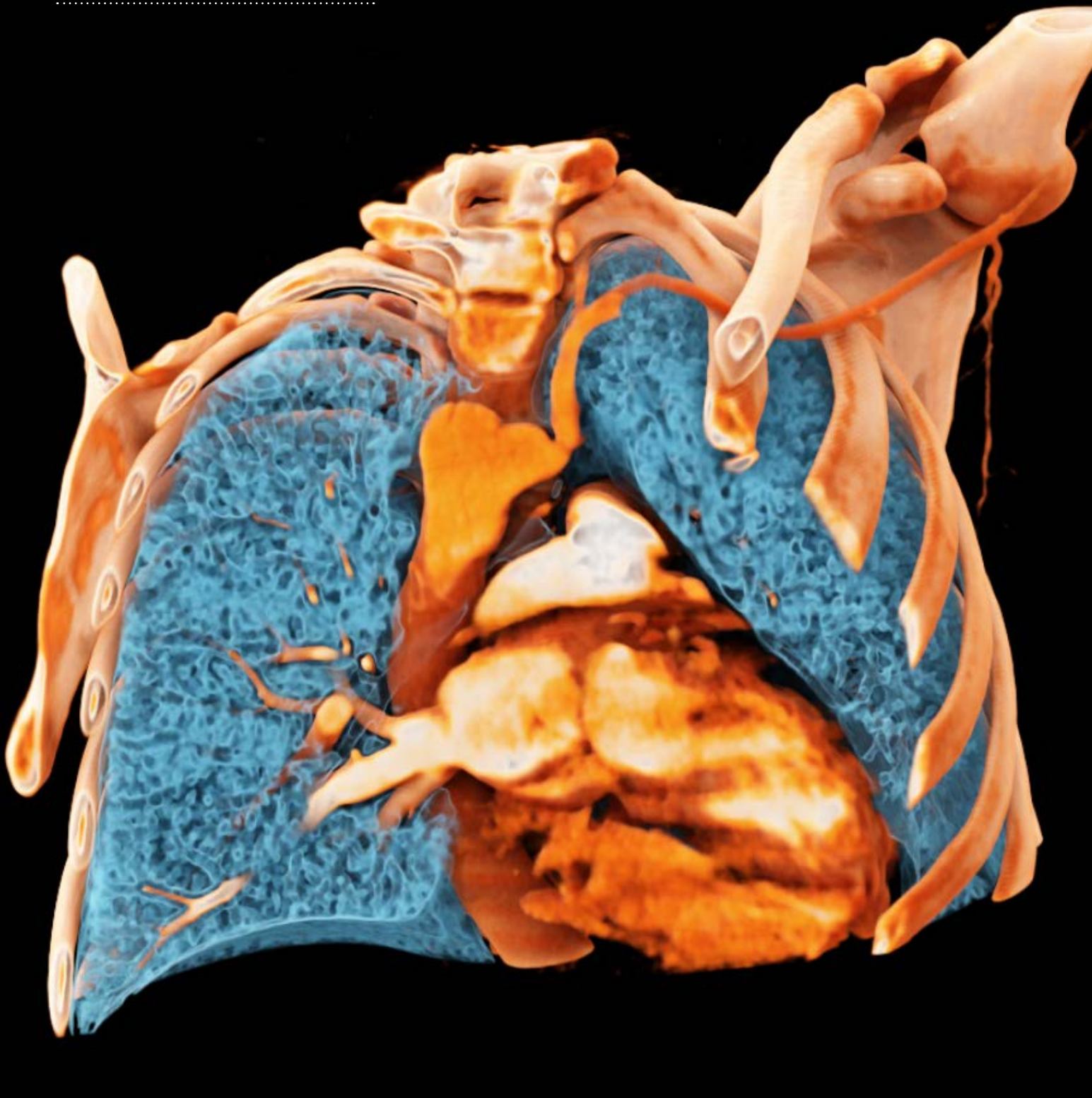
A cinematic rendering image created on *syngo*.via Frontier shows a right-sided aortic arch with aberrant left subclavian artery from Kommerell's diverticulum. Read more on page 54.
Courtesy of KGS Advanced MR and CT Scan, Madurai, Tamil Nadu, India



The Radiology Conundrum – And How To Handle It

It is no secret: To tackle the countless challenges that modern radiology is facing, daily routines and processes along the whole radiological patient journey have to be far more standardized and automated than they currently are. The reward will be better image quality, higher patient and staff satisfaction, lower radiation doses, and more efficiency. So what steps are necessary to transform vision into reality? The technology is there. Just ask the radiologists what they need.

Text: Philipp Grätzel von Grätz | Photos: Siemens Healthineers

While countries and their healthcare systems may differ, the demands that radiologists are facing all over the world are strikingly similar. For instance, radiologists and technicians have to diagnose more and more patients. In Europe and the US, this is a result of higher imaging demand plus consolidation processes in times of tighter budgets. And in growing economies like, for example, India, it is the overall patient numbers that are driving the increased workload on radiologists and technicians.

Workloads on the rise, expectations, too

Statistics and scientific analyses support this point. According to OECD data, between 2005 and 2014–2016, the average number of CT examinations per 1,000 inhabitants per year has risen in the US from 195 to 254.[1] In Denmark, it went up from 56 to 162, in Germany from 90 to 144, and in Canada from 102 to 157. This was not accompanied by a proportional rise in the number of radiologists. On the contrary, it is becoming increasingly difficult to find qualified doctors and technicians.

Research from the US suggests that the number of individual images that a radiologist, in theory, has to look at per minute has risen more than fivefold from 3 to 16 since the turn of the century.[2] It's no wonder, then, that a survey conducted in the New England region of the US found that a staggering one third of radiology residents reported feelings of burnout. In fact, the radiology department of Brigham and Women's Hospital in Boston has already created a wellness committee to lessen the risk of burnout and depression among staff.[3,4]

The challenges that modern radiology faces are not limited to increasing workload and the shortage of qualified labor. There is also a growing demand to keep up with quality standards and to document proper performance. Pressure is built up through reimbursement or legislation, or both. Two examples: In the US, there are serious efforts, for example with Medicare's Value-Based Payment Program, to shift the healthcare system from volume-based towards value-based reimbursement. And in Germany, a new radiation protection law came into effect in June 2017. It features, for the first time, a reporting obligation for radiological institutions when certain dose limits are exceeded.[5]

A case of cognitive dissonance

Digitization is a challenge for radiology, too. Although experts agree that artificial intelligence (AI) and big data analytics will not replace radiologists any time soon, there is some concern. In a recent interview at the European Congress of Radiology 2017, former ESR president Lluís Donoso of Hospital Clinic Barcelona recommended opening up radiological departments in the face of digitization.[6] "Radiologists," he said, "should become more active in multidisciplinary teams and more visible on clinical wards." This echoes the European Action Plan for Medical Imaging that the ESR published three years ago. It not only calls for better quality and safety, but also for more interaction with other medical providers – and with the patients.[7]

Most radiologists would probably agree with what Donoso and the ESR recommend. But the reality is different. For organizational and financial reasons, radiological departments are having difficulties shifting their discipline towards patient-centered care. A recent survey showed this very clearly. The researchers diagnose a severe disconnect between what radiology leadership espouses and what radiological departments currently practice. So here is the radiology conundrum: On the one hand, radiologists are acutely aware of how radiology should evolve to keep its position at the center of care. On the other hand, the actual efforts to get there are somewhat limited. Radiology, to give a diagnosis, seems to be suffering from cognitive dissonance.[8]

What radiologists want

Is that inevitable? No. If you ask radiologists and technicians, they know what to do. In essence, it's all about workflows and standards. Radiologists won't – or rather cannot – compromise on quality and safety. So they will explain that they want tools and processes to ensure high diagnostic quality and high degree of safety for every patient, the lean and the obese, the old and the young, the relaxed and the agitated. They want quality and safety to be constant

Stay close to the patient without interruptions to the workflow with touch panel tablets.

New Mobile Workflow – A whole new way to operate the scanner

- A whole new, flexible way to operate the scanner
- Stay close to patients when they need it most (e.g., in complex examinations)
- Keep a close eye on the patient with the integrated camera[1]
- Available for SOMATOM go.Now, go.Up, go.All[1] & go.Top[1]

in every situation, during the week, when experienced staff are available, as well as at the weekend, when younger doctors or less experienced technicians are on duty.

Radiologists also want fast and efficient workflows in order to avoid unnecessary delays to patient care. This will improve patient satisfaction and satisfy hospital management. At the same time, it will give the imaging centers more time to address the challenges they are confronted with. In Madurai, India, the radiologist K.G. Srinivasan has gained time by switching to a new CT platform, and he is investing that time in teleradiology and CT-guided invasive procedures.

Step one: Improve patient preparation

The good news is: The deficits in CT workflows that need to be addressed to increase efficiency, to make CT imaging more independent of the individual technicians' skill level, to reduce radiation dose, and to provide less fluctuations in image quality, are all well known. Let us start with patient preparation: It takes too long, in general, and it can be fairly cumbersome, since the technician has to go into the examination room, position the patient, then go back to the control room, select the program, and then sometimes reposition the patient. If a patient needs a series of examinations over a certain period of time, all positioning and programming has to be done again, and again, and again.

In an age of mobile communication and real-time surveillance, this could be much easier. A technician could be next to the patient and use a mobile device or a touch panel to

The product is pending 510(k) clearance, and is not yet commercially available in the U.S.

FAST Integrated Workflow[1]

- Automated patient positioning workflow powered by world's first FAST 3D Camera[1]
- Unique technology with smart algorithms bring a high-end workflow to high-end scanners
- The new FAST Integrated Workflow[1] is a seamless combination of FAST 3D Camera,[1] touch panels, and advanced applications
- Available on SOMATOM Force, SOMATOM Drive, and SOMATOM Edge Plus[1] scanners

Always keep the patient in view with the ceiling-mounted FAST 3D Camera.[1]

choose programs and adjust the settings. This would save time and increase patient satisfaction. Much of the positioning and parameter settings could be automated, which would allow less experienced technicians to take responsibility earlier and may reduce the likelihood of imaging errors due to lack of experience.

Automation could be based on the examination type, of course, but also on individual patient characteristics. It would be ideal if there was a tool that could be used to check the patient's position and measure individual body shape, including the abdominal height, to select optimal protocol settings and the correct scan range. This is not only about convenience: Research has shown that up to 95% of patients are not positioned accurately in the gantry isocenter.[9]

Step two: Optimize image acquisition

Next: Image acquisition. A lot can go wrong here. The amount of contrast media could be too high or too low; the radiation dose could be inappropriate; motion artifacts might occur; or image quality may not be sufficient. Whatever the problem, the result is unpleasant: An image might have to be retaken; results could be inconsistent in serial examinations; radiation dose statistics might be spoiled; or examinations turn out to be unexpectedly long.

None of this is inevitable. If examination protocols could become more standardised, not just in routine examinations but also in more advanced procedures such as cardiac imaging, this could limit the likelihood of operator-dependent imaging errors. Automated selection of tools like special filters and low kV tuning tools could help achieve optimal dosing, especially when a system is used that is technically prepared to enable a high number of dose permutations. (Read more on page 70)

Connectivity, too, comes into play here: If scanners and workstations are properly connected, it is possible to transfer proven and tested protocols between systems and thus standardize quality and dose across different scanners or scanning units. Not rocket science, again, but not every CT solution out there features this kind of connectivity. In CT imaging, single-scanner islands remain the standard geography in many places. (Read more on page 12)

Step three: Streamline postprocessing

Finally, image processing. Lengthy and cumbersome image processing is among the most important causes of reduced efficiency in radiology. Fast and reliable postprocessing tools can reduce the time a patient is on the system, and thus increase the number of patients diagnosed. A common user interface reduces the risk of error and, again, the time to operate. Dual Energy CT imaging is an area where much can be achieved through better postprocessing. Without remote workstations and with direct reporting, Dual Energy imaging would be less restricted to research scenarios and far more accessible for routine care.

So, here's the bottom line, or the finish: Yes, CT imaging can be standardized even more. And it should be – if consistent quality, low radiation dose, high throughput, and improved patient experience are the goals to aim for. Implementing workflow features like the ones above is not impossible, but so far it has not been done as widely as it could be. The reason is probably that progress in CT imaging has been driven by technological leaps forward in recent years. But important as the technology is – the patient perspective and the user perspective should not be forgotten. ●

GO technologies

- Comprehensive workflow automation to fully focus on patients
- Guidance through all procedures and zero-click postprocessing
- Dose-neutral Dual Energy[1] imaging integrated in clinical routine with automated, ready-to-read postprocessed results
- Check&GO helps to optimize coverage and achieve the right contrast distribution and timing

Philipp Grätzel von Grätz is a medical doctor turned independent journalist and book author based in Berlin, Germany. His focus is on biomedicine, medical technology, Health IT, and health policy.

References

[1] OECD.Stat, Health Database, http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT

[2] McDonald RJ et al. Acad Radiol 2015; 22:1191-8

[3] Guenette GP et al. AJR Am J Roentgenol 2017; 209:136-41,

[4] AuntMinnie.com 10/7/2017, Burnout among New England rads tied to residency year; http://www.auntminnie.com/index.aspx?sec=sup&sub-=imc&pag=dis&ItemID=117770

[5] Deutsche Röntgengesellschaft (DRG), http://www.drg.de/de-DE/3594/strahlenschutzgesetz

[6] AuntMinnie, 2/3/2017; http://www.auntminnieeurope.com/index.aspx?sec=rca&sub=ecr_2017 &pag=dis&ItemID=614137

[7] European Society of Radiology (ESR). November 2014. Call for a European Action Plan for Medical Imaging to Improve Quality of Care and Patient Safety. http://www.myesr.org/sites/default/files/ESR_2014_Call-for-Action-web.pdf

[8] Kemp JL et al. Radiology 2017; 20. Juni 2017; doi: 10.1148/radiol.2017162056

[9] Li J et al. AJR Am J Roentgenol 2007; 188(2): 547-52

[1] The product is pending 510(k) clearance, and is not yet commercially available in the U.S.
syngo.via Frontier is a research platform and not intended for clinical use.