By Elaine Sanchez Wilson

THEY SAID THEY WANT A REVOLUTION!

Customer input inspired Carestream's new work-in-progress mobile x-ray system.

Radiologic technologists of today abide by the rules of universal precaution. They wear gloves. They bag detectors when going to patient beds to avoid the transfer of disease. They clean their equipment with detergent. But the mobile x-ray imaging unit they drive does not carry any of these tools.

At this year's meeting of the Radiological Society of North America, Carestream Health (Rochester, N.Y.) will preview a work-in-progress development that is the result of extensive market research and customer input. The CARESTREAM DRX-Revolution Mobile X-Ray System, which is not commercially available, is being developed by a design team that has committed to understanding the clinical side of its product.

The new DRX-Revolution will make a technologist's life easier by providing storage space for gloves, sanitizers, markers and paperwork. But the most outstanding characteristic of this new design is immediately obvious: a collapsible column that will slide down to the same height as the body of the portable unit. "This is a very simple thing, but nobody has been really able to produce it successfully in the past," said Diana L. Nole, president of the company's Digital Medical Solutions group.

"As many technologists can attest, there is a common fear of running into someone or something with a portable x-ray machine. The big column in the middle of the unit obstructs an operator's view," said Jimmy Ogle, product line manager. "Our concept was you need that column when you're positioning at bedside, but you don't need it when operators are driving the system down the hall," Ogle said. "In fact, it's a major hindrance."

"We discovered technologists didn't use the grid for mobile imaging because of the challenging workflow parameters. We wanted to be able to enable grid use because it can enhance image quality."

–Diana L. Nole, President of Digital Medical Solutions, Carestream Health

So Long, Square Box with Wheels

Carestream's path to the DRX-Revolution began with a more modest product, its DRX-based mobile retrofit system that allowed cash-strapped facilities to convert existing mobile systems to the wireless DRX detector. The design team then focused on building a new mobile x-ray system from scratch. "We wanted to take our time in developing our own portable x-ray imaging system and do something that nobody else had ever done before," said Ogle.

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–Jimmy Ogle, Product Line Manager, Carestream Health

"All portable units in the marketplace today, whether they are CR or DR, have an analog tube and an analog workflow. These systems are a square box with wheels that are used for bedside imaging. We really wanted to design and build the DRX-Revolution from the ground up to be a digital portable x-ray imaging system that was easier and more efficient for the technologist to use. All of the capabilities that are built into this new mobile system will be fully integrated so that we are really providing a more efficient process than the traditional analog workflow."

Nole said the development team—consisting of more than 80 people—kept the user in mind when creating the unit's ergonomic design. The team also considered how the system would be designed to incorporate use of a grid. "We discovered technologists didn't use the grid for mobile imaging because of the challenging workflow parameters. We wanted to be able to enable grid use because it can enhance image quality."

The company was also interested in improving imaging for intensive care environments. "These are the patients who get some of the worst x-ray images, yet they are often some of the most critically ill patients in the facility," Nole pointed out.

Tailored Design

Although it is usual practice for a product team to visit sites and compile a list of requirements, Carestream did things a bit differently. Software, hardware and engineering teams accompanied Ogle on more than 50 site visits, where they not only spoke with customers but also observed them conducting mobile imaging exams. Leveraging his own clinical background as a radiographer and radiology administrator, Ogle paid special attention to workflow processes and the challenges operators encountered in using existing mobile imaging systems. "We wanted to account for everything a technologist does at the bedside in our new design," he explained. Ogle even returned to customer sites and showed them design sketches to get their input. "We want to make sure our design addresses the needs users voiced and that we are being truly innovative with the product," he said.

The company traveled to large academic hospitals as well as small to mid-sized community hospitals in North America and Europe. Facilities had varying workflows, building designs and room layouts, which the product team wanted to take into account. "We wanted the design of this system to fit the needs of institutions of all sizes across the globe," Ogle said.

Better Images at Bedside

There are a number of differences between a traditional portable system and an x-ray room, Ogle said. With a portable system, the image receptor does not communicate with the tube head. Instead, the operator performs all the processes manually. Inside an x-ray room equipped with a DR system, the tube knows where the detector is, the detector knows how far the source-to-image distance is and it knows whether there is a grid involved. "In an integrated room, there is a lot of communication and information provided to the operator," Ogle said. "Our task is to develop a portable system that will have all the advantages of a room-based workflow in a mobile device you can use at the bedside."

For example, the same distance and technique is always used in a chest x-ray acquired in a room. With portable imaging, it may be perhaps 50, 60 or 70 inches from the tube head to detector, with no communication of information taking place. "What happens is when a radiologist or internist takes care of a patient in the ICU, and they compare images, they don't know if a change was caused by disease process or the way the image was acquired," Ogle said. "We're trying to standardize all that so that when clinicians make a decision, they know that the image they are viewing was acquired using the same technique. They know that they've used a grid to get the best possible image. Our desire is that the operator can actually look and see what was used on that patient yesterday."

Maneuverability was another key focus. When Carestream invited users to drive the prototype model, testers noticed that it ran very smoothly—actually it felt as if the unit was getting away from them. "This is why you really want customers to help you throughout the design process," Nole said. Now as a result of customer input, a pressure-sensitive handle adjusts to the operator's pace. "If you walk faster, it goes faster with you," Nole said. "If you slow down, it automatically slows down. The design team really tried to observe and think through all of those things."

Other DRX-Revolution features will include a 19-inch touch-screen monitor, a touch-screen tube head monitor, detector and grid holder. A dual-drive system will enable the unit to turn 360 degrees in constrained spaces.

An extendable tube head will enable the DRX-Revolution to provide enhanced bedside imaging.

The compact DRX-Revolution will have a collapsible column to improve visibility and safety during transport.

DRX Family Built Around Innovative Detector

When commercially available, the DRX-Revolution will be the newest member of Carestream's successful DRX family built around its innovative wireless DRX-1 and DRX-1C detectors. The family of solutions currently includes the CARESTREAM DRX-1 System, CARESTREAM DRX-Mobile Retrofit Kit, the CARESTREAM DRX-Evolution modular DR suite, the CARESTREAM DRX-Transportable System and the CARESTREAM DRX-Ascend System.

"We've built these digital x-ray systems around our popular DRX detector, which can be used in all our room and mobile-based DRX systems to maximize capital purchases and help organizations better manage radiology-related costs," said Nole. "I don't believe anyone else in the market has the breadth of flexible DR imaging solutions we can offer."

Availability of the DRX-Revolution in the U.S. is contingent upon FDA clearance, with worldwide availability anticipated in mid-2012.

In the meantime, according to Nole, customers that want to convert existing mobile systems to the flexibility offered by wireless DR can buy DRX-Mobile Retrofit kit upgrades. "This way, they can achieve the advantages of wireless DR functionality today. And if they buy a DRX-Revolution when it becomes available in the future, they can continue to use their existing DRX detector," she notes.

Elaine Sanchez Wilson is a contributing writer for *Imaging Economics*.