



Raising the Bar

The Hospital for Sick Children, commonly known as SickKids, is recognized as one of the world's foremost pediatric healthcare institutions. Located in downtown Toronto, SickKids employs 9,600 people, with more than 14,000 admissions, 11,000 surgical procedures, and more than 5,000 interventional radiology procedures each year.



It is a teaching hospital for the University of Toronto. The hospital's research institute is the largest children's research facility in Canada, employing about 2,000 people. The research institute is known for its work in stem cells and childhood cancer. The Siemens Artis zeego is the hospital's newest and most technologically advanced angiographic imaging equipment.

Teamwork between Siemens and doctors at The Hospital for Sick Children in Toronto is leading to lower radiation dose and better outcomes for patients and staff alike.

By Ron French

When The Hospital for Sick Children (SickKids) in Toronto entered negotiations with Siemens Healthcare, they were doing more than shopping for a new piece of imaging equipment. They were creating a partnership. Installation of the Siemens Artis zeego in October 2010 gave SickKids, Canada's leading center dedicated to advancing children's health, state-of-the-art 2D and 3D imaging and more precise dose control for both patients and staff. But making the most of that technology took more than flipping a switch. Interventional radiologists Bairbre Connolly, M.D., and Joao Amaral, M.D., continue to work with Siemens engineers to modify the equipment to meet

the hospital's needs. The doctors call it an "evolving" process that continues to help improve the hospital's – and Siemens' – ability to serve children of all ages. "There's a learning curve for physicians and Siemens," says Connolly. "The whole world of imaging has evolved."

New Technology, New Challenges

Image resolution continues to increase, but so do concerns about the cumulative effect of radiation to patients. Radiation exposure per capita has more than doubled in the past 20 years in the United States, according to a report by the National Council on Radiation Protection and Measurements.

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Joao Amaral, M.D., Pediatric Interventional Radiologist, SickKids, Toronto, Canada



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That same report revealed that nuclear medicine imaging, CT and interventional radiology account for a quarter of imaging procedures in the United States, but contribute 89 percent of total radiation exposure.

Interventional radiology uses imaging to provide guidance during minimally invasive procedures, particularly in cardiovascular medicine, cerebrovascular medicine, transplant and oncology, as well as for line placement and other procedures involved in the diagnosis and treatment of a wide variety of conditions. “There’s increasing concern about the adverse effects of radiation,” says Connolly, who grew up and trained in Ireland before coming to SickKids in 1993. “People are now looking at ways of reducing dose as much as possible because of the long-term effects.” That challenge is even more vital in pediatrics. “Kids have a longer life span to show the adverse effects from radiation,” Connolly says. There is also growing research that children are more susceptible to the negative impact of radiation. “Some people believe cells in children are up to five to ten times more vulnerable to the effects of radiation,” adds Connolly. “It’s crucial that we lower dosage as much as possible.”

Lower Dose and Better Workflow

Siemens has long been a leader in dose reduction. Artis zeego, the flagship of Siemens interventional imaging equipment and the only system in the market with robotic technology, and the Artis zee system family offer unparalleled dose savings and image quality. Design characteristics of Artis zee enable ergonomic, streamlined, efficient

operation, all of which support dose reduction. All systems come equipped with the Siemens' CARE applications as a standard, providing the operator an extensive set of features to reduce radiation dose. Users can optimize system parameters such as exposure time, photon energy and others to match clinical needs while making the dose as low as reasonably achievable.

The room with the Artis zeego system is also equipped with a Siemens Artis zee Large Display. The 56" monitor can display images in different sizes providing the physicians with a larger view of the anatomy. Also new for SickKids are the 3D rotational angiography features and *syngo* DynaCT to provide soft tissue images during the procedures. Connolly notes the new capabilities of portrait and landscape imaging and virtual CT were not available.

SickKids installed the Artis zeego in a hybrid room, giving clinical teams easy and efficient patient access in a suite with state-of-the-art imaging equipped with OR standards. Both physicians use the room for different types of procedures.

An Evolving Partnership

Siemens didn't just hand over the keys to the shiny new Artis zeego and walk away. Company engineers have been a regular presence in Toronto, learning the unique needs of doctors here while physicians adjust to the new technology.

It has been a learning experience for everyone. "There are so many things you can change on the new equipment, the software and the computer behind it that it takes a fair amount of time to get the image right," says Amaral,

who trained in Brazil before coming to Canada to work at SickKids. "Companies make machines for adults. You challenge them, saying, 'Do you know what you're getting into?' Because you're talking about a machine that has to be capable of imaging patients ranging from a premature baby weighing 500 grams to an 18-year-old weighing 150 kilos. Being able to tweak the machine to have low radiation and good image quality is a challenge, and it is a challenge that evolves. That's why when we purchase equipment, we also have to have a commitment from the company," says Amaral, "because we want to reduce radiation on one hand, and we want an image that is diagnostic on the other – maybe not the best image quality – this shows we are thinking of the child first, not the pleasure of seeing a beautiful image."

Connolly adds, "We needed the engineers to tweak what they could to improve quality while trying to keep the dose low." At one point, she says, doctors and engineers "put the dose down so low that we couldn't see the (guide) wires, and we had to go back up until we found a happy medium. It's difficult to optimize a very complex array of parameters."

Siemens recently delivered a free software package update to hospitals around the globe that have Artis zee systems installed. Called CARE (Combined Applications to Reduce Exposure), the package allows doctors to better monitor dose accumulation and save radiation dose. "In one study, we looked at kids who were coming back for the eighth or ninth visit [for procedures involving radiation] in a short space of time," Connolly says.

"That's where the dose metric program which we've been working on with Siemens is going to be hugely valuable. We would like to use that as a tracking system on an individual patient basis, and also for sets of procedures so we can track the average dose for certain procedures. The long-term goal is to be able to tell over time the cumulative dose for an individual patient," she explains. "We're not there yet." Connolly also would like to see the software advance to the stage that it could incorporate accumulated dose levels across different vendors. "Siemens might be in this room, but the next time Johnny comes in for a procedure, it might be in another room," with imaging equipment from a different company, Connolly says. "We need to be able to track Johnny's dose from room to room."

Connolly and Amaral continue to push the limits of the Artis zeego. "With some procedures, the image comes up great, and we try to challenge the company," says Amaral. We tell them, "That's great that you gave me that image. Now let's raise the bar. Let's see what we can do about lowering the radiation. This is something that has to happen in unison with the company."

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