

# Uniting Clinical and Business Virtues

Ask radiologists and cardiologists about the new SOMATOM Definition Flash computed tomography scanner, and first they will extol its clinical virtues: superb image quality; amazing speed; unprecedented dose protections. But what is becoming equally clear at medical centers around the globe is that it makes perfect business sense as well.

By Catherine Carrington



As the SOMATOM® Definition Flash computed tomography (CT) scanner debuts in its first worldwide installations, it is proving to be versatile, innovative, and reliable. And in the process, it is eliminating barriers to scanning even the most challenging patients, improving efficient use of healthcare resources through better diagnosis, streamlining workflow in key ways, and opening doors for CT to expand into new markets.

"The big advantage of this scanner is that there are tailored protocols for all patients, including those with high heart rates, those who cannot hold their breath, trauma patients, obese patients, and pediatric patients," says Nico Mollet, MD, PhD, a radiologist at Erasmus Medical

Center, Rotterdam, the Netherlands. "SOMATOM Definition Flash also gives you additional findings, so it's not only broadening the types of patients you can scan; it's broadening the kind of information you get from the scan." The system gets its name from its flash-fast speed. Equipped with two detectors, two X-ray sources, and a gantry that rotates in 0.28 seconds, the scanner boasts a temporal resolution of just 75 milliseconds (msec). Moreover, thanks to a unique innovation, the patient table no longer needs to slowly inch forward during scanning. Instead, in low-dose Flash mode, it can glide along at 458 millimeters (mm) per second while the scanner integrates data from both

detectors, achieving a gap-free scan even though each spiral is wide open. At the same time, the new scanner cuts radiation dose at every turn. Adaptive dose shielding blocks unnecessary X-rays at the beginning and end of each scan, cutting radiation dose by as much as 25 percent in every spiral scan.

## Split-second Thorax

The result, says Mollet, is that SOMATOM Definition Flash can scan the entire thorax in less than one second at a radiation dose of under two millisievert (mSv). Consider, for example, a patient who comes into the emergency room with chest pain and



SOMATOM Definition Flash delivers superb image quality at an amazing speed with unprecedented dose protections – and makes perfect business sense as well.



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shortness of breath. In a split-second scan, SOMATOM Definition Flash can help determine whether the culprit is a pulmonary embolism, a clot that blocks blood flow into the lungs. If physicians also suspect a possible heart attack, the scan can be timed to coincide with an electrocardiogram, providing crystal-clear images of the coronary arteries. Include the aorta in the scan, and it's possible to diagnose the third leading cause of chest pain, aortic dissection, in a single scan.

Rapid scanning is not only a clinical advantage; it also pays economic and operational dividends. Because SOMATOM Definition Flash is able to quickly evaluate patients with chest pain, it can help relieve overcrowding in the emergency room by identifying those who can be safely discharged home. Trauma patients can be scanned from head to toe in less than five seconds, quickly providing surgeons with the information they need. If patients are too sick to hold their breath or are on a ventilator, SOMATOM Definition Flash is fast enough to handle it. Even restless children are easier to scan, says Elliot Fishman, MD, Director of Diagnostic Imaging and Body CT, and a professor of radiology and oncology at Johns Hopkins Medical Institutions, Baltimore, Maryland, USA. "At Hopkins, we avoid using sedation for kids whenever possible," he says. "Scanning will be much easier in Flash mode. It's so fast, it just minimizes the chances of motion artifact."

### Cardiac Imaging Below One mSv

Nowhere is speed more important than in cardiac imaging. With its high temporal resolution, SOMATOM Definition Flash can freeze the motion of the heart. And in Flash mode, the scanner can capture all the information it needs during a single 250-msec pause between heart beats, at a dose of less than one mSv. For patients with high heart rates or irregular heart rhythms, the scanner is also equipped with the Flash Cardio Sequence, which captures images during the resting phase of several cardiac cycles, guided by the electrocardiogram.

At Erasmus Medical Center, the speed and versatility of SOMATOM Definition Flash

means that cardiac patients no longer need to be pretreated with beta blockers, medications that slow the heart rate and were once considered a must in order to achieve acceptable image quality. Starting an intravenous line, infusing the beta blockers and monitoring the patient is labor intensive and would otherwise tie up the scanner for some 15 minutes, Mollet says.

Cardiologist Stephan Achenbach, MD, a professor of medicine at the University of Erlangen in Germany, sees additional health system benefits. Perhaps 20 percent more patients can undergo cardiac scanning on SOMATOM Definition Flash than on a conventional CT scanner, he estimates. This can substantially reduce the number of patients going directly to cardiac catheterization.

Consider obesity, an increasingly common risk factor for heart disease. At some medical centers, obese patients are too much for the CT scanner to handle.

SOMATOM Definition Flash is up to the challenge. The 78-centimeter gantry and the heavy-duty table can accommodate patients up to 660 pounds (ca. 300 kilograms). In addition, with two 100-kilowatt X-ray tubes, there is enough power to deliver the dose needed for good image quality even in large patients.

SOMATOM Definition Flash can also be a centerpiece in marketing a cardiac program, in Achenbach's opinion. "It can really position you as the site with the best scanner that has the best temporal resolution," he says. "If the image quality is very high and you can do cardiac CT at a very low dose and have to turn away very few patients, it can definitely put you on the map as a cardiac CT center."

In the future, SOMATOM Definition Flash could open new doors for cardiac CT. For example, some of the first users conduct studies that verify the scanner's ability to evaluate myocardial perfusion. If the results prove accurate, CT myocardial perfusion imaging could be used to determine the clinical significance of obstructions in the coronary arteries, challenging nuclear scans for this purpose. At the same time, a radiation dose of less than one mSv raises the intriguing possibility of using SOMATOM Definition Flash for

cardiac screening, for example, in people who have a strong family history of heart disease. "Because of the low dose, cardiac CT could become like a colonoscopy – you do it to make sure there's nothing there," says Fishman. "The issue has always been dose. But now that the dose is so low, CT coronary angiography could become part of a routine cardiac workup."

## Dual Energy Dose Neutral

Dual Energy CT captures the imagination with its ability to simultaneously scan at two different energy levels while automatically revealing hidden information on tissue composition, blood flow, and function. But its benefits stretch beyond the clinical: By improving the efficiency of diagnosis and guiding the best choice in therapies, Dual Energy also has enormous economic benefits for healthcare systems.

Consider CT angiography. With a conventional CT scanner, it is difficult to differentiate the bright contrast material that illuminates the inside of the artery from calcium deposits in the artery wall. Dual Energy imaging can separate the two materials, revealing the true arterial contours. It overcomes a similar problem in the base of the skull, where thick bones interfere with visualization of blood vessels.

"With Dual Energy, bone removal is more elegant and can be done more quickly than with image reconstruction software," says Maximilian Reiser, MD, Radiology Chair and Dean of the Medical Faculty at University Hospital of Munich, Germany. "It cuts the time by at least half and requires less operator control. When you're short radiologists, that's important."

The new Selective Photon Shield makes that job even easier by better separating high- and low-energy images. This improves differentiation of bone and contrast material by up to 80 percent while cutting the radiation dose.

Dual Energy can even avoid the need for a baseline scan before contrast injection. The radiologist can simply perform a contrast-enhanced scan and use Dual Energy techniques to remove the contrast

from the image, creating a "virtual" non-contrast scan and cutting radiation dose by one-third to one-half. "We all recognize that the goal is to do the best study possible while using the lowest dose possible," Fishman says. "This scanner makes that easy."

Dual Energy also helps physicians choose the best therapies. For example, it can be used to detect whether a tumor is cancerous, based on whether it has developed a network of blood vessels to feed its growth. Similarly, it can gauge whether a tumor is responding to medications designed to shrivel that blood supply, so-called antiangiogenic therapy. By comparison, conventional CT can only determine whether the tumor itself shrinks in response to treatment. "We have found that the size may not change, even though the tumor no longer has a blood supply," Reiser says. "If you see no reduction in size and think that's a poor therapeutic result, you might stop therapy or increase the dose. Both would be a mistake."

## Summary

### Challenge:

- Minimize radiation dose to patients
- Expand the range of patients who can successfully undergo CT scanning
- Improve patient throughput in the CT department
- Minimize unnecessary procedures
- Establish position as a cardiac center of excellence

### Solution:

- Take CT capabilities to a new level through the installation of SOMATOM Definition Flash
- Establish protocols for patients with challenging clinical conditions
- Educate radiologists, cardiologists, and technologists in advanced imaging and dose reduction features unique to SOMATOM Definition Flash
- Educate referring physicians about expanded CT capabilities with SOMATOM Definition Flash

The ability to provide functional information in addition to anatomical detail means that Dual Energy imaging could reduce the need for multiple imaging tests under a variety of circumstances. That not only saves the patient from unnecessary radiation exposure but also improves workflow and reduces healthcare costs.

"For hospitals, it's very helpful to have a one-stop shop," Reiser says. "With Dual Energy, we frequently have enough information to make a diagnosis without additional tests."

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## Further Information

[www.siemens.com/SOMATOM-Definition-Flash](http://www.siemens.com/SOMATOM-Definition-Flash)

### Result:

- Dramatic increase in the range of patients undergoing CT, including those with a high heart rate, arrhythmia, trauma, or ventilator dependency, as well as those weighing up to 660 pounds
- Faster patient throughput as a result of subsecond scan times and a reduction in need for breath-holding instruction and beta blocker administration
- Better diagnosis leads to fewer invasive procedures, including a 20 percent reduction in patients who go directly to cardiac catheterization
- Dramatic reductions in radiation dose, including cardiac scans of < 1 mSv
- Marketing program can promote premier status of SOMATOM Definition Flash: highest temporal resolution, crystal clear images of the coronary arteries, lowest radiation dose in the industry, ability to image nearly any patient