

Real-time Dose Technology Measures Staff Exposure, Minimizes Risk

Technology will soon hit the market that provides real-time feedback about radiation exposure to interventional radiologists during fluoroscopy procedures and offers the promises of helping reduce radiation risks for both patients and staff.

TWO STUDIES—one in North America, the other in Europe—demonstrated the groundbreaking potential of technology featuring a real-time radiation dose display screen and individual wireless dosimeters worn by healthcare staff. Current technologies measure the radiation exposure for an entire month, which makes it difficult to pinpoint the precise time of a high-dose exposure.

“All of us work in radiation all day, so we’re always looking to reduce our risk of exposure,” said James Benenati, M.D., an interventional radiologist at Baptist Cardiac & Vascular Institute in Miami, Fla., and co-author of, “New Device for Interventional Radiology Team Dose Reduction Using Real-time Feedback,” presented at RSNA 2011. “This technology allows us to see how much radiation we’re getting every time we step on the fluoroscopy pedal.”

During the 22-week study at Baptist Cardiac & Vascular Institute, researchers using the technology discovered a downward trend in total accumulated weekly team dose per fluoroscopic minute (PFM). The attending, fellow, nurse, technician and anesthesiologist wore a dosimeter for every procedure. The mean team dose per PFM during the final 10 weeks—the open period of the study—was statistically less than the team dose during the closed phase (42.79 microSieverts (μSv) per minute vs. 19.81 μSv per minute).

Seeing the real-time radiation exposure allows team members to adjust their behavior during procedures, Dr. Benenati said. “With this technology, you’re watching every time you touch the pedal,” he said. “We’re able to act on it immediately. Everybody in the room is involved, so we can see who is getting the most or least exposure. You can look and say, ‘OK, I’m getting too much here. I’m going to move the shield or step back.’ It changes the behavior of the whole group.”

Researchers used the Philips DoseAware system, which resulted from a collaboration between Philips Healthcare and Unfors Instruments. The technology could be market-ready this year, Dr. Benenati said.

Real-Time Dose Display Measures Scatter Rates

A European study focusing on scatter dose also demonstrated the potential of real-time dosimeters in improving personal safety for healthcare staff.



(left to right) Jose Miguel Fernandez, Roberto Sanchez and Eliseo Vaño

Researchers in Spain evaluated a new occupational Dose Aware System (DAS) showing staff radiation doses in real time in several angiography rooms at Hospital Clínico San Carlos in Madrid.

“When specialists know the dose rate received at any time during their work, they can adopt protection strategies easily without compromising the success of the procedure,” said Roberto M. Sanchez, M.D., a medical physicist at Hospital Clínico San Carlos and lead author of the study, “Staff Radiation Doses in a Real-Time Display Inside the Angiography Room,” published in December 2010 issue of *Cardiovascular and Interventional Radiology*.

“This technology allows us to see how much radiation we’re getting every time we step on the fluoroscopy pedal!”

James Benenati, M.D.



Physicians exposed to radiation on a daily basis have long been concerned about minimizing the risk. Researchers in Spain evaluated the new Philips Healthcare occupational Dose Aware System (DAS) showing staff radiation doses in real time. Dosimeters (*bottom*) worn by healthcare staff members (*left, right*), wirelessly track radiation levels every second and relay them to a base-station screen mounted close to the diagnostic monitors, providing an opportunity to improve personal protection

Images courtesy of Philips Healthcare

Researchers used a DAS prototype that utilized dosimeters placed at shoulder level over the protective lead apron of the radiologist. Dosimeters wirelessly track radiation levels every second and relay them to a base-station screen mounted close to the diagnostic monitors. Another dosimeter was placed on the C arm to measure scatter radiation.

An easy transfer of the values to a data sheet permitted further analysis of the scatter dose profile measured during the procedure.

The cumulative occupational doses measured per procedure ranged from 0.6 to 350 μ Sv, Dr. Sanchez said. The dose rates recorded ranged from 1 to 5 milliSieverts(mSv)/h during fluoroscopy and from 12 to 235 mSv/h during digital subtraction acquisitions (DSA).

The mean cumulative dose measured at the C-arm during the trial was 1.04 mSv—10 times higher than the dose received by the radiologist (0.11 mSv per procedure). This difference was attributed in large part to radiologists stepping back or leaving the angiography room during DSA.

Researchers concluded that real-time dose display to staff members warns interventionists whenever the scatter dose rates are too high or the radiation protection tools are not being properly used, providing an opportunity to improve personal protection accordingly.

“Patients and physicians both benefit from this new tool,” Dr. Sanchez said. “For the radiation protection specialist, you can now record every second that a dose is received, which can also be valuable for researching dose reduction strategies.”

Although the mainstream media is currently focused on patient exposure to radiation, physicians have been concerned about their own exposure for decades, Dr. Benanati said.

“We’ve been looking for something like this for a long time,” he said. “Patients are the top priority, but the reality is that the vast majority of them will receive only minimal exposure to radiation throughout their lifetime. The physicians who are in the room every day are at a much greater risk from exposure to radiation.” □

WEB EXTRAS

☑ To access an abstract of the RSNA 2011 presentation, “New Device for Interventional Radiology Team Dose Reduction Using Real-time Feedback,” go to RSNA2011.rsna.org.

☑ To access an abstract of the study, “Staff Radiation Doses in a Real-Time Display Inside the Angiography Room,” in the December 2010 issue of *Cardiovascular and Interventional Radiology*, go to www.springerlink.com.