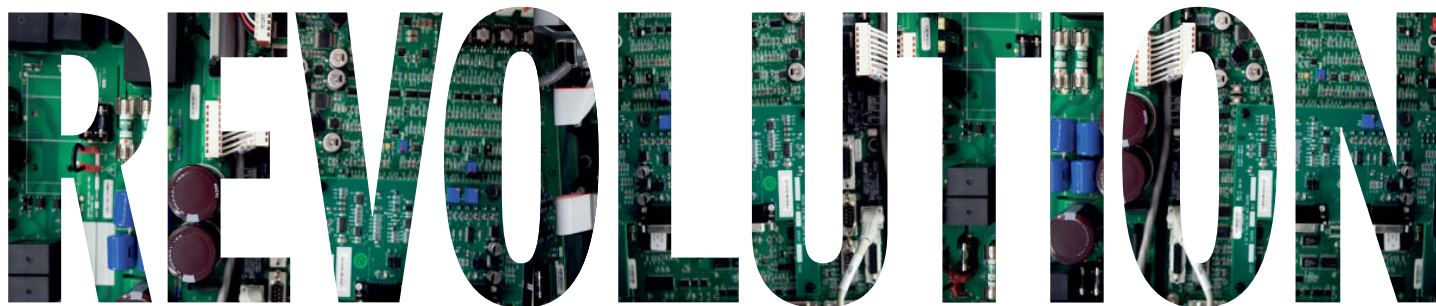


ROCNEXT

INSIDE THE

Carestream Health transforms from an X-ray film company to a leader in digital medical imaging



By Matthew Daneman
Staff writer

We've all seen the scene: The handsome surgeon, brow furrowed with concern, holds the X-ray transparency up to the light, squinting to identify the dark blob that only his deft scalpel will be able to excise.

Television and movie doctors still use a lot of X-ray prints. But in real life, the X-ray — following in the footsteps of everything from photography to music — is increasingly digital. And within that realm, Carestream Health Inc. has quickly muscled in to become a dominant force.

When the Rochester-based medical imaging company started in 2007, breaking off from Eastman Kodak Co., it was a considerable presence in the X-ray film business and in computed radiography, which creates a digital image instead of a physical X-ray print.

Today, much of Carestream's R&D — and an increasing part of its sales — are in the digital radiography universe, where an X-ray pops up almost instantly on screen.

That makes Carestream's DRX-Revolution the medical imaging equivalent of a point-and-shoot camera — instantaneous, digital, and incredibly portable. Perhaps not “fit in your pocket” portable — each unit



Chris Chang assembles the lower bin cover for the DRX-Revolution, a mobile digital X-ray machine, at Carestream Health's West Ridge Road plant. The Revolution has proved to be a big hit. LAUREN PETRACCA/@LAURENPETRACCA/STAFF PHOTOGRAPHER



Kurtis Fannon tests a finished DRX-Revolution at Carestream Health's plant on West Ridge Road. PHOTOS BY LAUREN PETRACCA/@LAURENPETRACCA/STAFF PHOTOGRAPHER

weighs roughly 1,200 pounds and is the size of a motel housekeeping cart — but able to be wheeled to a hospital bedside a lot more easily than the bed can be taken to the Radiology Department.

The Revolution has proved to be a big hit for the company, with assemblers at Carestream's West Ridge Road plant turning out five a day of the units, which cost anywhere from \$100,000 to \$200,000.

X-RAY 101

An X-ray machine is a camera that uses X-rays instead of light to make an image. The X-rays are absorbed by some materials and pass through others. When they hit a film cassette or X-ray detector, the X-rays that made it through create the image of an internal structure, such as the insides of a patient.

Computed radiography, or CR, uses an imaging plate instead of film, with that plate read by a laser in the CR Reader. The end result is a digital image, though it typically takes about the same amount of time as developing film did. Digital radiography, or DR, uses a digital detector system that instantly converts the X-rays into a digital image.

ABOUT THIS SERIES

Carestream Health is the 13th business to be featured in our Passport to Innovation series. It's noteworthy because:

- » It has set the bar technologically for many companies in the medical imaging industry.
- » Its products ultimately help patients live longer, healthier lives.



Tracie Miller works on a DRX-Revolution at Carestream Health's plant on West Ridge Road. The plant produces about five of the units a day.

ABOUT CARESTREAM

What: Medical film and digital imaging company headquartered in Rochester.

Key players: CEO Kevin J. Hobert; Digital Medical Solutions President Diana L. Nole; Global Medical Sales and Services Vice President Jianqing Y. Bennett; Medical Films and Printing Solutions President Marco Bucci; Dental Systems President Richard S. Hirschland.

Employees: 7,000 worldwide, including 1,250 in Rochester.

How Carestream measures success: According to the company, "One of our key measures of success is how well we do at providing the best customer experience. Do we understand their needs and exceed their expectations in ways that are meaningful to them? Did we help them improve patient care and enhance their operations? We obtain answers to these questions and more like them by engaging in constant dialogue with our customers."

Carestream in a word: Trendsetter

It's a line of business that, for Carestream, didn't even exist prior to 2012, when the company launched the product.

"We hadn't been in mobile X-ray and we had this (portable) detector which was great technology and didn't know how to apply it there," said Diana Nole, president of the company's Digital Medical Solutions business. "We learned about all the issues with today's technology ... and tried to solve all of those in a different way."

It is also one of the products that has given the Rochester-based medical imaging company a David-like presence vs. some medical industry Goliaths.

In the digital radiography universe, where X-rays are turned instantly into digital images the way your photo pops up instantly on your digital camera's screen, Carestream has a 16.4 percent market share — more than such household names as GE, Phillips and Siemens, according to data from health-care market research firm Frost & Sullivan.

Much of that market share, said Nadim Daher, Frost & Sullivan's advanced medical technologies principal analyst, comes from Carestream's presence in the retrofit market of turning traditional X-ray rooms into digital ones, where it has a 35 percent market share.

In mobile digital radiography, or DR, Carestream went quickly from not being a player in the field to having nearly an



DRX-Revolutions are in the process of being assembled at Carestream Health's facility on West Ridge Road. LAUREN PETRACCA/@LAURENPETRACCA/STAFF PHOTOGRAPHER



Carestream introduced the DRX-Revolution in 2012. PROVIDED PHOTO

eighth of the market thanks to Revolution, according to the most-recent Frost & Sullivan numbers.

Being a smaller medical imaging company, "It's taking advantage of that to come up with some smart products ahead of the competition," Daher said.

EMERGING FROM KODAK

Carestream was born when a Canadian holding company, Onex Corp., bought Eastman Kodak Co.'s Health Group.

Today, Carestream sells "a very minuscule amount" of its products under the Kodak brand, having rebranded most and phasing out the rest, spokesman Robert Salmon said.

Kodak said it didn't have the resources needed to put into Carestream. Nole said that post-Kodak, Carestream has been more entrepreneurial and focused on beating the competition. "We were really encouraged by our board to listen to customers, to be innovative, to look for growth," she said.

Carestream employs more than 1,200 locally, including roughly 100 full-time assembly workers at its Ridge Road plant. The site also houses Carestream's product development and R&D functions, its service engineers, and its U.S. call center.

Out of that Ridge Road site flows a variety of Carestream products such

as its Revolution, Evolution X-ray room equipment, its computed radiography Classic and Elite systems; and such consumables like the phosphor sheet used in its computed radiography systems.

A considerable portion of Carestream's business still is tied to film for such customers as dental offices and developing markets, said Helen Titus, worldwide marketing director for Carestream's X-ray solutions operation.

While much of the company's and industry's efforts are focused on DR, "There's a whole segment of the market that hasn't gotten there yet — the smaller offices, the chiropractors, the vets, the emerging markets," Titus said. "There's a lot of people using film."

However, Nole said, "We think they will adopt (DR). It's just a matter of time and what kind of business model you might go to with them. Who is the last person using film? It could still be 10, 15, 20 years out in the future. The first (computed radiography product) was placed in 1991, and we still say probably half the global market is still on CR today, 25 years later. It takes a while. We'll probably still be selling CR for the next five, 10, 15 years (though) it will get smaller and smaller."

Almost every hospital still uses some film, particularly for niche, less-common procedures such as kidney contrast exams, said James Burns, director of advanced development and strategy: "There are few that are totally digital."

NEW USES FOR FILM

Carestream's R&D spending on traditional legacy products like film and CR is focused more on improving its existing lineup, like a computed radiography product coming out soon that is scaled down to desktop size, for use in small office medical practices. "Some people might not describe it as innovation," Nole said. "I believe it still is because I think innovation is various types of things, not just technology."

And in Carestream's film business, Nole said, much of the company's focus is on finding new uses and markets for its film assets. "The same type of technology used to make film can be used to make touchscreens, solar panels, similar kinds of things," Nole said.

Instead, much of the company's R&D efforts today are on new applications and technologies for DR, including even greater portability, as well as the emerging possibilities of 3-D imaging, where a variety of low intensity X-ray doses result in a 3-D diagnostic image, though the total radiation exposure to the patient isn't any more than a traditional X-ray.

"We're probably spending a lot more with digital radiography or three-dimensional (imaging) because you're trying to discover," Nole said. "It's a lot more discovery and research. The other spaces are probably redesign."

The company has been meeting for some time with medical professionals as it gets feedback on various designs for 3-D medical equipment — much the same

kind of focus group-like approach it took to designing its Revolution.

Beyond hospital bedsides, the company also is pushing more heavily into sports medicine. Carestream has installed digital X-ray systems at the Green Bay Packers' Lambeau Field, the San Diego Chargers' Qualcomm Stadium, and at the Buffalo Bills' Ralph Wilson Stadium.

"We envision you'll be able to take a device into the stadium and the locker room," Burns said. "Today all the NFL teams have a traditional X-ray room, but they'd have these 3-D things where you can look at a player who has gone out with a twisted knee — how severe is that injury? Those are things we are working on."

Further down the road, he said, the company is looking into the ways X-rays interact with objects. X-ray images today come from the contrast between what X-rays are absorbed by the body and what hit the detector or film. But X-rays also go through a phase shift as they pass through the body. "That actually is more sensitive ... than absorption information is," said Timothy J. Wojcik, Carestream research program leader.

In R&D, "We try to cover the horizon," Wojcik said. "We have projects and technologies that will be out in the market in the next year. We also have stuff that's probably five years out that is more breakthrough in nature. "We don't try to just do what's going to help us next year and help our sales next year."

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PASSPORT TO INNOVATION: CARESTREAM HEALTH

DRX-1 was make-or-break product for firm

By Matthew Daneman
Staff writer

The DRX-1 is about the size of a sheet pizza box and weighs about 8 pounds.

And it revolutionized the way a doctor figures out if that aching toe is horrendously stubbed or broken.

Before the DRX-1, getting an instant digital X-ray image meant buying a digital X-ray room — easily a \$350,000 to \$450,000 investment for a hospital.

But Carestream Health Inc.'s DRX-1, which debuted in 2008, fits in the same slot where X-ray film cartridges or computed radiography cartridges sat. And it transforms a film or computed radiogra-



Worldwide Growth Business Manager Jimmy Ogle explains how the DRX-1's detector works at Carestream Health on West Ridge Road.

LAUREN PETRACCA@LAURENPETRACCA/STAFF PHOTOGRAPHER

phy X-ray room just by plugging in. X-rays passing through the patient hit the DRX-1, which then translates the results into a digital image instantly.

It also revolutionized Rochester-based medical imaging company Carestream. “It was a big turning point” for the company, said Diana Nole, president of the company’s Digital Medical Solutions business. “It was a big investment, a big risk. But it was something where, if we weren’t successful with that, we probably wouldn’t be in DR.”

The vast majority of Carestream detectors are 14 by 17 inches — pretty much a universally standard size for most X-ray diagnostics. It also has put out a smaller detector primarily for pediatric use, and a larger one for bigger patients.

The DRX-1 also kicked off an array of related products — a full, in-room DR system designed around the wireless detector, also released in 2009; then multiple versions of a digital X-ray room system; and then the wheeled mobile Revolution digital X-ray unit in 2012.

Today, Carestream still dominates the retrofit market, with more than a third of the market share, though competitors have come up with their own offerings, said Nadim Daher, an analyst with Frost & Sullivan.



Carestream DRX-1 System. PROVIDED PHOTO

But in general radiography, “We are followed more than we follow,” said Jimmy Ogle, advanced radiography global business manager. “We lead the world to movable portable detectors. Everybody’s been catching up with us.”

However, the DR world is getting increasingly more competitive, with

Samsung pushing harder into digital radiography, Nole said.

“My biggest fear that keeps me up at night is we’ll rest on our laurels,” she said.

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