, so we need a fast preparation and speedy image acquisition." On the other hand, standardization is especially important in postoperative imaging in order to make a precise comparison. Add to this the current shortage of skilled staff while more and more examinations have to be performed, and it soon becomes clear that radiography is facing enormous difficulties at the moment.

That doctors at Martha-Maria Hospital can nevertheless rely on diagnostic image quality and standardized images is largely due to the intelligent radiography system YSIO X.pree, which the hospital helped develop in 2020. "It was important to me to have the right equipment for all of our diagnostic imaging, not just in CT and MRI but also in radiography," Wolfgang Wüst stresses. "With YSIO X.pree, our radiography section is really well-equipped."

"The preset protocols are a huge advantage. They ensure that the system is always already in the right place and has the right presets. My team is very happy with the system and how smoothly they can work with it."

Prof. Wolfgang Wüst, MD
Head of the Institute of Radiology,
Martha-Maria Hospital Nuremberg, Germany

Intelligent support across the entire examination workflow

Development of the new radiography system included a complete revision of its predecessors' operating concept and imaging chain. For example, the automatic assignment of the correct protocol for each requested examination is based on a selective patient structure that's automatically transmitted via the RIS. This means that the right protocols for all required examinations are automatically applied or can be selected very easily. In addition, AI applications have been implemented for collimation and post-processing and can now be used in the clinical radiography routine for the first time. At the core of the solution is myExam IQ, a comprehensive imaging concept that uses intelligent dynamic range optimization and neural networks to enable smart technologies like auto-cropping and offer a selection of predefined Image Flavors in post-processing.

myExam IQ

YSIO X.pree's holistic imaging concept uses a variety of smart technologies to support the entire radiographic workflow and reliably ensure consistently high image quality. myExam IQ includes the following features:

- Auto-cropping with efficient detection of the collimator edges with the help of neural networks
- Intelligent noise removal enables low-dose settings for all clinical tasks
- Gridless imaging based on special algorithms and multi-frequency band processing
- Dynamic contrast optimization to compensate variations in object thickness, exposure, and the use of additional filters (for example, copper filters for pediatric images)
- Predefined Image Flavors for a standardized image impression.

Optimized results in free exposures

How YSIO X.pree facilitates the everyday work of the technologists is best illustrated by a series of typical examinations that are performed frequently at Martha-Maria Hospital. "Let's take chest X-rays, for example," says Gottschalk. "More and more patients come to us with a monitor and oxygen, and we increasingly have to take bedside images." In these cases, myExam IQ supports the technologists with an intelligent solution for gridless imaging. An algorithm filters the scattered radiation from the image data and enables diagnostic images with no additional dose, especially in difficult exam situations. "We use this primarily for free exposures with the patient lying in bed, and we achieve nearly the same quality as we do with a scatter grid," Gottschalk says.

In addition, YSIO X.pree also helps avoid retakes because even a slight angle between emitter and detector renders an image unusable when a scatter grid is used. With the help of position sensors, YSIO X.pree automatically detects these skews and displays the exact angle on the user interface. "No other system I know of can do that," Gottschalk says enthusiastically. "I get the information that the detector is positioned at 22 degrees, and then I can accurately set the parameters to ensure that the tube is really at a right angle to the detector. This is a great help in our everyday work."

Gridless imaging

Unlike most technologies available today, myExam IQ doesn't mimic the use of a grid; rather, it optimizes gridless images by reducing the appearance of scatter with a special algorithm based on multi-frequency band processing. This enables clear images with high contrast even in difficult situations, with no need for system calibration or other prerequisites.
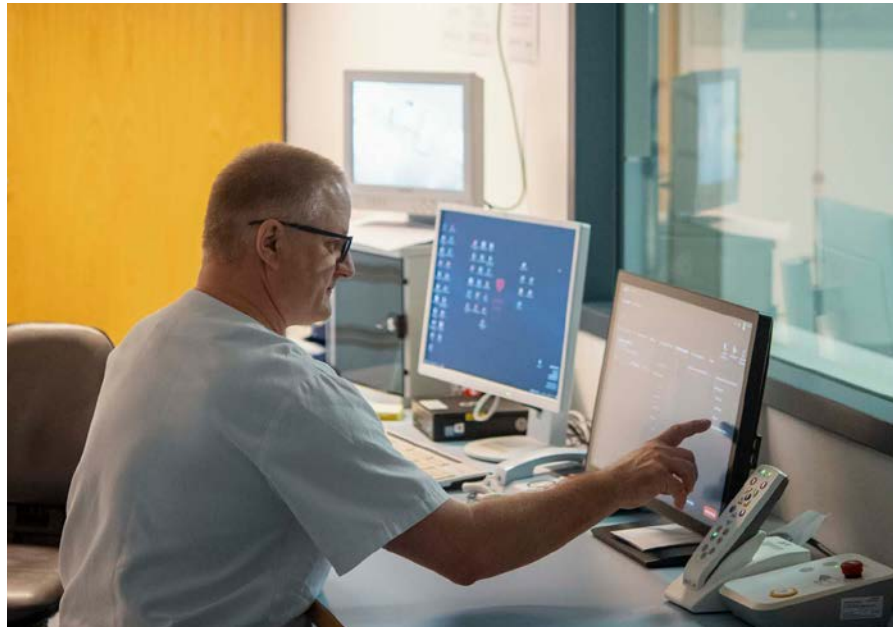
"I almost never have to window an image or post-process it in any way. The only thing I usually do is add some comments, for example regarding difficult conditions during the examination."

Marco Gottschalk,
Deputy Head of the technologists at the Institute of Radiology, Martha-Maria Hospital, Nuremberg, Germany

Fast and precise long-leg imaging

Another exam that's performed multiple times every day at Martha-Maria Hospital are long-leg images that are requested by the surgeons in endoprosthetics both before and after surgery. Great precision is required to enable the correct planning of a total hip replacement, for example. "As a maximum care arthroplasty center, we need to meet special requirements to ensure that our colleagues in the orthopedic department can use their software systems to calculate the angles accurately," Wüst says. "It's meticulous work they do there, and that's why we have to make sure to provide standardized imaging." The requirement is just as high when images are taken again for postoperative checks, but the circumstances are often more difficult. Many patients can only stand for a short time, and imaging in a standing position is often impossible. In these cases, the technologists also benefit from myExam IQ's fast workflow and reliable image quality: "Patient positioning, acquisition, image provision – it's all done really, really quickly," says Gottschalk. "And I can also perform the imaging with the patient in supine position, if necessary. That wasn't possible with our previous system."

Dose Adaptions

YSIO X.pree allows dedicated acquisition parameters to be defined for every clinical protocol for up to 22 age brackets, which are then automatically applied based on the patient's data. The dose can be modified even more with the Patient Size Adapter depending on the patient's shape. The AEC target dose can also be adjusted manually in steps of 0.5 EP to fine-tune acquisition parameters for each patient.

Presets for all protocols

YSIO X.pree doesn't just demonstrate its strengths in special imaging situations: It also facilitates the workflow of all types of examinations with the help of myExam IQ. Protocols for every examination can be predefined based on the standards of the institution and are then available in all exam situations – whether they're at the table, at the Bucky wall stand, or a free exposure. With the help of the Patient Size Adapter, the acquisition parameters can be easily modified with predefined settings (S, M, L, XL) depending on the individual anatomy of the patient.

Using this information, the system then moves automatically into the correct position for the exposures specified in the protocol – at the table or in front of the wall stand, at the appropriate distance, and with the right collimation. "If we need more adjustments, I can still make changes in the room at the collimator or system display," Gottschalk explains. "For example, a patient might be wheeled in who's very slim. But then I take the blanket off and realize that he has large pieces of metal on his leg in the fixator. In that case, I can still easily adjust the settings in the room."

Larger metal implants are also a test of the system's AI-assisted auto-cropping. "This automatic collimation based on density differences works really well in almost all cases: It's only with solid blocks of metal that I might have to make some quick adjustments on the touchscreen," Gottschalk reports. "But especially when it comes to the critical structures – for example, at the borders of a prosthesis or at the transition from the abdominal cavity to the lungs – we no longer have any of the problems that occurred with the previous system."

Auto-cropping

For its AI-based cropping algorithm, YSIO X.pree uses a deep neural network that segments the image into collimator and image areas in a binary segmentation map. Auto cropping is applied by default to free examinations without needing source image information or examinations with rotated collimator. It has a success rate of 99 percent.[2]

"To achieve optimal image quality with patients who can't fully cooperate is always a great challenge when you're pressed for time. This is where YSIO X.pree offers lots of support with its new functions and great flexibility."

Marco Gottschalk,
Deputy Head of the technologists at the Institute of Radiology, Martha-Maria Hospital, Nuremberg, Germany

Image Flavors for more standardization

YSIO X.pree not only offers preset protocols, it also provides ready-to-go image impressions that minimize post-processing steps. Based on the specifications of the institution, easily adjustable Image Flavors can be set to achieve the desired image impression for each protocol. This produces standardized clinical results with a consistent image impression, regardless of user-dependent variations during acquisition. "Because we've set this up very well with the help of the Application Specialists from Siemens Healthineers, we almost never have to window or perform any other kind of post-processing," says Gottschalk. "The standardized post-processing chain ensures that the image comes out exactly as we defined it."

For Wüst, this is a decisive factor, especially with respect to staff experience: "When you have varying levels of expertise, you need a device that can take the lead. That's why we're happy about a system that takes much of the work off your shoulders as a technologist and is intuitive to operate. Our technologists appreciate this a lot. I myself want to work with cutting-edge imaging systems, and the technologists are just as excited about using good equipment. It's great to hear from my team that everyone's happy." And Gottschalk is eager to point out that the patients also appreciate the smooth processes that YSIO X.pree enables with myExam IQ: "We hear this a lot: 'Oh, are you already done?'"

Image Flavors

myExam IQ offers easily adjustable Image Flavors that help align image impressions based on the clinical requirements of the institution. The preferred image impression can be chosen from 16 preset flavors for each clinical protocol, which can then be customized even more. With Dual Processing, the image is also automatically created in a second flavor that can be used to enhance certain structures.

"If you're looking for a high-end radiography system that masters the current challenges in radiography and makes AI applications available in everyday radiography, then you should definitely consider YSIO X.pree. Both from a diagnostic point of view and in terms of usability, we can highly recommend this system."

Prof. Wolfgang Wüst, MD
Head of the Institute of Radiology,
Martha-Maria Hospital Nuremberg, Germany

YSIO X.pree with myExam IQ enables fast long-leg examinations with maximum precision – even when large metal implants are involved.
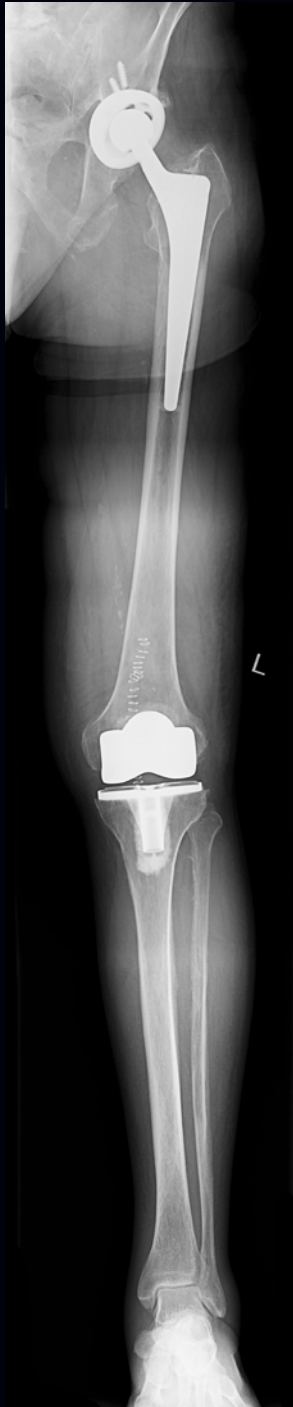
Immobile patients are a major challenge in radiography, but myExam IQ ensures diagnostic image quality in difficult exams: for example, in bedside chest X-rays with gridless imaging.

Study ID: 5aaa723

Courtesy of Martha-Maria Hospital Nuremberg, Germany

Study ID: 5aab178

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[1] *Diagnostic Imaging Dataset Annual Statistical Release 2018/19, NHS, p. 6.*
[2] *MAX detectors only. Data on file.*