A Vision Becomes Reality

Beginning with a simple video-conferencing system at Astrid Lindgren Children's Hospital in Stockholm, a doctor's vision revolutionized the way pediatric cardiology is practiced throughout Sweden. It is an example of how challenges in access to high-quality healthcare can be overcome, and what tomorrow's healthcare system may look like.

By Tanja Berbalk

The midnight sun, snow-buried winters, traditional meatballs, herring, Vikings and Volvos, and IKEA – these are the things for which Sweden is known. But Sweden is much more than just those things. Many Swedish innovations are big successes around the globe: Affordable Swedish design is among the most popular in the world and the country's domestic and international policies serve as models in Europe and beyond. Although Sweden is the third largest country in the European Union in terms of geographic size, its total population is only about 9.4 million[1] – comparable to the metropolitan region of Chicago. A sparsely populated country like Sweden needs intelligent solutions – not only for its infrastructure, but also for its healthcare system. How can the best healthcare be brought to the most remote areas?

Bo Lundell, MD, had an idea about how this question could be answered. He is the head of the Pediatric Cardiology Department at Astrid Lindgren Children's Hospital at Karolinska University Hospital in Stockholm. Lundell's department is the center of pediatric cardiology in this region, covering two million inhabitants in the Stockholm area and treating 300 inpatients and 7,000 outpatients per year. Lundell and his team have always worked in close collaboration with the other 34 pediatric cardiology teams in Sweden to discuss all kinds of heart problems such as congenital malformations, myocardial infarctions, arrhythmias, and cardiomyopathies in fetuses, children, and adolescents up to 18 years of age. In the past, discussions took place over the phone. But the children's hospitals mainly examine their little patients using ultrasound systems – a technology that usually produces videos. "Motions cannot be described over the phone. And especially in acute cases, sending files takes too much time," Lundell points out.

As a consequence, he purchased a standard, off-the-shelf video-conferencing system and set up a communication center with monitors, cameras, microphones, and high-speed Internet to be able to go over patient files in real-time with colleagues all over Sweden.

The Prerequisites

Of course, the project was not as easy as it sounds. The biggest challenge was to equip a total of 34 children's hospitals across Sweden with identical and compatible video-conferencing systems, just like the one at Karolinska – simultaneously. The future conferencing system had to suit their purposes to transfer high-resolution images at high frame rates and take two data streams with up to 60 images per second. Funds were needed. Lundell found a partner in the Swedish Heart and Lung Foundation. There were, however, some prerequisites. A doctor at every hospital needed to be trained to run the system and do the technical maintenance, and the system had to be used for children with heart problems only. Another prerequisite was to use the proprietary healthcare network of Sweden instead of the conventional Internet connection to meet data security regulations. Since the Swedish healthcare network was already well established, this task was solved easily. Soon after Lundell's initial idea, the Swedish conferencing network in pediatric cardiology named "Gertrud" was born. Lundell's eyes sparkle when he sits in his fully equipped, high-tech communication center reflecting on his and his team's greatest achievements – which is saving children's lives.

All For One

From a technical perspective, the video-conferencing system was only possible because the hospital had one single image storage software. The pediatric cardiology department is using *syngo*® Dynamics – a cardiovascular image and information system that was developed for diagnostic image review, dynamic image processing, and archiving cardiac imaging.


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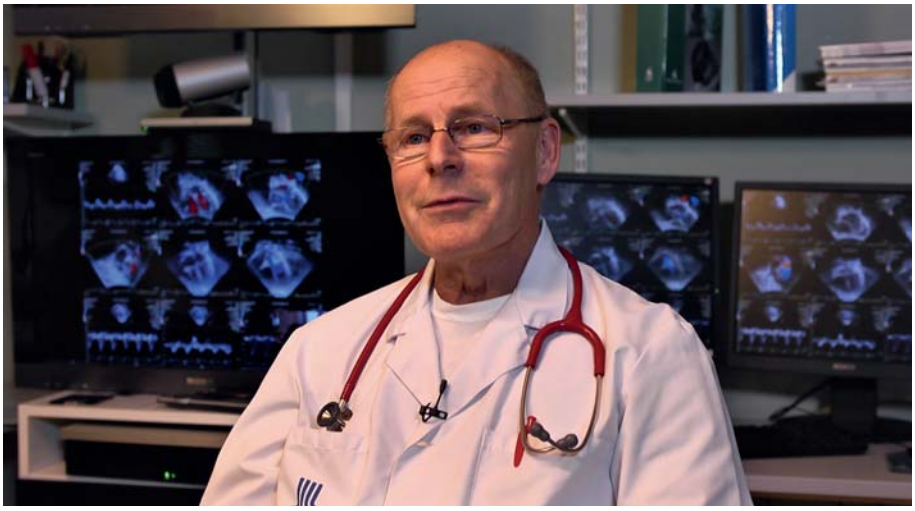

Bo Lundell, MD, established a video-conferencing system to be able to discuss cardiac cases remotely throughout Sweden.

"We can now make our healthcare system more worth the money."

Bo Lundell, MD, Head of Pediatric Cardiology, Astrid Lindgren Children's Hospital, Karolinska University Hospital, Stockholm, Sweden

As soon as Lundell presses "store" on one of the Siemens ultrasound systems, the image or video file is transferred to the image database and can be accessed from any workstation or ultrasound system – anywhere within the hospital network – including the video-conferencing room. To remain consistent, *syngo* Dynamics is also used in the obstetrical department for fetal examinations – critical for departments that need to work so closely together.

Taking it one step further, the institution will soon receive the *syngo*.via WebViewer[2] for Apple iPads®[3] so that Lundell and his colleagues can have video conferences wherever[4] they are. They can move around in the ward, perform examinations, and then answer a video phone call using the integrated iPad camera for video streaming.

Before *syngo* Dynamics, the department did not have a digital storage system and had to rely on video tapes, but never accessed them again because it was too complicated to retrieve them. When asked about the most important feature of *syngo* Dynamics, Lundell answers: "It is the ability to compare previous and newer studies of one patient directly in the system to be able to see minor changes." Lundell prefers to work with Siemens ultrasound systems because of their high image quality and resolution. This is particularly important in pediatric imaging, "Since defects might not be bigger than a millimeter, and precise images are the base for a successful procedure. We do fetus examinations in week 17 or 18 with the ACUSON® S2000 ultrasound system. We are able to characterize complex lesions at an early stage," Lundell says.

No Distance Too Far

Since the video-conferencing system has been up and running in all Swedish pediatric departments, it has contributed tremendously to the collaboration between them. To Lundell, the benefits of this new way of communicating with hospitals across the country are obvious. First, the system offers new ways to share and increase expert knowledge. If anyone in the hospital network needs consulting on a complicated case, the doctor in charge can call his or her colleagues in Stockholm or elsewhere in Sweden. Additionally, the system is used for training and education across the country. Lundell also organizes periodical conferences with all 34 children's hospitals to discuss new and significant cases from which everyone can learn. As a knowledge sharing platform, the video-conferencing system is especially valuable for smaller hospitals in remote areas. With the push of a button, they can contact other hospitals and departments in Stockholm, Goteborg, or Uppsala for difficult cases of very sick infants, particularly newborns.

Secondly, the system can be a valuable tool to get a fast diagnosis, determine treatment, and prepare the patient's transportation. Lundell explains: "If a child needs to be transported to us, we can plan the care in advance because we have already discussed every detail via video conference. The more we know about the patient, the better we can provide care." Just like in the summer of 2011, when a baby was born in Goteborg and appeared to be healthy after the first routine check-up. A few weeks after the baby's birth, the parents took the baby on vacation to the small island Öland, in the south east of Sweden. All of a sudden, the baby got sick, and the parents took their newborn to the local hospital. Since the small hospital was not specialized in pediatrics, they did not have the expertise to diagnose the little patient. Thanks to the video-conferencing system, the doctors could immediately contact heart specialists in Goteborg on the other side of the country and together they managed to diagnose the heart malformation of the child. The baby was then transported to Goteborg by helicopter and operated on just three hours after the diagnosis – the baby survived.

In another case, the video-conferencing system spared sick patients and their families the burden of traveling to the next larger pediatric center. Lundell recalls a story about a family that lives in a small city in the north of Sweden

Cardiovascular Disease in Sweden

How many people with cardiovascular disease are there?
The total number of deaths in 2010 from age 0 to 19, accounting for diseases of the circulatory system, was 19. At age 85 and older, the total rate was 19.452.[1] 42 percent of all deaths in all age groups account for cardiovascular disease.[2] Sweden's infant mortality rate was three per 1,000 live births in 2010 – compared to a global rate of 42.[3] The total fertility rate in Sweden in 2010 was 1.98; the global rate was 2.45.[4, 5]

What proportion of health expenditure goes toward cardiovascular diseases?
The total healthcare costs of cardiovascular disease in 2003 was € 2,841,727,504 (3,500,328,269 US-Dollars) or 12 percent of the total healthcare expenditure.[6]

[1] The Health and Welfare Statistical Database. The National Board of Health and Welfare. Available at http://www.socialstyrelsen.se/statistics. Last accessed May 23, 2012.
[2] World Health Organization. NCD Country Profiles, 2011. Available at http://www.who.int/nmh/countries/swe_en.pdf. Last accessed May 23, 2012.
[3] United Nations Department of Economic and Social Affairs/Population Division. World Population Prospects: The 2010, Volume II: Demographic Profiles. Available at http://esa.un.org/unpd/wpp/country-profiles/country-profiles_1.htm. Last accessed May 23, 2012.
[4] http://www.scb.se/Pages/Product____25799.aspx, Last accessed May 23, 2012.
[5] European health for all database (HFA-DB). World Health Organization Regional Office for Europe. Updated: January 2012. http://data.euro.who.int/. Last accessed May 23, 2012.
[6] British Heart Foundation Health Promotion Research Group/Department of Public Health, University of Oxford. European cardiovascular disease statistics, p. 92.

Summary

Challenge:
- Connect expert centers for pediatric cardiology in Swedish metropolitan areas with hospitals in remote areas
- Discuss ultrasound videos in real-time
- Deliver fast and excellent care in acute cases
- Spare sick children the burden of unnecessary travel

Solution:
- Establish a nationwide video-conferencing system in all 34 pediatric facilities that are connected to *syngo* Dynamics for data reviewing and storage

Result:
- Easier way to share knowledge
- More efficient healthcare system
- Improved quality of life
- Equality in treatment, regardless how remote the patients may live

and planned to have their baby undergo surgery in Uppsala, a city just north of Stockholm. Since their hometown hospital was connected with Uppsala via video conference, the family did not need to travel to Uppsala for pre-surgical exams and consultations with the responsible surgeons. Instead, they participated in a remote discussion with their doctors. This saved the family and the hospital time, money, and stress.

Lastly, the implementation of the video-conferencing network streamlines workflows, making the entire Swedish healthcare system more efficient. "Thanks to the system, we can make our healthcare system more worth the money," says Lundell. He is convinced that a video-conferencing network like the one he implemented in Sweden would be possible anywhere in the world, if the prerequisites of data security, Internet bandwidth, and clinical IT are tangible. Already, several neighboring countries, such as Iceland and Norway, have shown interest in getting connected to Sweden's system as well.

In the long run, a video-conferencing system for remote case discussions not only improves knowledge among clinicians, but also contributes to equality in treatment, regardless of where the children and their families live or what their financial situation may be.

Sweden ranks among the lowest for infant mortality in the world.[5] Close collaboration through video-conferencing certainly did its part to help achieve this. By all means, Bo Lundell does his part day-in and day-out to improve the quality of life throughout Sweden.

Tanja Berbalk *has a degree in sociology, marketing, and communications. She is an editor at* Medical Solutions.

[1] The Health and Welfare Statistical Database. The National Board of Health and Welfare. Available at http://www.socialstyrelsen.se/statistics. Last accessed May 23, 2012.
[2] The application is not for diagnostic viewing/reading on mobile devices. Please refer to your sales representative whether the product is available for your country. Diagnostic reading of images with a web browser requires a medical grade monitor. For iPhone® and iPad® country specific laws may apply. Please refer to these laws before using for diagnostic reading/viewing. For Japan: Applications on iPhone/iPad/iPod® are not a medical device in Japan. Use at your own risk. They are not intended to be used for diagnosis.
[3] iPad is a trademark of Apple Inc.
[4] Prerequisites include: wireless connection to clinical network, meeting recommended minimum hardware requirements, and adherence to local data security regulations.
[5] http://en.worldstat.info/World/List_of_countries_by_Infant_mortality_rate, Last accessed May 23, 2012.

Further Information

www.siemens.com/*syngo*-Dynamics
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