

An Environment for Children's Care

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An entertaining cartoon is projected onto the SOMATOM Force. Distraction from the images helps the little patients stay calm. Together with the latest in scanning technology, this helps to get good images in pediatric cases.

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At Astrid Lindgren Children's Hospital in Stockholm, Sweden, the child always comes first. In 2016, they opened a new scanning center designed to ease the stress of diagnostic scans for children. Doctors, radiologists, videographers, and engineers came together to create a relaxing environment with the most modern scanning technology.

Text: Nils Lindstrand | Photos: Lasse Burell

Asick and nervous child accompanied by worried parents is always a tough challenge for doctors and nurses. When the task is to correctly diagnose what might be a severe illness, you can't always rely on established hospital routines. But if you combine a bit of modern magic, a group of committed and creative professionals, and the latest in scanning technology, the challenge can be turned into a major success. This is what has been accomplished over the last few months at Astrid Lindgren Children's Hospital in Stockholm, Sweden.

The toughest challenges

The patients at the scanning center at Astrid Lindgren Children's Hospital are often very small, some of them just babies, and they are often scared or extremely anxious. Sometimes, however, they are not nervous at all, but happy and lively and won't keep still. Some patients also have mental or social issues. What they do, however, all have in common is that they are not adults that can be just told to

lie still during a medical examination or a scan. They move, they refuse to lie down on the scanning table, or simply won't go near this impressive but somewhat scary piece of technology.

"When we moved Astrid Lindgren Children's Hospital to the new complex where we are today, we realized we wanted to do something drastic to convert the scanning room into a friendly environment for children," says Lena Gordon-Murkes, MD. "It was clear that the latest in scanning technology gave us a chance to get good images even with children as patients, but we still needed to get them to cooperate and to be calm for a few minutes."

Creating a new environment

Lena Gordon-Murkes, knew of a company in Sweden that is developing audiovisual technology for commercial and educational use.[1] Cartoons, light effects, sound, and video films are projected onto walls or backgrounds, using very powerful projectors and loudspeakers.



The Astrid Lindgren's Children Hospital, established in 1998 through the merger of three existing children's hospitals in the Stockholm area, provides care for the most severely ill children from all over Sweden. The motto of the hospital is 'The child always comes first'.

"I phoned them up, and we started collaborating to create a scanning room that would be welcoming and calm children and parents instead of scaring them," Gordon-Murkes says.

And it worked. It really, really worked. The rest of the room is dark, and the scanner is covered with images of stars, rainforest backgrounds or simply dreamlike flickering lights. For small children, popular cartoons are screened onto the ceiling.



Lena Gordon-Murkes, MD (middle) discussing a cardiac case with her colleagues Patrik Nowik (medical physicist) and Marika Lidegran, MD (pediatric and cardiac radiologist).

“If we show them one episode of a popular cartoon, they want to watch all the episodes before they have to go home...”

Lena Gordon-Murkes, MD,
Astrid Lindgren Children’s Hospital,
Stockholm, Sweden

“We had one boy of about ten years who was autistic. He got very anxious when he was about to lie down on the scanning table, and got quite aggressive in his agitated state. But when we tested the popular small children cartoon ‘Babblarna’, a concept originally created to aid language development for small children with or without special needs, this young man became quite calm, totally focused on the story played out in the cartoon.”

A positive effect

The new scanning room design really worked, and not only for the children. “We saw the positive effect it had on the parents”, says Lena Gordon-Murkes. “They came in, obviously being very anxious about what the scanning would show, and nervous about the procedure as well. The audiovisual display gives them another focus, and something beside the health issues to talk about. This provided a much more calm and positive situation all together.”

Gordon-Murkes says, smiling, that the old challenge of getting the children to lie still during the scanning procedure has been replaced by the problem of making them leave. “If we show them one episode of a popular cartoon, they want to watch all the episodes before they have to go home...” So, the situation and mood during the scanning of small children has become much more calm and positive. But this is obviously not enough.

The purpose of the whole operation is to get images from the scanning procedure to achieve sound diagnosis of health issues, involving such delicate parts of the body as the heart, the spine or individual blood vessels. This task is certainly not made easier by the fact that these details in pediatric imaging are extremely small. The demand for good quality in the scanning images is therefore very high; at the same time, the small bodies involved means you have to keep the radiation doses at a minimum.

High quality scans at lower dose

The group working at Astrid Lindgren Children’s Hospital have made it all work – with doctors, nurses, and physicists dedicated enough to go the extra mile. They also had access to the advanced scanning equipment that made it possible to succeed.

Dual Source is the fundamental technology in Siemens Healthineers premium CT imaging technology. It enables extremely short scan times of about half a second, with excellent results, and very low radiation doses. The powerful tube makes it possible to use low levels of contrast agent. With the unique Tin Filter, high quality images can be produced even at very low doses of radiation.

“The equipment has done what Siemens Healthineers said it would do, and has done so from day one,” says Gordon-Murkes. “This is not



Left: An MIP image shows the right coronary artery (RCA) of a 2-month-old baby with a heart rate of 133 bpm. Images were acquired with 1.16 mGy at 70 kV using CARE Child technology.

Courtesy of Astrid Lindgren Children's Hospital, Stockholm, Sweden

Right: A MinIP image shows a foreign body in the proximal left main bronchus of an 18-month-old baby. A 25 cm scan range was acquired in 0.3 s with 0.02 mGy at Sn100 kV, using Turbo Flash mode and Tin Filter technology.

Courtesy of Astrid Lindgren Children's Hospital, Stockholm, Sweden

always the case when you buy health-care equipment, but this is extremely important." At the same time, the technology continues to develop in collaboration between the hospital staff and Siemens Healthineers.

"Our physicist, Patrik Nowik, has been instrumental in the applications and further development of the scanning features, similarly the colleagues from

Siemens Healthineers have been integral to the creation of this process," says Gordon-Murkes with a smile. "It has been very important for the successful use of this new technology that all of those working with it at the hospital have been able and willing to work together as members of one single team, whether they are doctors, nurses, physicists or engineers." ●

Reference

[1] www.ljudbyran.se

The statements by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

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Gentle examinations for the smallest patients

"We literally work from head to toe, and we are using modern scanning technology for a lot of things we didn't before," says Lena Gordon-Murkes. "Using Siemens Healthineers' SOMATOM Force as a dedicated pediatric scanner has given us advantages in a number of areas."

Here are some examples: The parents of a baby operated on for congenital hip dislocation (CHD) were worried that the hip might not be in place. This was checked with a follow-up scan at a very low dose. "The child was happy and constantly kicking his feet", says Gordon-Murkes. "But with the scan we got useful images anyway, despite the extremely low dose and the kicking feet. The hip was in place and the child is doing fine today."

Another baby was suffering from cardiomyopathy and had a pulse of 133 bpm. The baby was referred to Astrid Lindgren Children's Hospital to rule out any coronary anomalies. Despite the extreme pulse, a very low effective dose scan gave very precise images of the child's coronaries (see image above).

Gordon-Murkes and her team have also established new clinical pathways with Siemens Healthineers' unique Tin Filter

technology. CT scanning has become a standard procedure when they get children in with foreign bodies in their airways. "Beside lung imaging and orthopedics, another possible area is the check up of shunt catheters in a whole body acquisition. While in the past this was done with several X-rays from different angles, which is time-consuming and cumbersome, one single ultra-low dose CT scan can now fulfill the diagnostic task. Using CT technology makes it much easier for the doctors on call to establish what the situation is and what they need to do, compared to previously used techniques," says Gordon-Murkes.

It has also been possible to use CT imaging for all neck exams, due to the low radiation doses, instead of applying it only in special cases where it was considered absolutely necessary. "The toughest challenge of them all," according to Gordon-Murkes, may be to visualize the spinal arteries in small children. With the SOMATOM Force images being so exact, the doctors at Astrid Lindgren Children's Hospital were able to successfully operate on a child with a tumor adjacent to the artery of Adamkiewicz.

The team at Astrid Lindgren Children's Hospital has also used images from the SOMATOM Force to produce a 3D model for



Lena Gordon-Murkes, MD, is convinced of the advantages of the SOMATOM Force in the pediatric field.

preoperative planning in a case of complex dysplasia (see image above).

The doctor said after the operation that the 3D model had totally changed their line of approach to the operation that wouldn't have been the case without it.