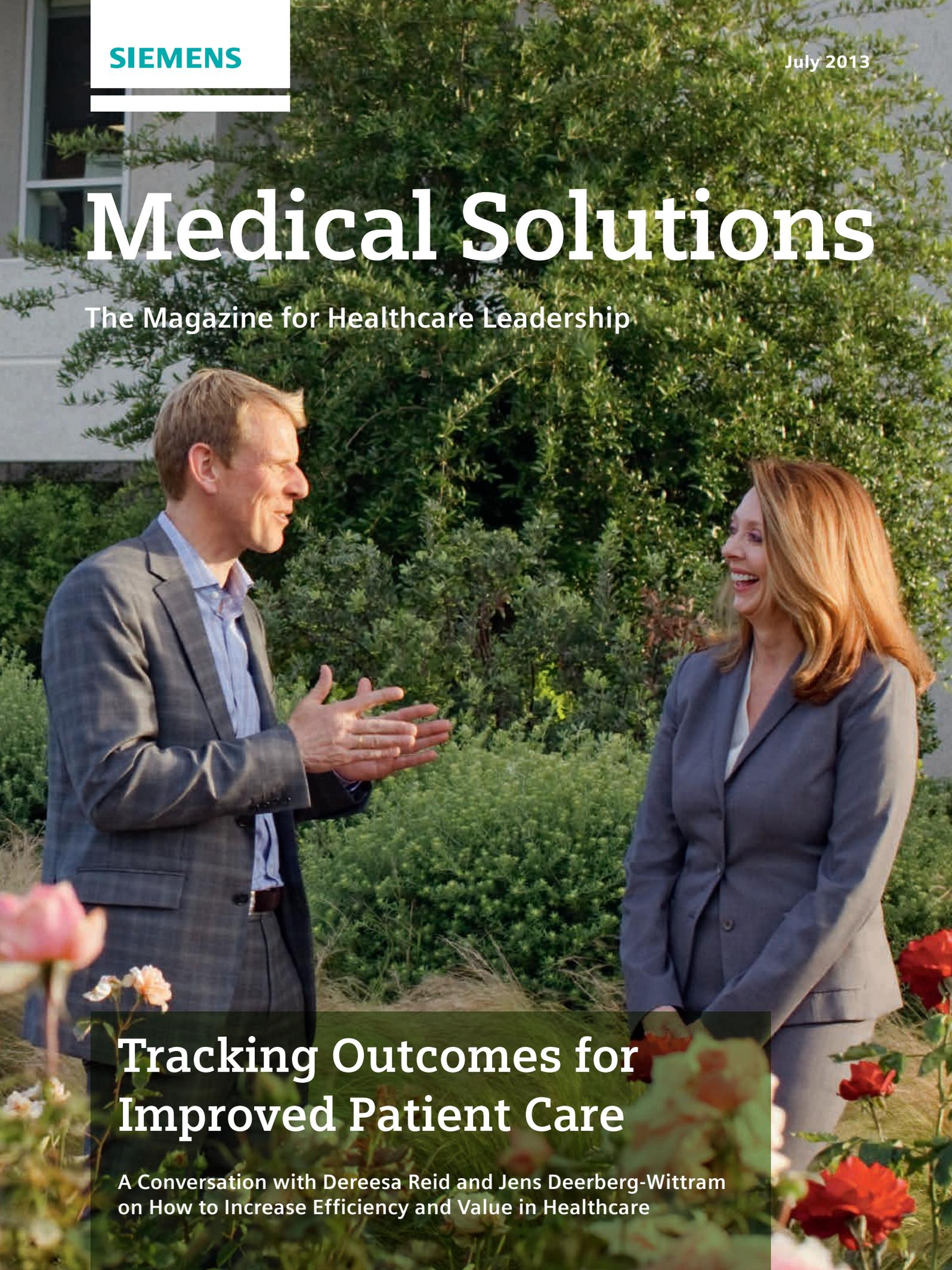


Medical Solutions

The Magazine for Healthcare Leadership

A man and a woman in business attire are standing in a garden, engaged in a conversation. The man is on the left, gesturing with his hands as he speaks. The woman is on the right, smiling and listening. They are surrounded by lush greenery and colorful flowers, including pink and red roses. The background shows a building with windows.

Tracking Outcomes for Improved Patient Care

A Conversation with Dereesa Reid and Jens Deerberg-Wittram
on How to Increase Efficiency and Value in Healthcare

“Investments in health-care are driven by value propositions in a system of transparent value chains.”

Hermann Requardt

Member of the Managing Board of Siemens AG and CEO of the Healthcare Sector



Hermann Requardt,
Member of the
Managing Board of
Siemens AG and CEO of
the Healthcare Sector

Collaborative Efforts for Value-Based Healthcare Delivery

Dear Reader,

Influenced by social, political, technological, and financial circumstances, healthcare systems have always been running through cycles either of growth and increasing healthcare spending or of consolidation and cost reduction efforts.

In this decade, however, we are entering a fundamental evolution. Healthcare is not regarded as a sole cost factor anymore, but progressively seen as an investment in the future prosperity of our economy and society – considering the continuously growing share of healthcare costs in relation to total GDP and the increasing relevance of healthcare as a productivity factor in our ageing population.

Investments of this magnitude and relevance require due diligence and solid justification. A one-dimensional approach to cost containment is no longer a sufficient driver – neither for the investors nor the investees in the healthcare system. Investments are driven by value propositions in a system of transparent value chains. They are directed towards a return on invest which needs to be relevant and measurable.

The ultimate value proposition of sustainable healthcare systems is proven outcomes, based both on quality and productivity on a societal level. Profitable investments in healthcare will be measured in terms of improvements to the quality of life, reduction of rehab time, and increase in work performance. On the cost side, the focus of healthcare investments will shift from procedures and services towards episodes of care and total lifetime costs per person and workforce.

Inevitably, value-based or outcome-driven investments will lead to an industrialization of healthcare: Continuous improvement cycles and professional process management, as exemplified in other industries, combined with disease- and patient-oriented data management will be indispensable for sustainable, future-proof healthcare.

Among other factors, healthcare information technology will be a key lever in this development.

This edition of *Medical Solutions* features collaborative efforts between our customers and Siemens to meet the requirements of value-based healthcare delivery today. For example, the International Consortium for Health Outcomes Measurement (ICHOM) develops standardized measures for improved clinical outcomes in order to make the results transparent in international registries. The California-based Hoag Orthopedic Institute has transferred ICHOM's ideas into clinical practice by continuously feeding back such information into their clinical processes.

There are tremendous changes to come. These changes need to be designed and implemented by all stakeholders in our healthcare systems, integrating medical and industrial expertise to ensure that our investments in healthcare create a positive outcome. It is our joint responsibility to actively participate in creating, developing, and delivering the right value proposition. Our mission is to support you as healthcare providers in this transition, as showcased in this issue of *Medical Solutions*.

I hope you find this issue both informative and inspiring.

Hermann Requardt

Member of the Managing Board of Siemens AG
and CEO of the Healthcare Sector

Contributors



Peter Jaret

Peter Jaret, a prize-winning journalist who lives in northern California, knows the crisis in healthcare first hand. "Over the past few years, my family's insurance premiums have doubled," says Jaret. "Medical care is expensive and disconnected." When he sat down to interview physician Jens Deerberg-Wittram and hospital executive Dereesa Reid, pioneers in reforming the medical system, he was skeptical that a business model for value could be applied to healthcare. No longer. "They convinced me that there are simple solutions based on measuring outcomes that matter to patients."

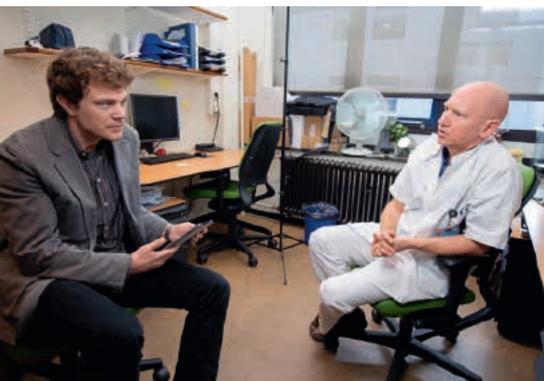
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Nils Lindstrand

The experienced journalist **Nils Lindstrand**, pictured on the left, together with Siemens representative on site, has worked for Siemens many times over the years, explained about the job in Gävle, Sweden:

"I have to say, I love to do stories about doctors and new medical technology. The stories always have a deep human angle, and doctors are a dream to interview. They are insightful, they know what the technology is really meant to do, and they know how to express themselves. In Gävle this turned out also to be true of representatives from the county and from Siemens."

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Philipp Grätzel von Grätz

When acclaimed medical journalist **Philipp Grätzel von Grätz** visited Erasmus Medical Center in Rotterdam in late February, he hadn't seen any sunshine at all in Berlin for three months. At least it felt that way. When he realized that he would be granted a day of true blue sky in Rotterdam, he went to the old harbor before anything else to have a coffee outside and synthesize vitamin D. Sunshine continued within the hospital, where the staff was extremely pleased to be able to work with an automated digital radiology system.

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Orlando Hoetzel

Orlando Hoetzel, regular illustrator for the *Medical Solutions* essay, says: "Mythical creatures are always great to illustrate. In order to indicate that we are in China, I chose a dragon, whereas the colors arose from the Chinese flag."

Orlando Hoetzel was born in Orlando, USA, in 1971 and studied design and communication at the University of Essen and at the Ecole Supérieure D'Arts Graphiques in Paris. He has lived and worked in Hamburg, Paris, Madrid, and now calls Berlin home. He has received numerous awards for his work.

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Ye Rin Mok

At first, **Ye Rin Mok** thought it would be difficult to take photos in Irvine, California, USA. She says: "Having gone to school there, I know it is primarily a business area, quite desolate with many anonymous looking buildings and very little nature. I was pleased when I saw the garden at the hospital, which turned out to be perfect. We started in late afternoon and were able to capture some beautiful light just before sunset."

Ye Rin Mok was born in Seoul, but grew up in Los Angeles. She has worked for Dwell, Wired, Bloomberg Businessweek, and Monocle.

See page 14 and cover

Charlie Whipple & Hans Sautter

International award-winning writer **Charles Whipple**, from Arizona, USA: "I started writing articles from Japan in the mid-1970s and have worked extensively for Siemens, meeting many interesting people."

Hans Sautter, graduate of the Munich Academy of Photography: "I live on a rural island surrounded by the world's largest megalopolis – where we took this picture before heading to Utsunomiya which lies about 110 kilometers north of Tokyo."

The well-established team came back very impressed by the Saiseikai Utsunomiya Hospital.

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Sergio Membrillas

"Working on this illustration was a really nice challenge," says artist **Sergio Membrillas** on his work on page 12. "I tried to communicate the rather abstract topics of quality and productivity. We can see a girl both entering and leaving the hospital. Inside, there is a lot of technology, efficient processes, and medical professionals at the patients' service. When she leaves the hospital again, the girl looks at her watch and is really happy about how fast and pleasant her experience was."

Sergio Membrillas is a freelance illustrator. He lives in Valencia, Spain, as a freelance illustrator and works for a great variety of international clients.

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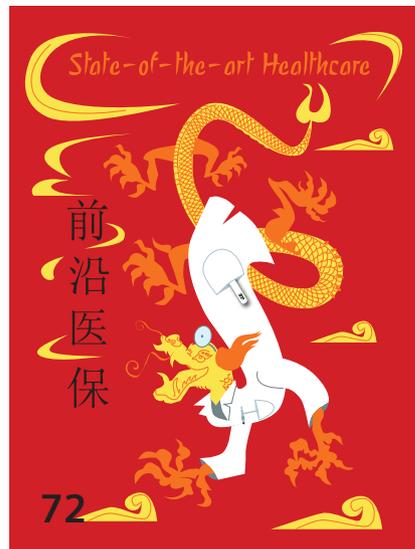
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Imaging is becoming more and more important at the AO Davos Courses 2012 on orthopedic and trauma surgery.

New Service for Cancer Centers

In oncology, the various diagnostic procedures and a growing number of interdisciplinary treatment options place high demands to provide the best possible oncological patient care. Siemens now offers cancer centers a

new way to assess and improve clinical processes and center-specific structures: Act on Oncology.

Act on Oncology analyzes a cancer center's processes based on a model specifically developed for cancer center workflows. Using objective and reproducible analysis, the model is based on clinical pathways, internal and external communication processes, management structures,

integration of research, and strategic considerations.

Experts from the Siemens Clinical Competence Center Oncology and the Healthcare Consulting team collaborate with globally recognized experts in Europe and from overseas to integrate the latest developments from medicine and science into the Act on Oncology model.

Following an Act on Oncology assessment, Siemens provides a customized optimization plan to achieve excellence in cancer patient care. In a target-oriented approach, Act on Oncology can help improve processes sustainably in a cancer center bringing both qualitative and economic benefits. In this way, Siemens can support you in fighting one of the most threatening diseases – cancer.



Further Information

www.siemens.com/actononcology

Favorable Outcomes 5 Years after Successful TAVI

Transcatheter Aortic Valve Implantation (TAVI) is a minimally invasive surgical or pure interventional option for patients with severe aortic valve stenosis for whom conventional surgical valve replacement is considered to be too risky.

Initial studies have focused on short- or medium-term outcomes, without considering long-term in-vivo durability of heart valves or clinical outcomes beyond three years. Now, research conducted at St. Paul's Hospital Vancouver has demonstrated favorable outcomes even five years after TAVI.¹

The study showed a 5-year survival rate after successful TAVI (Cribier Edwards & Edwards Sapien valves) of 35 percent with a median survival period of 3.4 years. Furthermore, there were no cases of structural

valve failure, or severe regurgitation. No patient required reintervention.

With good results for hemodynamics and moderate prosthetic valve failure observed in only 3.4 percent of patients, these results provide opti-

mism for the future use of TAVI in high-risk patients.

¹ Toggweiler S, Humphries KH, Lee M, et al. 5-Year Outcome After Transcatheter Aortic Valve Implantation. J Am Coll Cardiol 2013;61:413-9.



Product Design Award for Mobile X-ray System

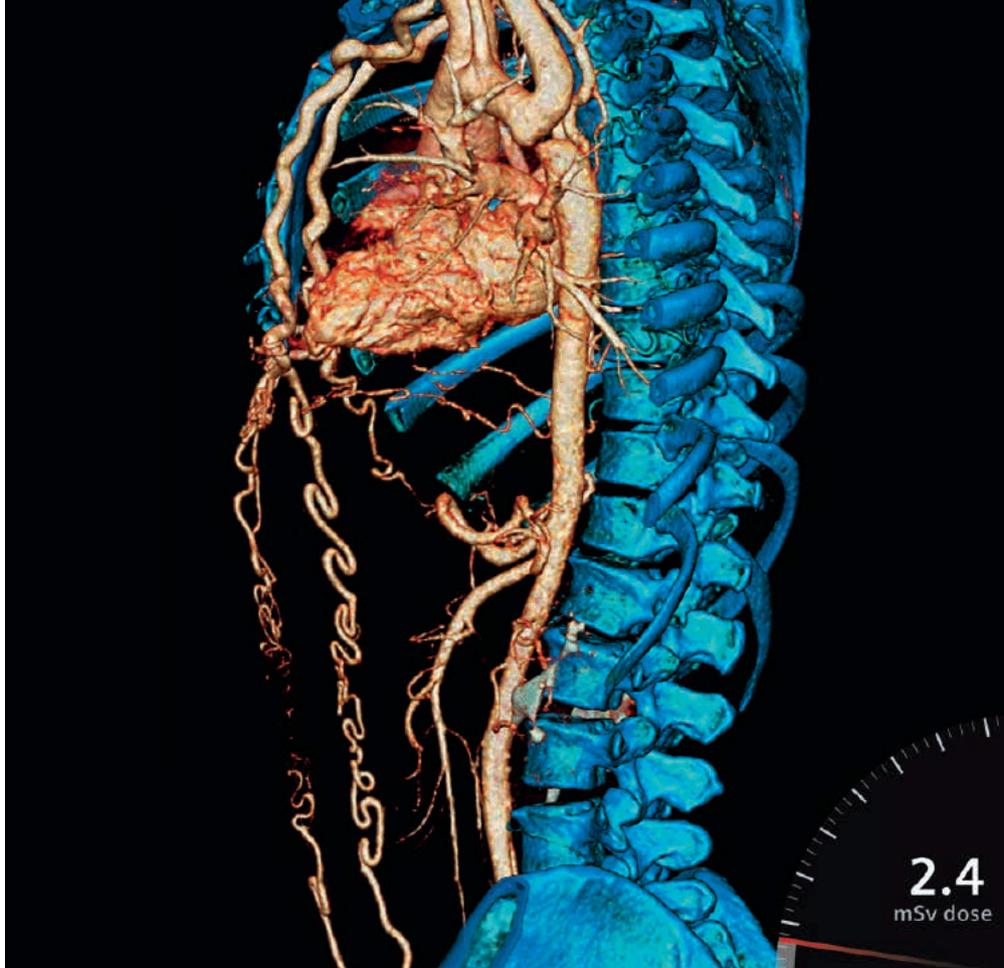


The mobile X-ray system Mobilett Mira is the winner of this year's red dot design award in the category "Life Science and Medical", convincing a jury of 37 experts from 24 countries – all independent, qualified designers, university professors, or trade journalists. A total of 4,662 applications were received in 19 different categories.

But beauty alone was not enough. Functionality, ergonomics and ecological compatibility are some of the criteria upon which the jury base their decision. The reasons why Mobilett Mira convinced the jury: With its industry-leading arm range and its counterbalanced design, the rotating swivel arm allows customers to examine almost every region of interest in nearly every position, and from most angles. Mobilett Mira offers customers high imaging power in a small space. The high output power provides pin-sharp images, comparable to those of high-end stationary X-ray imaging systems. And, the system's ECO-Mode saves up to 25 percent in energy when in stand-by mode.

Further Information

www.siemens.com/mira



Coarctation of aorta. Winning image 2011, category "Vascular", by Liz D'Arcy, Wexford General Hospital, Ireland.

Right Dose Image Contest 2013

Following the success of the image contests held over the past few years, Siemens Healthcare has decided once more to invite radiologists and radiographers from across the world to take part in the latest round of this international competition. Again a jury of experts, this time consisting of members of SIERRA (the Siemens Radiation Reduction Alliance), will choose in eight different categories the institutions who best demonstrate how they achieve images with the right dose for an ideal balance between diagnostic quality and low radiation.

From June 2013, any clinical institution or hospital with a CT scanner from the SOMATOM® Family can once again submit their best images to be shown on the contest website.

A new element this year is the fact that sustainable dose management at the participating institution will also play a role in the evaluation of the images. Indeed, there will even be an additional category for the entrant with the best dose reduction strategy.

"The many hundreds of submissions we've had in the past few years clearly demonstrate that our customers enjoy presenting their work to a global audience and having it discussed by a specialist community," explains Peter Seitz, Vice President of CT Marketing.

Further Information

www.facebook.com/imagecontest, www.siemens.com/imagecontest2013

High-Channel Upgrade for Significantly Improved Workflow

The 15-Channel Knee Coil from Siemens offers radiographers and medical professionals just what they need today: improved image quality and significant workflow acceleration.

Etobicoke General Hospital (EGH), part of the William Osler Health System in Toronto, Canada, purchased the coil for their 1.5 Tesla MAGNETOM Avanto system in fall 2012. The reason for their decision: The community hospital was looking for a reduction in waiting times for musculoskeletal (MSK) studies. Joe-Anne McCue, the hospital's corporate and diagnostic imaging director, explains: "The image resolution is outstanding and, while this is obviously clinically important, as an administrator, I was very excited by the efficiencies that were gained."

Whereas previously 30 minutes were scheduled for each MSK study, the hospital can now book 20-minute time slots for this procedure thanks to the new coil. The result: The protocol time is reduced from 25 minutes to less than 15 minutes for each scan.¹ Furthermore, the increased image quality resulted in fewer repeat scans

and, therefore, more patients could be examined in one shift. "With increasing demands for gains in efficiency and productivity, this is the type of technology that is very beneficial both clinically and financially," adds McCue.

The 15-Channel Knee Coil is a high-channel coil that allows parallel imaging and so accelerates exam times. Now, the William Osler Health System has ordered another 15-Channel Knee Coil for the second hospital location, Brampton Civic Hospital in Brampton, Canada.

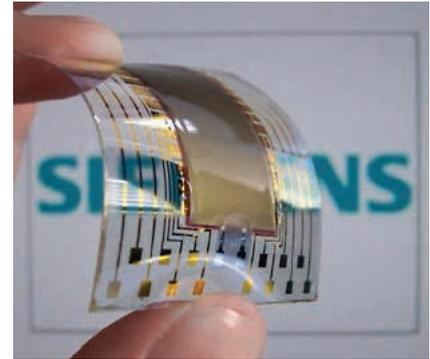
¹ Data on file.

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.

Further Information

[www.siemens.com/
15-channel-knee-coil](http://www.siemens.com/15-channel-knee-coil)

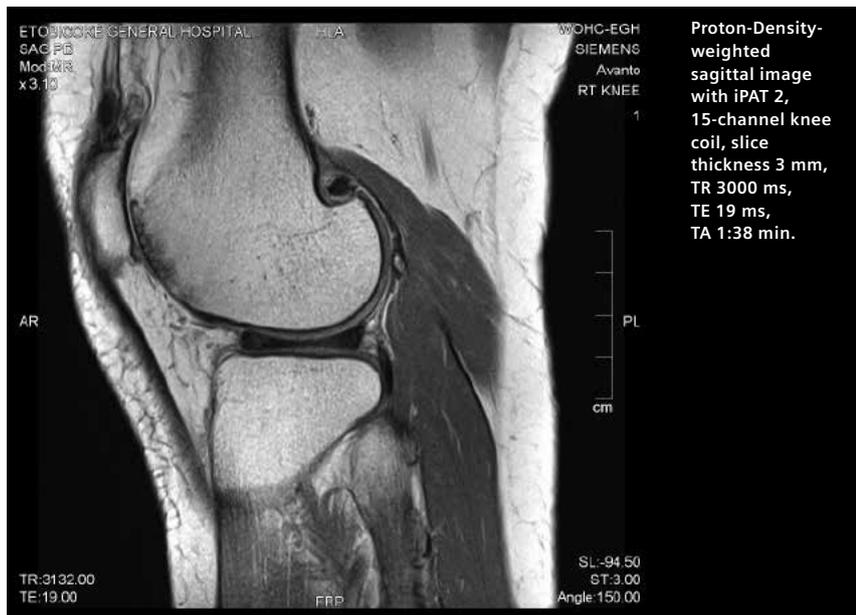
Organic Detectors for X-Rays



Example of an organic detector

Siemens is researching the use of organic detectors for X-rays. This technology promises better image resolution than is currently possible with crystalline detectors and has the potential to reduce production costs substantially. In this innovation, specific substances are mixed into organic detector materials. These substances absorb X-ray radiation, which is converted into visible light. The HOP-X project to develop and demonstrate the new technology is funded by the German government and coordinated by the Corporate Technology research department at Siemens. Initial potential applications include mammography devices and conventional X-ray machines.

Based on organic plastics, the organic photo detectors can be sprayed or printed onto a substrate at a low cost. This means that production costs are no longer directly linked to the detector surface area. The organic diodes can also be used as dose-measurement chambers. More sensitive than the current ionization measurement chambers, they can also be structured more easily. Consequently, the organic diode measurement unit can be adjusted to individual patient dimensions to allow more effective control of dose.



Affordable 2-in-1 Fluoroscopy and Radiography with Flat Detector

With Luminos Fusion¹, Siemens recently introduced a new system to the mid-range price market segment for fully digital fluoroscopy and radiography. The new flat detector enables faster examinations compared to image intensifiers that have been available in the mid-range up to now.

Working with current image intensifier systems has been a time-consuming process. Luminos Fusion with flat

detector technology is different. Its 43 centimeter x 43 centimeter image surface provides fully digital, distortion-free X-ray and fluoroscopic images within seconds. Patient throughput can be increased and the higher quality images give radiologists more diagnostic information.

Additionally, the images are up to double the size of those from typical image intensifiers and, therefore,

offer a wider range of examinations, such as chest X-rays. The flat detector also takes up less space and simplifies patient positioning.

Earlier, the flat detector systems were only available in a higher price segment. With Luminos Fusion, fully digital fluoroscopy and radiography in one system is now available for a broader range of users.



Luminos Fusion's new flat detector enables faster examinations and patient throughput compared to image intensifier systems.

Further Information

[www.siemens.com/
luminos-fusion](http://www.siemens.com/luminos-fusion)

¹ Luminos Fusion is not commercially available in all countries. Due to regulatory reasons its future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

Protecting the Lives of Premature Infants

Premature infants face many physiological challenges, including high risk of neonatal apnea – the cessation of breathing for more than 20 seconds. Therapy for this life-threatening condition in newborns includes administration of theophylline or, preferably, caffeine. Regardless of which therapy is employed, continuous monitoring of serum caffeine concentrations is critical to avoid the of accumulation potentially toxic serum caffeine levels.

Such therapeutic monitoring requires a highly specific and reliable diagnostic testing methodology. Certain traditional methods such as high-performance liquid chromatography (HPLC), radioimmunoassay, and gas chromatography-mass spectrometry (GC-MS)

are not an option available to or practical for many diagnostic laboratories.

Siemens is committed to helping protect the lives of premature infants and offers an alternative to traditional methods: the highly specific and cost-effective Syva[®] Emit[®] Caffeine Assay – a caffeine immunoassay that includes a unique neonatal testing indication. The assay can be run on the V-Twin[®] and Viva-E[®] Systems, with applications for many general chemistry analyzers.

Further Information

[www.siemens.com/
drug-testing-diagnostics](http://www.siemens.com/drug-testing-diagnostics)



Increasing Efficiency and Value in Healthcare

Thoughts and Insights on How to Raise Quality
and Productivity in Healthcare under Time and Cost Pressure







Unleashing the Power of Outcome Measurements

Medical science has done wonders, extending life expectancy and improving health for all ages. But in many industrialized countries, the healthcare system itself is ailing. *Medical Solutions* sat down with Dereesa Reid and Jens Deerberg-Wittram to discuss the use of value-based outcome measurements as a way to fix the system.

Text: Peter Jaret Photos: Ye Rin Mok

Unprecedented advances in medical science come at a price. Around the world, governments and health professionals are struggling to control the rising costs of healthcare without jeopardizing quality. Experts in the new field of value-based care believe that models developed for businesses in other industries can enable the healthcare industry to manage costs and dramatically improve care. At Hoag Orthopedic Institute (HOI) in Irvine, California, Jens Deerberg-Wittram, MD, president of the International Consortium for Health Outcomes Measurement, and Dereesa Reid, chief executive officer for HOI, sat down to talk with *Medical Solutions* about how the new value model could go a long way toward solving today's healthcare crisis.

Dr. Deerberg-Wittram, you trained as a molecular oncologist. You are now president of the newly formed International Consortium for Health

Outcome Measurement. How did you first become interested in outcome metrics?

Deerberg-Wittram: I started my career as a hospital manager in 2002. I loved the job because I worked with management but also felt very much part of the clinical team. I knew what was happening throughout the hospital. Then I was promoted to the executive board, and I lost touch with what was happening in the wards and the clinics. I realized that healthcare was one of the few industries where the rule seemed to be that the people leading the institution had no idea about the product. That was when I began to think about instituting a system to measure health outcomes. At our institution, we already had some doctors with an interest in outcome measurement. We put together expert groups to define meaningful outcome measures for the medical con-

ditions we were treating. We ended up with a very comprehensive system that tracked 3,300 different outcome measures. It wasn't perfect, but it gave us a good idea about how well we were doing and what needed improvement. In 2009, I met Harvard Business School professor Michael Porter, the author of the book "Redefining Healthcare." Three years later he founded, together with the Boston Consulting Group and the Karolinska Institute, the International Consortium for Health Outcomes Measurement (ICHOM), and I became the first president of this non-profit institution.

What is its mission?

Deerberg-Wittram: We believe that we can revolutionize healthcare by basing competition on patient outcomes. This may seem like common sense, but it is almost never done. In the U.S., healthcare is typically ►



Jens Deerberg-Wittram, MD

Jens Deerberg-Wittram, MD, who began his career as a molecular oncologist, was recently named president of the International Consortium for Health Outcomes Measurement (ICHOM). He is also a senior fellow and faculty member of the Harvard Business School, where he lectures on delivering value in healthcare. Between 2004 and 2012, Dr. Deerberg-Wittram served as chief executive officer for a 15-hospital, 4,800-bed healthcare organization in Germany. There, he developed and implemented a value-based corporate strategy based on outcome reporting. Dr. Deerberg-Wittram works closely with Harvard Business School professors Michael E. Porter and Robert Kaplan on value-based care issues.

“The way to create value is to focus on outcomes that are relevant to patients.”

measured on the basis of process – did a physician prescribe a beta-blocker to patient X or order an X-ray for patient Y? In Germany, the tendency is to measure structures. We love to count MRI machines and how many nurses have this or that certificate. Yet, what matters most is the patient’s outcome. At ICHOM, we are developing the first standardized set of outcome measurements based on medical conditions.

Healthcare is far more complex than making and selling a car or a computer. How can you establish standard outcome measurements that take this complexity into account?

Deerberg-Wittram: First, it’s important to focus on medical conditions. This is actually quite a new concept. So far, healthcare has been organized around doctors. We have departments for urology, neurology, pediatrics, gynecology, and so forth. Often, only doctors understand what these distinctions mean. The patient says, “I don’t know about neurology. My problem is my back pain.” So instead, we focus on specific conditions. Next, we choose outcomes that are meaningful to patients. Again, common sense, but it hasn’t been done. Doctors tend to focus on clinical indicators: things like blood pressure, blood sugar levels, or PSA. In contrast, we think the way to create value is to



Hoag Orthopedic Institute

Located in Orange County, California, Hoag Orthopedic Institute combines a 70-bed hospital with two freestanding surgery centers. The Institute, which began operation in November 2010, is part of Hoag Memorial Hospital Presbyterian, the leading healthcare system in Orange County. With a staff of more than 320 medical specialists and 80 board-certified

orthopedic surgeons, HOI is one of the highest volume specialty hospitals in the U.S. It exemplifies the integrated practice unit, or IPU, a facility dedicated to excellence in one specialty area. In 2012, HOI was named one of the top orthopedic hospitals in the nation by *U.S. News & World Report* and by *Becker's Orthopedic, Spine and Pain Management Review*.

focus on outcomes that are relevant to patients. In the case of prostate cancer, for example, how well did the patient recover from surgery or radiation? Did he experience incontinence or erectile dysfunction from the surgery? What was the five- or ten-year survival rate?

Treating something as complex as cancer can take years. How do you decide on the time frame of your metrics?

Deerberg-Wittram: We establish a hierarchy. The first tier represents the result achieved from treatment, survival, and return to function and quality of life. The second tier involves the process of recovery: In other words, were there complications and other problems, such as infection, bleeding, fistulas, and so forth? We also measure how long it takes for a patient to return to health or function. The third tier measures sustainability of health. For example, if a patient receives an artificial hip, and after seven years this is already worn out, necessitating a new one, this is not a good outcome.

Every patient is different. A 50-year-old patient getting a knee replacement is likely to be up and walking faster than, say, an 80-year-old. Can outcome measurements address those differences?

Deerberg-Wittram: Our model also includes what we call risk adjustors. We look at the age of patients and whether they have other health problems, or comorbidities. Do they smoke? Do they have a very high body mass index? All of these are taken into account to make sure we are not comparing apples with pears.

Isn't there a risk that your outcome metrics could become so complex that they are unwieldy and difficult to use?

Deerberg-Wittram: Our goal is to keep things as simple as possible, while still providing useful data. Ideally, we will come up with 10 or 15 outcomes, and maybe 10 risk adjustors, depending on the condition. As it turns out, it's often sufficient just to differentiate between patients with relevant comorbidities and those without. It isn't necessary to categorize patients into 150 subgroups.

Are you finding that outcomes vary significantly between hospitals or doctors?

Deerberg-Wittram: It's amazing how much they vary. In Germany, the average incontinence rate after prostate cancer is about 45 percent; however, the best providers achieve rates of only 10 percent. Such outcome

data enables us to ask why some providers get much better results. What can the worst performing hospitals do to improve? In Germany, the average hospital stay for hip replacement is 10 days, with 21 days inpatient rehabilitation. Meanwhile, over the border in Denmark, in a hospital only two hours away from Germany, the inpatient stay is less than two days and rehabilitation is done outpatient. But outcomes in the Danish hospital are better than those in most of Germany. Using outcome measures, we can begin to understand why. In Germany, if you ask doctors why they are keeping patients so long in hospital, they might say this is because of the risk of dislocation. But very often they have no data for that. With outcome measures, we can show that dislocation rates aren't higher. Then, there are risks of infection associated with being in the hospital. By reducing hospital stays, we can save money and improve outcomes. That's the power of measuring outcomes.

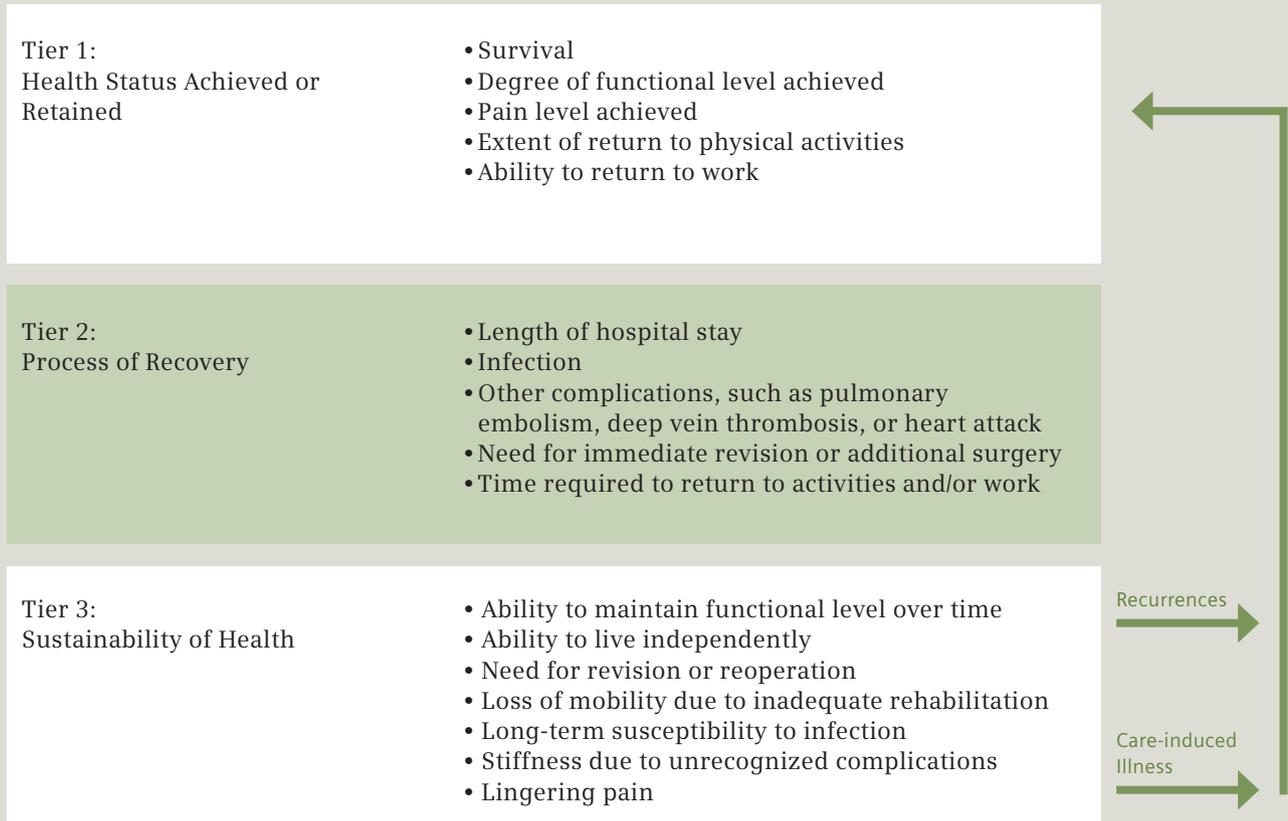
We're here at the Hoag Orthopedic Institute (HOI), with its chief executive officer Dereesa Reid who has led the Institute's value-based care efforts. Dereesa, how has HOI employed outcome measures? ▶

Measuring Outcomes

Medical care is a complex process that takes place over time. Experts in the field of value-based healthcare have developed a three-part hierarchy of measurable outcomes that can be used to assess quality of care across a wide spectrum of medical conditions. This example, based on Harvard Business School professor Michael E. Porter's work, shows how the hierarchy would be used to measure specific outcomes for knee replacement surgery.*

Outcome Measures Hierarchy

Examples of Measurable Outcomes for Knee Replacement Surgery



*See also "What Is Value in Health Care?" Michael E. Porter, The New England Journal of Medicine, 2010; 363: 2477-2481.

Reid: HOI opened in November 2010 and from the beginning the doctors were passionate about quality and about measuring outcomes. By early 2012, we were beginning to see really good quality outcome data. And again, right from the start, everyone was totally aligned with the idea that we needed to put the results out there.

How did you decide which outcomes to measure?

Reid: There are standard metrics that we collect as part of the Centers for Medicare and Medicaid value-based purchasing program – measures like infection rates and readmissions – but we also drill deeper into the data. Very few of our patients need to be readmitted later because of problems.

Nevertheless, we still want to know the root cause on occasions when patients do have to be readmitted. Was it a result of the surgery or the medical care afterwards? We drill down to the physician level, so our doctors can compare their results with those of their peers, and against national averages. We let our physicians know who is achieving the best outcomes in terms

“We feed data back to our medical staff at all levels, so they understand that they are making an important contribution to value.”

of cost and quality of care. In fact, our surgeons specifically asked us to put their names on the data so they could learn from one another how to deliver the best value. We feed data back to our medical staff at all levels, so they understand that they are making an important contribution to value. If you work in a sterile process, for example, you should know what the infection rate is. That way, if there are problems, we know right away and can address them. And if we're doing very well, the people involved know that they make a real impact on the value we provide.

Are health professionals generally receptive to the idea of outcome measures?

Deerberg-Wittram: Doctors are by nature competitive, curious, excited. They want to know how they can improve costs and outcomes. Measuring outcomes that matter to patients gives them the means to do that. I know of one organization where they get together every six months and review more than 80 pages of outcome data, down to the tiniest aspect. The rule is that the surgeons who are not doing so well have to assist their better-performing colleagues for the next five operations. Once, the medical director with the longest experience had some deviations in outcome, so he had to assist one of the young doctors. I think that is marvelous. ▶



Dereesa Purtell Reid

Dereesa Reid is chief executive officer of Hoag Orthopedic Institute, based in Orange County, California. Before joining HOI, Ms. Reid was principal of CareInfinity, a healthcare consulting company, and assistant vice president of Covenant Health System, where she directed operations and finance. A graduate of Texas Tech University, she has served in a variety of senior and executive level roles during her varied career, including hospital operations, managed care, physician practice management, and network development and operations. In 2008, she received the Texas Tech University Rawls College of Business Professor Whitehead Award for Leadership Excellence in Health Organization Management.

International Consortium for Health Outcomes Measurement

The International Consortium for Health Outcomes Measurement (ICHOM), founded in 2012, is a not-for-profit organization dedicated to developing universal standards for measuring health outcomes. By bringing medical experts, patient advocacy groups and other healthcare professionals together to identify key outcomes for specific

conditions, ICHOM hopes to address the most urgent challenge facing healthcare today: controlling costs while maintaining quality. Jointly founded by The Boston Consulting Group, the Karolinska Institutet, and Harvard Business School professor Michael E. Porter, ICHOM held its inaugural meeting in October 2012, welcoming more than 80 healthcare leaders from five continents.

ICHOM's early efforts in standardization are focused on four high impact medical conditions: coronary artery disease, prostate cancer, low back pain, and cataracts. ICHOM has also made available a publicly accessible data-base of over 50 registries from more than 40 organizations, covering 16 of the world's most burdensome conditions.



Boston-based Jens Deerberg-Wittram came to visit Dereesa Reid at HOI to have a discussion about outcome measurements, led by journalist Peter Jaret.

so I want to go there." But as Dereesa points out, by making your outcomes public, you are saying that this is an institute that cares about quality. You are enriching your brand as an organization.

ICHOM is in the process of creating standardized sets of outcome measurements that can be used internationally. Why is this important? How would established outcomes add to HOI's efforts?

Deerberg-Wittram: Hoag is doing a great job. What we hope to do is to expand on those efforts. We are currently setting up a working group looking at hip and knee osteoarthritis. We are involving experts as well as patient advocacy groups. We're looking at the instruments that are used to measure outcomes to see if they are as good as they can be: Some of the measurement instruments being used are out of date, for instance. Today, people live longer productive lives than ever before. So one important question to ask is how soon patients can go back to work. That's meaningful to patients and to society. Outcome data might show that an institution like HOI could offer more value by involving specialists dedicated to helping hip or knee replacement patients get back to work.

Reid: Let me add that having a standard set of outcome measures would help us avoid duplication and lower our costs. We wouldn't have to use one outcome instrument for this insurer and another instrument for that regulator, for example.

What role could standardized outcome measures play in medical research?

Deerberg-Wittram: The old model is the randomized controlled trial, which is usually a small study with carefully chosen research subjects. But increasingly, regulatory groups are beginning to ask for registry data. Registries collect outcome metrics from very large groups of patients. In a very short time, you can get data from thousands and thousands of patients. Using them, you can very quickly spot problems or test hypotheses. Hoag has been chosen as one of three institutions to set up the California Joint Registry. That's a good measure of its commitment to outcomes.

Medical standards are constantly evolving, as new treatments and new medical devices come along. How can standardized outcome measures deal with evolutionary or revolutionary changes in medicine?

Deerberg-Wittram: That's the magic of using patient-based outcomes.

Studies find that the biggest impact of outcome measures is internal.

Can outcome data also help health-care organizations compete?

Reid: Absolutely. By making the data public, we show that patient-based outcomes matter to us. The results allow us to show that we're doing a great job on things like helping people get back to work, or reducing the risk of infections and other complications.

Deerberg-Wittram: Some people may shop around and say, "HOI is better,

Medical treatments may change, but what matters to patients remains the same. If patients have osteoarthritis, they want relief from pain and a return to function. If a new artificial joint or a new surgical approach makes that happen faster or with fewer complications, that's wonderful. And we can see that by measuring outcomes.

HOI is an integrated practice unit – a facility dedicated to treating orthopedic problems. How does the concept of an IPU fit into value-based healthcare?

Reid: From the beginning, our strategy was to keep costs down and quality up. One way we do this is by being a focus shop. We embody the idea that if you focus on a limited number of things, you can do them very well and very efficiently. We also embody the idea of a cycle of care. We don't just perform surgery. We treat patients through the entire cycle of care for their condition, which means preparing them if they need surgery, following them through rehabilitation, and then measuring how well they are doing three, six, nine months later and beyond. Too often, outcome measures only follow patients from hospital admission to discharge.

It's important for us to see how patients are doing one year, two years out. That's when we know if we really provided value. We have begun offering bundled payment, so the price includes the full episode of care. And now we are looking at ways to expand the episode of care across a longer continuum.

Deerberg-Wittram: Exactly. We believe IPU's are very important to delivering value. Hoag is the perfect example. This is a facility devoted entirely to musculoskeletal disorders. In the cafeteria, you see chairs designed for people with hip or knee problems, to make it easier for them to sit. You see a center that brings together experts from different backgrounds – orthopedic surgeons, pain experts, nurses who know how to mobilize hip and knee replacement patients – all dedicated to dealing with this one area.

Quality care depends on recruiting and keeping top-flight staff. Do outcome measures help or hinder that?

Deerberg-Wittram: The strongest incentive for keeping doctors and nurses is very high patient satisfaction. That's true in most service industries.

If your customers are happy, your employees are happy. In a hospital like this, if you want to recruit and keep the best professional staff, it's important that you create opportunities for them to add value. If a nurse has a particular ability to care for wounds, for example, you make him or her a wound care expert. You improve morale. You improve patient outcomes. It's a win-win.

Reid: In the end, healthcare is a calling. People get into this business because they want to care for patients. Outcome measures allow them to know how they're doing, and the ways in which they can improve the quality of care. In our experience, that turns out to be incredibly powerful and inspiring. ■

Peter Jaret is a frequent contributor to the *New York Times* and other publications. He is the author of several books, including "Nurse: A World of Care" (Emory Press), and "Impact: From the Frontlines of Global Health" (National Geographic).



More to See on Health Outcomes Measurements

Our interview partners both met at Hoag Orthopedic Institute for a conversation. *Medical Solutions* also visited them separately for video productions and further insights.

To watch the videos, scan the QR codes using the reader app on your smartphone or paste the URL into your browser.



www.siemens.com/video-hoi



What matters at HOI: Dereesa Reid on healthcare quality, costs, and values.



www.siemens.com/video-ichom

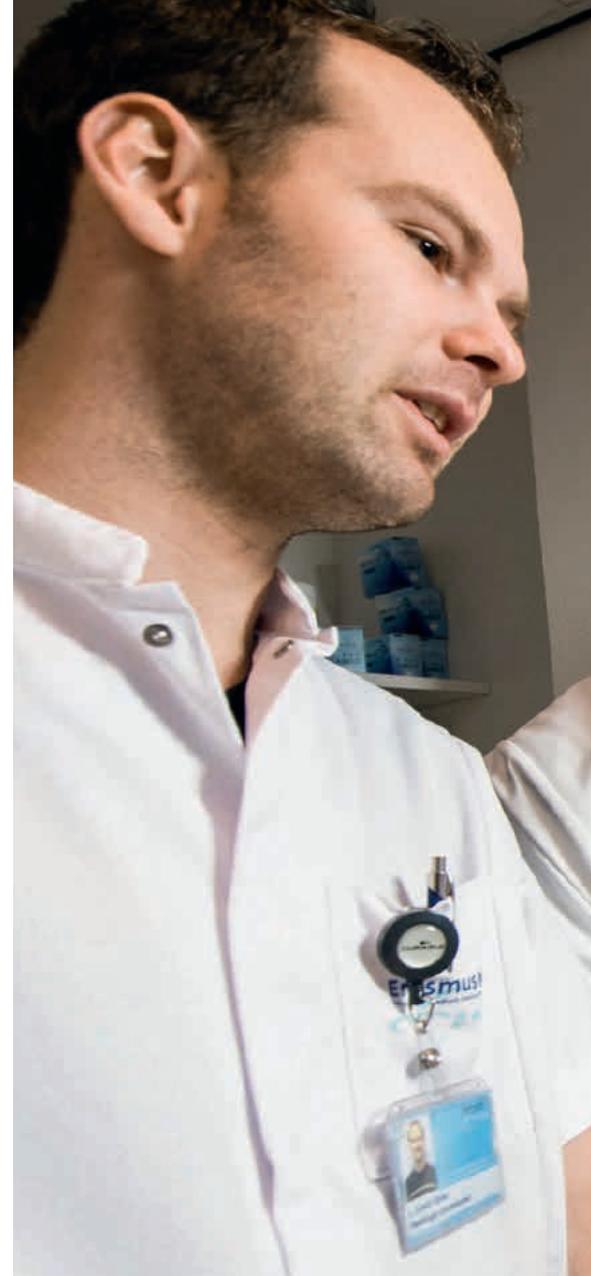


Healthcare Outcome Measurements up close: Jens Deerberg-Wittram at work.

Direct Benefits of Being Digital

Fully digital radiography solutions have huge potential to increase efficiency and to improve the availability of images within hospitals and beyond. Completely automated solutions combine the advantages of the fully digital approach, creating benefits for radiology departments, individual technicians, and patients.

Text: Philipp Grätzel von Grätz
Photos: Ezequiel Scagnetti



“I find the Ysio system fairly easy to use. There is far less physical work involved, compared with older systems.”

Luud Rijnen, Radiology Trainee, Erasmus Medical Center, Rotterdam, Netherlands



Radiology trainee Luud Rijnen (left) sees the advantages of digital radiography when discussing clinical images with Bert Huijbens (center) and fellow student Milan van Holstein.

Erasmus Medical Center in Rotterdam is no usual hospital. Its main site, in the center of town, is more like a district than a building. There is a separate children's hospital in the next street, and a cancer center in the south of the city. The Department of Radiology is very busy, with around 100 medical technician assistants providing cover for all three institutions. Some 60 to 65 doctors are then responsible for analyzing the X-rays from the computed tomography (CT) scans, magnetic resonance (MRI) images, and interventional radiology that those technicians produce.

For general radiographic examinations alone, there are 90,000 patients per

year. This workload is handled using a total of 24 radiographic systems, not counting CT, MRI, or interventional solutions. Some of the systems are fully digital, but not all of them. Siemens has become one of the hospital's most important industrial partners in recent years.

Departmental Perspective: Efficient and User Friendly

"We have made the shift towards fully digital radiography in recent years. For the average technician, this was a completely new thing – really, a new world," says Bert Huijbens, Unit

Manager for Conventional Radiology at Erasmus Medical Center. From the perspective of the department, going digital was a huge leap forward: "Our doctors love it. Image quality is far better with the digital systems than it was in the old days. There are far more details on chest X-rays, for example." There are obvious logistical advantages to using DR systems, too: Having the X-ray images instantly available, and being able to distribute them within minutes – or indeed, seconds – to wherever they are needed is of utmost importance to an institution the size of Erasmus Medical Center. "And to be able to check the quality of the images, while the patient is still ▶



“From the point of view of the department, Ysio is a highly efficient tool for examining high numbers of patients.”

Bert Huijbens, key user and Unit Manager Conventional Radiology, Erasmus Medical Center, Rotterdam, Netherlands

present, is obviously also extremely helpful,” says Huijbens. Generally, a standard X-ray examination of a knee or a hip, using the Ysio® digital radiography solution, now takes a matter of minutes. On busy days, each room can handle as many as 60 patient examinations.

But, fully digital radiography also means that technicians must come to terms with a new way of creating and processing images: “Handling the system in the X-ray room is considerably quicker than it was during the non-digital era. But in post-processing, technicians need to be aware of spe-

cific parameters that affect image quality. This is something we all had to learn about and still have to,” says Huijbens. The Ysio system makes getting a handle on DR particularly easy, according to Huijbens: “There are hundreds of standard protocols that lead to high-quality images. They are easy to use even for less experienced colleagues,” he says.

As Unit Manager, Huijbens is one of two key-users allowed not only to use the system, but also calibrate it and change protocols. “Since the standard protocols are so good, we don’t have to change them very often. But when

we have to, it is very straightforward. The Ysio system is not only user-friendly; it is also key-user friendly.” This is one of the reasons why Erasmus Medical Center recently installed its third Ysio system in as many years.

Technician’s Perspective: Comfortable and Ergonomic

Another reason is the value that technicians place on the system’s high level of automation and excellent usability: “When I have a patient, I use the remote control to bring the tube



Bert Huijbens appreciates the Ysio system’s user friendliness and its huge variety of pre-programmed protocols.

into the right position, and to place it roughly in the direction needed. I don't have to touch the system at all. I only use the handles to fine-tune the position: it is absolutely effortless," says Luud Rijnen, a young trainee, who plans to become an assistant medical technician himself.

Rijnen also occasionally works in one of the older rooms. He is therefore well placed to compare the Ysio with other solutions. "A big plus is that fine positioning is so easy. If I unlock the table, I can move it with one hand and use the other hand to move the tube. There is certainly far more physical work involved with the older systems." Rijnen also likes the foot pedals, which are integrated into the table and can be used to raise and lower it, or position the tabletop: "This is far more comfortable for the back, since I don't have to bend over to help the patient."

According to Bert Huijbens, other technicians very much share his impression: "We had many colleagues with shoulder problems in the past. This is not an issue anymore. We can use the remote control, and even if we move the tube manually, it is lightweight and easy to maneuver." The ability to access the menus directly at the tube, via a large color touchscreen monitor, also helps keep staff relaxed. "We see everything on this menu: the name and date of birth of the patient, as well as the program selected. It is even possible to change the order of a program without having to go back to the workstation," Huijbens enthuses. Having relaxed staff is also good for patients: Not only are they diagnosed using a modern system with low radiation dose and quick examination times, they also interact with technicians who are highly satisfied with their working conditions. And a good atmosphere can be contagious. ■

Philipp Grätzel von Grätz was a medical doctor before he became a freelance healthcare journalist in the early 2000s. His areas of specialty include medical technology and healthcare information technology. From Berlin, he contributes as author, editor, and editorial director to various healthcare magazines in German- and English-speaking countries.

The Benefits of the Ysio System

Digital radiography (DR) addresses the needs of modern X-ray departments: Quick image acquisition and immediate availability of images for quality control and post-processing are what hospitals can expect from modern DR systems. However, DR doesn't have to stop there: Siemens' Ysio system has several features designed to support radiologists and technicians in their daily routines.

For example, Ysio features FAST (Free Axis Simultaneous Travel). With the help of a remote control, this provides parallel movement across six axes – thereby providing safe and highly accurate positioning. Usability was also a priority in the design of the Ysio system. A wireless remote control allows the tube to be positioned from any point in the room. And with the help of a large intuitive touchscreen, technicians can change all relevant image parameters directly from the tube without leaving the patient. Even changes to the order of examinations are possible without having to go back to the workstation.



Further Information

www.siemens.com/ysio

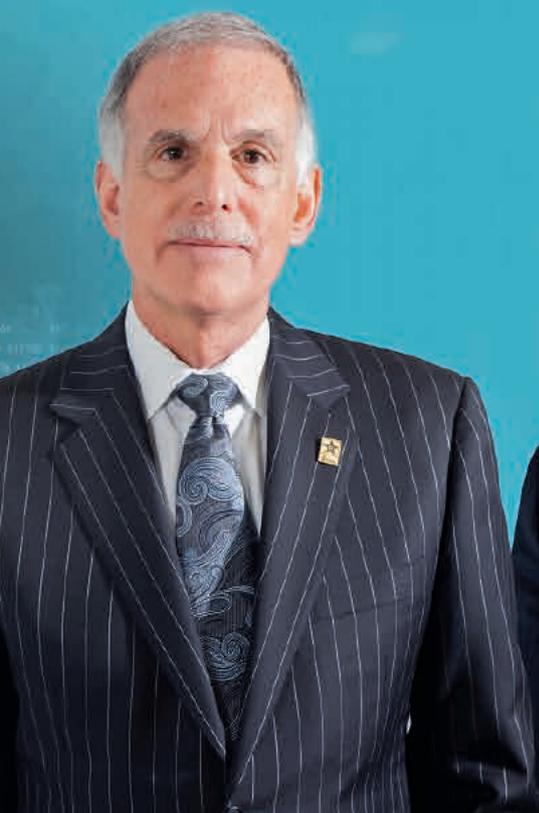
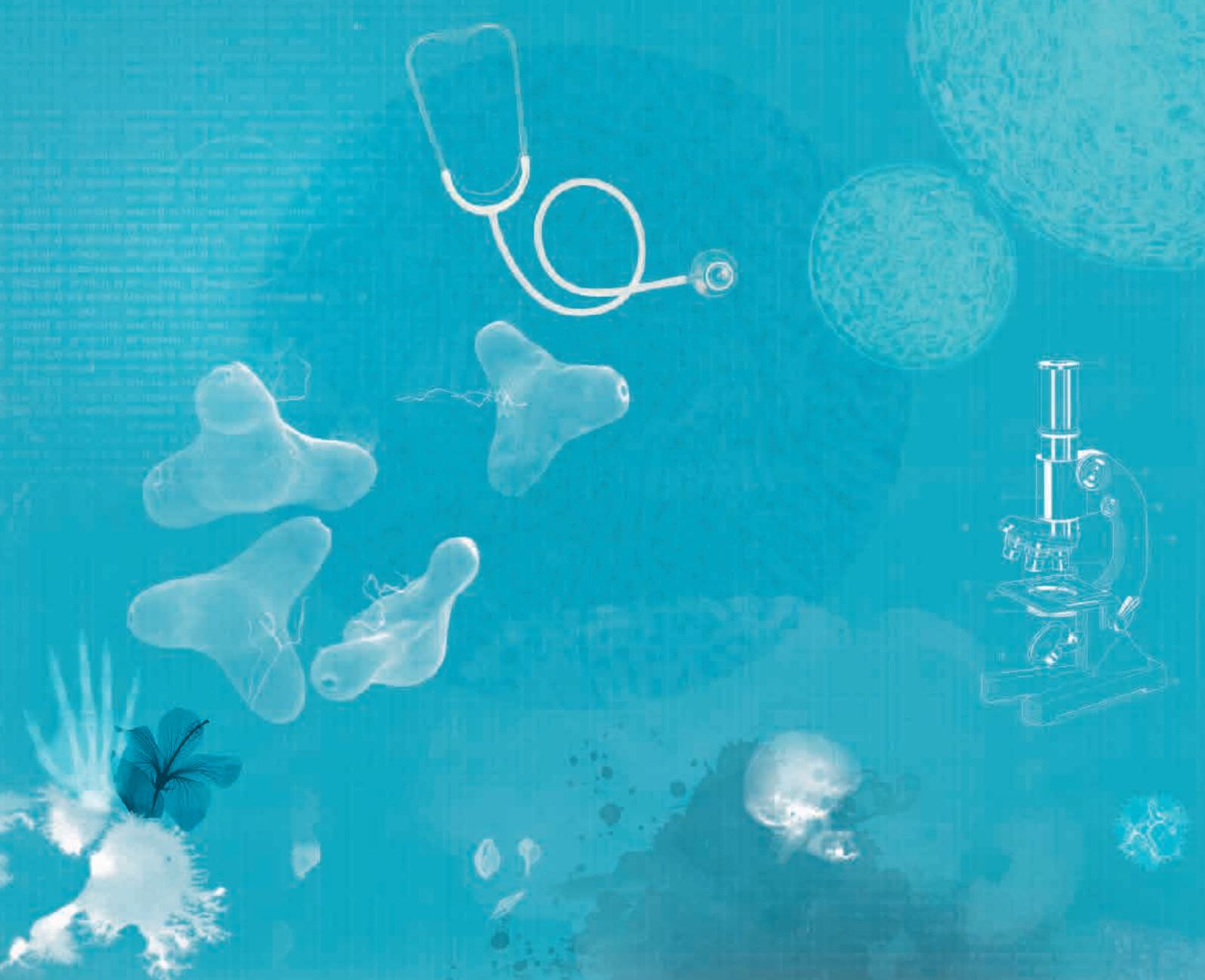
The statements by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve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

Best in Class

Medical Solutions met with the five top-level executives of Virtua, New Jersey's innovative Healthcare System, at their state-of-the-art hospital in Voorhees, New Jersey. The company is leading the way to future population health awareness – with a set of Siemens IT solutions at the core.

Text: Roman Elsener
Photos: Katja Heinemann
Illustration: Mariela Bontempi







Richard Miller

“We are putting the patient at the center of the healthcare process.”

Richard Miller is the President and CEO of Virtua. According to many of the managers and staff at Virtua, it is his vision for population healthcare that has made this New Jersey healthcare system not just a leader of the industry, but also best in class.

In your opinion, what are the main contributing factors to Virtua’s success?

Miller: There are three variables that are crucial: people, strategy, and process. Good people and good management are crucial, and I think we have both in abundance. Success requires a good strategy, and we have set a good course for U.S. health systems.

The third thing is process: How do you take the strategy you’ve developed through a process that will get you to the end results? And how do you measure the success of that process?

Facing today’s challenges, what are your main priorities?

Miller: Cost, quality, and access. In the USA, the cost of the product has to be brought down; it’s too costly

for business and for people in general. The quality of the product has to improve – we need high quality at low costs. Another key will be access to healthcare in the community. We will have fewer hospital beds in the future, but we need more access to outpatient services in the marketplace, especially primary care services for patients.

What strategies are you deploying to facilitate this outpatient care?

Miller: We are putting the patient at the center of the healthcare process. The setting is no longer the acute care center, but the patient’s home and other settings outside the hospital. We are focusing on an accountable care model that looks at taking resources and transferring them from the hospital setting to the outpatient or at-home setting. We have to manage care for patients with chronic disease differently. Then we will see lower costs in healthcare.

How do you plan to help the population lead a healthier life?

Miller: The focus for us now is health and wellness. We’re making a big bet here on keeping people well, making sure people exercise and eat properly. We’re trying to improve the lifestyles of 8,500 employees and their families – 12,000 to 13,000 lives – to lower the cost of care for our own staff. We will do everything to support a healthy lifestyle. At the end of the day, if the consumer doesn’t follow what we’re trying to accomplish, it’s going to cost him or her more.

How is modern technology helping you in achieving your goals?

Miller: Modern technology is a key factor. Our journey started when we installed Soarian® here for a base model for clinicals at Virtua. We went through an exhaustive search. The Soarian product is the foundation of our electronic medical record, so you have to make a good decision there, because that is where all the core information is going – to inform the physician’s clinical decisions. We have a pretty robust health information exchange here at Virtua, with the Siemens product being at the center-piece. Information technology today can measure outcome and success, and you can benchmark clinical quality

very well. The future is very bright in that area, because we'll be connecting a lot more together, as health systems. Even competing health systems now have converted to Virtua's health information exchange, for the benefit of their patients and their physicians.

Where does Siemens help you to be measurably more effective?

Miller: To have nursing documentation and physician order entry coming in electronically is huge. It's a life-saver for us and for a lot of hospitals around the country that no longer depend on handwritten notes from a physician, it's on the record, its electronic and clear – so there is no guesswork with physician orders or nursing documentation. Siemens has been at the beginning of Virtua's IT revolution in terms of getting us where we need to be.

How do you make sure you will still be on top of the industry even ten years from now?

Miller: One factor is that Siemens and Virtua are working together and preparing for what is coming in healthcare ten years from now. Information will be disseminated very quickly. Choices will be made on the Internet about healthcare. Most of it will be delivered on an outpatient basis. There will be a much better process of care. Eventually, you won't have to open a chest up for heart repair; I think this will be done minimally invasively at some future point. And technology has to keep up with that.

You have formed some innovative, strategic alliances in the past. What are you looking for in such ventures?

Miller: A partnership is based on how we gain value from each other. How can Siemens use Virtua as a research and development site for future products and to leverage a brainstorming and thought process? If you have a thought leader in healthcare and a thought leader in IT and diagnostic technology, you'll be thinking together. There are bright minds on both sides that can help figure out together what the future will bring.



Bob Segin

“We like to work with best-in-class organizations – and Siemens is certainly one of them.”

Bob Segin is the Executive Vice President and CFO of Virtua. He has been with the company for almost 30 years, and today oversees strategy in terms of mergers and acquisitions, the overall finance department, corporate compliance support services, and health information management.

As a CFO you have a special interest in running a tight ship. Can you share some of your strategies?

Segin: In our organization, we set a five-year strategic financial plan. If you provide excellent service, the financial results will come. It's never finance first and operations second. Our business is to provide outstanding patient care. If we do that, the financial results

will follow. Fortunately for us, the plan has been very accurate. Now, we're already planning five years out from where we think we are going to be financially.

You have a lot of data coming in. How do you manage the data flow?

Segin: We are very rigorous in data collection. Every Friday morning, we ►

hold a mandatory financial briefing. We project within one standard deviation what our monthly financial close and bottom line will be. Behind all that we have all the statistics of our businesses, all of the financial revenue, and expenses of each business unit projected out on a weekly basis to the end of the month. As a matter of fact, the system works so well that our latest meeting took only 45 minutes to cover our entire business projection and estimate for the month.

So that allows you to course-correct very quickly, should something not go according to plan?

Segin: Typically, in the real world, you get your budget variance report three weeks subsequent to the end of the month. It may take another

manager three to four weeks to look at it, so you're already two months behind in terms of course-correction. At Virtua, we look at it weekly, based on a projection, and we course-correct within that week. The question is not why you have the variance, but how to fix it. We applaud managers seeking help and guidance with other managers to help them mend their problem.

How do you select people for Virtua's managing workforce?

Segin: We have a portfolio of high-performing managers. So if a manager exits, we already know who could fill that slot in terms of succession planning. There's no guessing; we already know in advance, based on our best people review process, who can take that next position.

We try to educate and groom top-level people and to coach and mentor people that need improvement.

How does Siemens help you as a partner?

Segin: Siemens has helped Virtua get to where we are in IT at this point in time. We feel connected to Siemens as an organization, and they give us terrific support. Now, we are going to move into implementing the revenue cycle system via Soarian. We take pride in working with organizations that are best in class. So if Siemens is producing best-in-class products, Virtua would like to be at the table with Siemens and acquire these products. We like to work with best-in-class organizations, and certainly Siemens is one of them.



Al Campanella

"Efficiency is really the point."

In Al Campanella's view, Siemens Soarian is not only very proactive. The Executive Vice President for Strategic Business Growth and Analytics at Virtua oversees business and strategic development, and heads the internal consulting group. He steers the IT operation as a whole, the organization's wellness programs, and their access navigation centers.

What are the main priorities in managing a modern hospital?

Campanella: The main priorities are to serve the community, as we have for over 100 years, while also re-engineering and re-positioning ourselves for the future. As you know, here in the U.S., we are facing a major healthcare reform driven not only by government changes, but also by changes in demographics. There is a great ageing of the popula-

tion here. The baby boomers are rapidly becoming the dominant portion of the population. At the same time, employers are demanding that overall healthcare costs be reduced so that the premiums for employees can be reduced. Healthcare providers need to deliver care more efficiently and effectively.

How can you reduce costs while at the same time investing in the most modern technology?

Campanella: Efficiency is really the point. You need to have investment in modern infrastructure, but hopefully all of these factors contribute to greater efficiencies, so you make it up. Siemens has been a great partner with us in terms of technology and innovation. Our electronic medical record includes a set of components that not only allow our nurses and doctors to document care effectively, but also to perform very critical functions such as dispensing medications in a safe manner, ordering tests in a very safe manner, and running major operations. For instance, we use the Siemens pharmacy system and the radiology system, and those are two very large supporting departments to the daily activity. All that combined makes us very efficient and makes us a modern hospital.

Do you have a specific example where the process gained in efficiency?

Campanella: Siemens Soarian includes many tools. One of these is the workflow engine, and that set of technologies creates alerts, and reminds the nurses and physicians of necessary care tasks. It helps keep the day moving at a very good pace, and ensure that certain activities and certain things they are trying to do for patients really happen. It's very proactive.

With more than 20 years of experience in healthcare planning, you've seen almost revolutionary changes. What are some of the most memorable?

Campanella: The government's had a huge influence over the years in terms of how they want care delivered, setting standards. For example, the HITECH Act provided funding for both hospitals and physician offices to install EMRs so there could be a new standard of care, documenting care, and decision support. The data is available now and can be analyzed. Consumers are becoming more savvy, and they're seeking out those providers who have high quality and high standards, and whether the hospital uses modern technology.



Michael Kotzen

“Partnering with Siemens really paid off.”

Michael Kotzen is the Executive Vice President for Population Health Management at Virtua. He is responsible for the operations across the system, collaboration of hospitals, ambulatory services, and the post-acute network.

How has technology changed the healthcare system in recent years?

Kotzen: As healthcare becomes more about managing populations, as opposed to the acute episode that's right in front of us, we're really dependent on technology to bridge those gaps across the levels of care. And we need healthcare to be more efficient. There's a lot of pressure on

the industry to reduce the cost of healthcare. Technology can help drive that.

What are the challenges that you experienced in going fully electronic?

Kotzen: We had heard a lot of horror stories about implementing electronic medical records, and physician order ▶

entry. But our experience couldn't have been better. I was responsible for building this new 400-bed hospital in Vorhees, New Jersey. We spent a lot of time with Siemens to make sure we had that smooth transition. It really paid off. We are able to pull much stronger data to see whether our initiatives in re-admissions, safety in the hospital, and so on are really working. There's so much more that we need to do in terms of population health, and I think the possibilities are limitless.

You're planning a shift from treating disease to helping populations maintain their health. The USA is not the easiest country to make such a shift. How do you go about it?

Kotzen: I think one of the biggest challenges is in engaging the population in their own health. If we don't have that engaged patient population, we're just going to be adding another level of complexity without making the impact we want with the resources we're expending.

Is the population ready to take part in this shift?

Kotzen: I think so. For example, we have a number of initiatives for improving patients' medication management once they're discharged from a hospital and connecting that with our primary care physicians. But we'd like to see a broader impact, and be able to say that our population has improved in this respect. The health needs assessment will help us get there. I'm proud to say that in terms of patient satisfaction, we are in the top seven percent of all hospitals in the country.



Tom Gordon

"It's not about the amount of data, but about finding the most valuable information."

Entering data into an electronic record is one thing. But analyzing that information and making it available to the right person at the right time is key, explains Tom Gordon, the Chief Information Officer at Virtua. He is responsible for an IT department consisting of 175 employees, multiple platforms of technology and telephone services, and the technology strategy across the Virtua continuum.

Can you describe the Virtua healthcare system from an IT perspective?

Gordon: We have a very robust technology platform that enables us to coordinate care. Looking at care

across the continuum is really important, especially in terms of quality and efficiency. Connecting the physician ambulatory record to the acute record, to our health information exchange platform, and then of course to our electronic medical record creates a plat-

form that has helped us reduce medication errors. We've increased legibility, reduced variation in care, and we have faster order turnaround. IT has an important role in patient care.

Surely this new technology brings challenges...

Gordon: Just getting the data into an electronic record is one thing. But analyzing that information and making it available to the right person at the right time is key. The data has grown exponentially. Now we must bring the most important data to the forefront and turn it into useful information. It's also a question of cost. We want to ensure that we don't enter the same information into the same system multiple times. We want that information to be in the right electronic medical record and entered by the right person.

Do you have to be a computer expert to work at a modern hospital?

Gordon: The electronic record certainly has changed the workflow. Evidence-based care and decision support requires information to be put into the system in a certain way. Information needs to be readily available, medication errors need to be reduced, all leading to better patient care and quality. Clinicians no longer look at scripts. They're looking at a screen version or structured data as opposed to handwriting. That has really improved the quality of the data and accelerated processes. ■

Roman Elsener is the U.S. Head Correspondent for the Swiss News Agency SDA in New York. He has worked as editor, reporter and producer for various European and media. He has produced stories for, among others, Neue Zürcher Zeitung, NZZ am Sonntag, Swiss Television SRF, German TV ZDF, Spiegel Online, Handels-Zeitung and many more.

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.

Further Information

www.siemens.com/soarian

Virtua at a Glance

- Virtua is a multi-facility healthcare system in New Jersey that puts **health and wellness at the center of patient care**.
- Physicians at all four Virtua hospitals (Berlin, Marlton, Mount Holly, and Voorhees) are **entering clinical orders electronically** through the use of the Soarian Clinicals enterprise health IT solution by Siemens.
- A non-profit organization, Virtua is one of the area's largest employers. Virtua employs about **8,500 clinical and administrative personnel**.
- More than **1,800 physicians** serve on the medical staff.
- Virtua is chosen by more patients than any other healthcare provider in South Jersey. Virtua delivers more than **8,000 babies a year** at its hospitals in Mount Holly and Voorhees.
- Virtua has a **customer satisfaction rate of 93 percent**, in the top ten of all hospitals in the USA.
- Virtua offers **free classes** to educate people about disease prevention, facilitate support groups, and conduct a variety of health screenings.
- Virtua provides **clinical training** not only for local nurses, paramedics, and physicians, but also for the community including pediatric and adult cardiopulmonary resuscitation.
- Virtua has been honored twice with the **New Jersey Governor's Award for Clinical Excellence** (Bronze in 2005; Silver in 2006) and recognized with the **Leadership Award** for Outstanding Achievement by Voluntary Hospitals of America. Virtua is the recipient of the 2010/2011, 2009/2010 and 2007/2008 **Consumer Choice Awards** given by National Research Corporation.
- The New Jersey Technology Council awarded its annual top prize – **Master Technology Company of the Year** to Virtua. The key considerations for the award include **long-term growth and profitability**, substantial impact on industry and market within the last 10 years, advancement of industry standards, and accomplishments as an outstanding corporate citizen.

Helping People Feel Safe in Their Own Homes

According to Svante Lönnbark and cardiologist Per-Erik Gustafsson, MD, Sweden's Gävleborg region needs to increase efficiency in its health-care sector. They believe that people should feel safe in their own homes – independent of their age or health issues. New technologies like Soarian and remote pacemaker monitoring are helping make both these ambitions reality.

Text: Nils Lindstrand Photos: Tim Meier





GA VILJE KOMMUN

TRYGG-HANSA



County Council CEO of the Swedish Landstinget Gävleborg, Svante Lönnbark

New technology can help reassure people with health issues that they are safe. Rather than needing to live near a hospital or home visits from a doctor, many health issues can be monitored remotely, using the Internet, wirelessly transferred information, and modern medical equipment. By feeding the data from such monitoring into, for example, Soarian® Clinicals, all collected information can be easily accessed by doctors and other staff within the total healthcare system.

Tough Challenges

Svante Lönnbark is the County Council CEO at Landstinget Gävleborg, a regional body responsible for the healthcare and communication of more than 275,000 people, and administering 18,000 square kilometers (app. 7,000 square miles).

“We have a number of tough challenges,” Lönnbark says. “We have an ageing population with many senior citizens. Our region also has the highest unemployment rate in Sweden, and a population with a lower-than-average level of education for this country. These are statistics usually associated with health problems. People in Gävleborg, in

“The vast size of the county, as well as its scattered population, demands coordination to use resources efficiently.”

Svante Lönnbark, County Council CEO,
Landstinget Gävleborg, Sweden



Cardiologist at Gävle hospital, Per-Erik Gustafsson

many cases, worry about their future and do not consider themselves as being in good health."

Such a situation calls for new ideas and new solutions. Investing in Soarian in 2008 was one step the County Council took to improve healthcare efficiency and redefine perceptions of safety among people living with health issues: "We needed to free more time for our doctors and nurses to work with the patients and analyze their needs," Lönnbark explains. "We also needed to create a seamless chain in the healthcare system to guarantee patient safety, and ensure the efficient use of resources. Soarian was able to help us a long way with this." Citing cardiology, rheumatology, and diabetes as areas that could benefit from the use of remote monitoring and greater patient involvement, the County Council CEO explains, "All healthcare politicians say they want to put the patient first. It is easily done, though, to help the patient too much. We are trying to actually listen to the patient's own needs, letting him or her state what treatments are needed and when they are required. We also want to make it possible for patients to take an active role in health monitoring, by entering facts and figures about their own health. To do this better, we may need to develop the interfaces further."

Soarian Saves Time

Cardiologist Per-Erik Gustafsson at the region's Gävle hospital confirms Svante Lönnbark's view that Soarian can help healthcare staff to focus more on the patient: "I think Soarian Clinicals is fantastic because it helps make the patient safer and my work more efficient. Working with Soarian means we collect all the patient information in computerized patient records. Combined with technology like remotely controllable pacemakers, this contributes to a safer and easier life for the patient, and a more efficient healthcare system. Instead of searching through reams of papers and numerous binders for patient data, we can rely on all of it being collated in records that are easily accessible from the PC in my office. This means more efficient care and greater security for the patient, but also a better working environment for me."

Although Gustafsson is pleased with the results so far, the innovative doctor and his colleagues are already looking towards the next step: "The combination of Soarian and remote control has been very successful, but it will give us even greater gains when we involve more staff. Nurses are responsible for much of the planning, such as booking patients for hospital examinations. When we get them to ►



“The combination of Soarian and remote control has been very successful, but it will give us even greater gains when we involve more staff.”

Per-Erik Gustafsson, Cardiologist, Gävle hospital, Gävleborg, Sweden

harness all the possibilities offered by the remote monitoring and Soarian, we will probably become even more efficient.”

The cardiology department at Gävle hospital is also working together with the hospital IT department, Siemens, and other suppliers to establish a data link for pacemaker readings from hospital check-ups or adjustments with presentations into Soarian. This development work is progressing very well, and the project representatives are positive that this transfer of information into Soarian will soon be a reality. The complete switch to using pacemakers with remote monitoring still lies in the future, and it is vital to have data for all pacemaker patients immediately available via Soarian Clinicals as soon as possible. “This will be a major step in our becoming more efficient,” says Dr. Gustafsson. We will also extend the monitoring alternatives by cooperating with healthcare centers and other nodes in the healthcare system, thereby allowing more patients to get advanced treatment at the hospital.” ▶



Sweden's Efficient Healthcare System

According to a comparison by the Swedish Association of Local Authorities and Regions (“Swedish healthcare in an International perspective”, Stockholm 2005), Sweden’s healthcare system performs very well compared to those in other countries. This includes access to care, as well as quality, results, and long-term effects. These results have been achieved with only average expenditure, which means that the overall effectiveness of Sweden’s healthcare system is high. These conclusions are supported by the system’s ability to cope with growing demand from Sweden’s ageing population – using moderate resources (measured according to the number of doctors and nurses per thousand inhabitants).

Sweden also scores highly in medical results and the long-term impact of treatments, exemplified by its low mortality rates for cancer. One area in which the country is not performing so well is mortality from heart disease. Heart attack prevention is one area where Sweden needs to do better, as is stroke prevention.

These are medical conditions where remote monitoring – combined with solutions such as Soarian – can be vital; not least when one considers Sweden’s huge size and the percentage of its population that lives in the countryside, a long way from any hospital.

International surveys, such as the “Healthcare Systems in Transition Survey (2002-2005)” – commissioned by the European Observatory on Health Systems and Policies – share this positive view of Sweden’s healthcare system. They observed that Swedish healthcare ranks highly among that of other industrialized nations because it combines relatively low costs with wide accessibility – across all social strata and all geographical regions – delivering good medical results and long-term benefits from treatments.

The Swedish healthcare system is decentralized; both financed and managed mainly by the 21 regional or county councils. This decentralized organization has been further

emphasized in recent years. Previously, nationally managed systems have been transferred in large part to the regions or county councils. Responsibility for home care for older people relies on the 290 local authorities. This is especially true for residential care, nursing homes, and other forms of accommodation for older people.

Sweden’s healthcare is mainly funded through local and regional taxes. Patients pay around 2.7 percent of the total costs of treatment. Private funding is increasing, but still represents less than one percent of healthcare expenditure. The Swedish healthcare system costs around 250 billion SEK (approx. 28 billion euro), annually. Providing for a population of 9.5 million people, this equates to approximately 3,000 euro per person (Sources: Statistics Sweden and Swedish Association of Local Authorities and Regions).





There is No Place Like Home

The combination of a geographically huge area and an ageing population makes it essential to ensure that patients are safe living in their own homes. It also means that coordination and overview are key demands within the region's healthcare sector: "We want to make it possible for people to stay at home," says County Council CEO Svante Lönnbark, "except when they need specific care that is only available in the hospitals."

"There are a number of things that modern technology allows us to monitor from a distance. We can keep track of blood pressure and we can monitor if someone falls. In Gävleborg, we have been monitoring pacemakers since 2008 – using wirelessly transferred information and Internet technology. The automatic presentations into Soarian have been used since 2011. Both the vast size of the county and its scattered population also demands coordination to use resources efficiently. We can't have ambulances in every village; even less, have hospitals in small towns and villages. So we need to coordinate."

Part of this coordinated effort is the home-help service, generally provided by the local councils. By being included in the loop, the home-help employees can keep better track of how their clients are doing and the type of assistance they need. This helps to improve efficiency and also provides an easier working environment for the home-help staff.

Competence Needs to be Elevated

Svante Lönnbark says that the county has become rather good at what the industry usually calls "production plan-

ning", which in the healthcare sector means preparing for surgery and other demanding tasks: "We need to be able to use resources efficiently; not least human resources," he says. "We sometimes talk about this as 'the competence elevator', which means that we try to lift employees to their maximum levels of competence. For instance, nurses at health centers can safely handle a lot of examinations and treatments – saving other hospital resources for where they are really needed. But this requires better integration between different parts of the healthcare sector, so that information is available and patient safety can be guaranteed. Soarian can help with this, but we need to get more people using it. This, in turn, calls for easy-to-use systems."

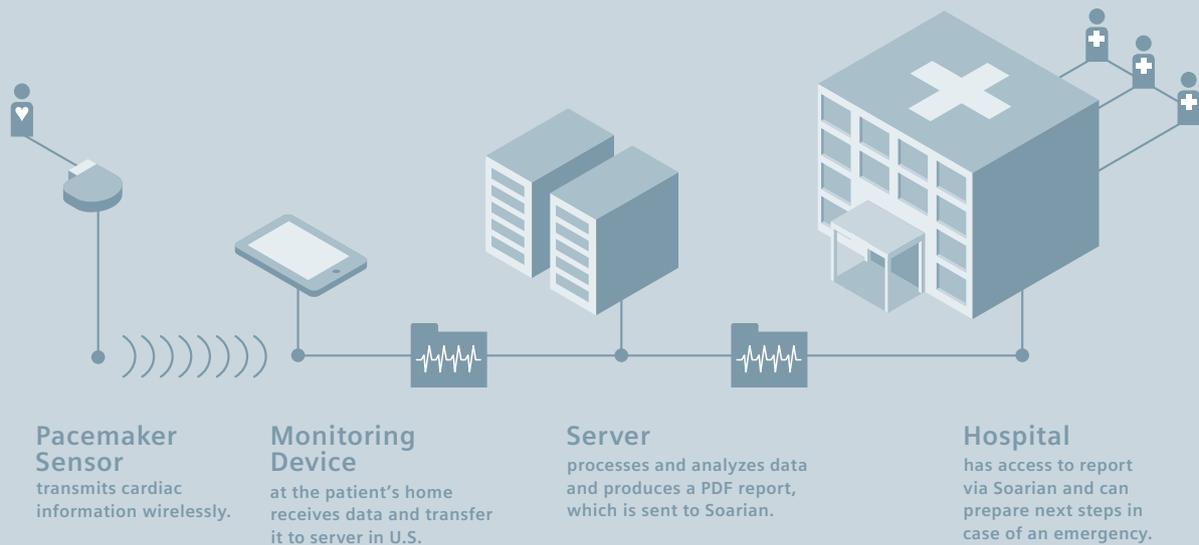
Further Development of Soarian

For the future, Svante Lönnbark wants more of the information entered into Soarian in a form suitable for statistical analysis. This might include more of "ticking boxes and clicking", and less free text. In general it is difficult to extract actual knowledge and understanding from free text.

Lönnbark points out that users often initiate innovations, and this is also true in this case. He cites the cooperation between Per-Erik Gustafsson, the IT department at Gävle hospital, and Siemens in improving abilities to import data to Soarian: "The innovation work done by Dr. Gustafsson has been noted by trade media and by Siemens," he says. "I am glad of this attention. I hope more of our staff will work like this – using new technology and improving it according to our needs."

The county CEO points out that it is the responsibility of employers to encourage an atmosphere of innovation: "We need to make sure that creativity and innovation are acknowledged and encouraged," he says.

Remote Monitoring: How it Works



A sensor within the patient's pacemaker or an implanted cardiac device (ICD) sends information once every evening, wirelessly transferred to a device in the patient's home. This device is similar in size to a small, flat radio or a tablet PC and you can easily take it with you while travelling.

The information received by the portable device is then processed and analyzed. If this analysis reveals that anything out of the ordinary has occurred, a report is sent via the Internet to the supplier's server: in this case, in California.

The information is then compiled in a PDF document, which is sent to Soarian. Once in Soarian, this data is available to everyone with clearance to read it. This means that, for example, doctors in the emergency room and physiotherapists can get quick access to vital information about how a pacemaker is set, and how it has been working for a patient. A notification is also sent to the doctor via Internet-based remote care system for patients with implanted medical devices – in this case, Merlin.net®. The doctor can then access this website to review all the messages received from the patient implanted device since the previous day.

The Stakes are High

When working on innovations in healthcare, it is also important to secure the trust and cooperation of the patient. Lönnbark believes that one way of doing this is by employing manual and automated methods in parallel: For example, in the monitoring of patients to demonstrate to them that the new technology is effective: "We can't afford to fail," he states. "We have to earn trust from patients through successful treatment. This will prove that new technology works." ■

Nils Lindstrand is a freelance science, business, and technology writer based in Stockholm, Sweden. His academic background is in chemistry and biology, and he has been working as a science writer and journalist for over 25 years.

The outcomes achieved by the Siemens customers described herein 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 others will achieve the same results. Soarian Clinicals is not intended for clinical monitoring, diagnostic, and/or therapeutic purposes.

Further Information

www.siemens.com/soarian

Getting the Full Picture – for the Sake of the Patient

Associate Professor Rolf Janka, MD, of Erlangen University Hospital, explains how Siemens' *syngo.via* helps him efficiently derive pertinent information from medical images – ultimately benefiting patients with high-quality diagnoses.

Text: **Oliver Klaffke** Photos: **Christian Kain**

"In order to boost quality and productivity in radiology reading, we need an intelligent display of the vast amount of information we get from medical imaging today," says radiologist Associate Professor Rolf Janka, MD. He works at Erlangen University Hospital in Germany and has witnessed the progress achieved in medical imaging technology during the past decade. Today, an average examination yields 1,500 images. When considering the number of patients examined, this number quickly reaches the 100 thousands each day.

Medical experts today often have access to images from a variety of modalities, such as positron emission tomography (PET), computed tomography (CT), or magnetic resonance imaging (MRI); great numbers of images from prior examinations; and visual data from other sources. When looking at a patient with a known malignant disease, for example, the prior images – possibly even from a different type of modality – might provide the decisive information for an accurate assessment of the progress of the disease. "Using sophisticated software is necessary to handle and analyze images of this volume and complexity," Dr. Janka says. Erlangen University Hospital relies on the latest

version of Siemens' *syngo*®.via software for 3D routine and advanced reading of images. *syngo.via* has been in use here for several years, helping to increase the quality of reading and productivity in radiology. "Since the introduction of *syngo.via*, we get much better results in the same amount of time," he says.

Prompt Diagnosis: A True Patient Benefit

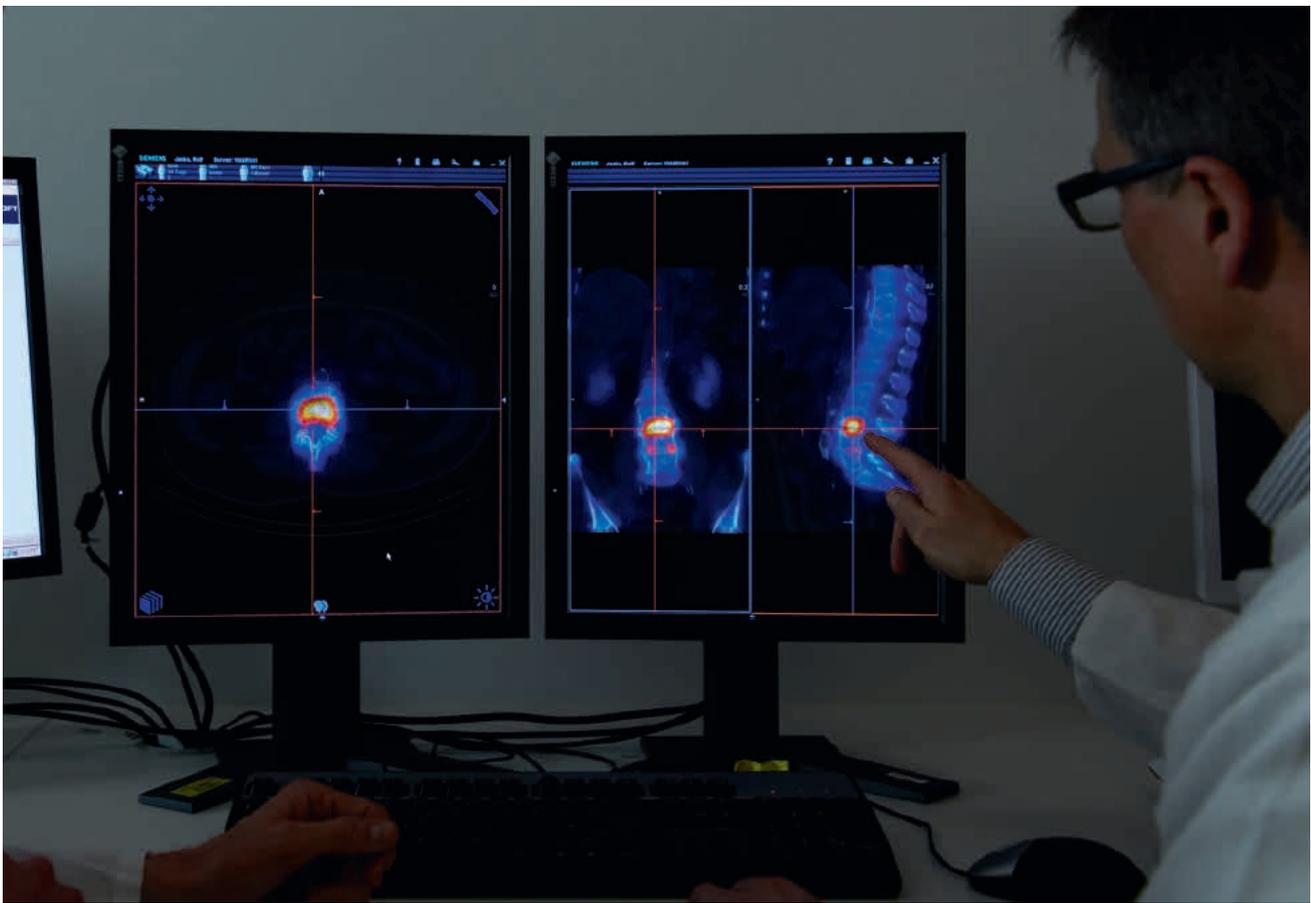
In some cases, using images from different modalities helps improve diagnosis. Regardless of which modality the images come, with *syngo.via*, they can be displayed and read on the same screen – even in a fused view. "Using different modalities will often provide more insight than using one alone," Dr. Janka says. He gives a compelling example: A female patient complained about pain in her back. Since she had previously been diagnosed with breast cancer, his colleagues needed to check whether the pain might be caused by bone metastases in the spine or by some kind of inflammation. "We combined scintigraphy and CT," Dr. Janka says. Scintigraphy shows regions of high metabolic activity in the body, while CT provides an images of the bones. "Fusing the images from these moda-

lities with *syngo.via* was easy and indicated that the high metabolic activity was located between two vertebrae," he says. And therefore it became clear that this was an orthopedic rather than an oncologic problem. "This was a great relief for the patient," he recalls. "Our ability to give a diagnosis within a shorter period of time is an excellent benefit for our patients." Take, for instance, those patients who come in for their regular check-up after tumor remission. They are under extreme stress and pressure until they get their results. "The sooner they get them, the better they feel."

Intelligent Features Help Increase Quality and Productivity

Radiologists appreciate accelerated workflows that increase efficiency without compromising quality. With *syngo.via*, they can access and read cases quickly and easily with features such as pre-fetching of prior examinations and automatic pre-processing of images. "Take the example of the follow-up scenario I just mentioned: within seconds, the priors and current data of that patient are automatically displayed," Dr. Janka says. The automated pre-fetching of past patient data helps ensure that the images needed ▶





Regardless of which modality the images come, with *syngo.via*, they can be displayed and read on the same screen.

syngo.via – Efficient. Flexible. Intelligent.

Siemens' *syngo*®.via is a software for 3D routine and advanced reading designed to increase quality and productivity in radiology. It organizes data from different modalities efficiently and speeds up the radiological workflow, thus saving valuable time. Cases can be read quickly, as features such as pre-fetching of prior examinations and automatic preprocessing make data readily available. No time is lost waiting for images, allowing physicians to focus on their core tasks.

New features and 3D tools in the latest release, such as automatic spine labeling, region growing, or anatomical image registration are a leap forward. They contribute to making *syngo.via* an even more powerful driver of efficiency in any radiological department. Tools like the 3D visualization help to make reading not only faster, but more reliable. Radiologists and their referrers greatly appreciate this timesaving feature, which also assists them in concluding when information on a normal image is not sufficient.

syngo.via supports flexibility. Radiologists can customize *syngo.via*'s applications and various layouts in line with their needs and preferences, enabling them to work smoothly. With functionalities for mobile devices, radiologists are flexible to access images even on the go. Furthermore, the system's modules can be arranged to meet clients' individual requirements. The modular licensing model available with *syngo.via* makes it suitable for specialized practices as well as for large university hospitals. Its flexibility is one of the most appealing features for managers who have to keep an eye on investment costs.

An intelligent software, *syngo.via* guides radiologists through the entire workflow. It automatically preprocesses images, collects findings, and provides powerful quantitative reading functionality. These functionalities help efficiently provide physicians with pertinent information needed for excellence in diagnostic imaging and patient care.

“Our ability to give a diagnosis within a shorter period of time is an excellent benefit for our patients.”

Professor Rolf Janka, MD,
Erlangen University Hospital, Germany

are readily available. No time is lost in retrieving data, and gone are the days when waiting for images was part of the job for any radiologist.

Dr. Janka also explains how automatic preprocessing of images, for example when reading cardiac cases, has positively impacted technical assistants: When the images appear on the screen, they have already been pre-processed by the software. This means for instance, that anatomical structures that are not relevant to the case, such as the ribs, are automatically hidden, whereas relevant structures like the coronary arteries are displayed and ready to read – without manual processing efforts. Having omitted this manual step, technicians can now devote their time to other tasks.

“Workflows are essential in our daily business,” Dr. Janka notes. One of the most helpful features of the *syngo.via* software for him is that it guides radiologists through the entire workflow. “This enables them to do the reading in a standardized way that ultimately helps save time and keep up quality standards,” he says. As *syngo.via* guides the radiologists automatically step-by-step through the reading process, they no longer need to be concerned about the next steps. “I can concentrate on reading the images instead of worrying whether I’ve covered everything that is required,” Dr. Janka explains. Using defined workflows is a good way to

maintain quality standards in any organization that handles demanding tasks. Since every radiologist in Erlangen University Hospital follows the same workflow steps, readings are highly standardized, and the resulting reports can easily be compared. “In the future, I’d greatly appreciate structured reporting of our readings to speed up reporting of the results,” says Dr. Janka. Today, he dictates them to an automated speech recognition system.

“Using *syngo.via* makes a number of tasks much easier,” Dr. Janka notes. “Very helpful in the latest *syngo.via* version are new 3D visualization features that specifically support quantitative reading and the Automatic Spine Labeling function.” The latter automatically identifies the vertebrae based on anatomical landmark recognition and labels them accordingly. “This sounds like a small thing,” he says, “but it is extremely handy.” The software is also designed to reliably support quantitative reading. Measurements, such as tumor volumes and vessel occlusions, are highly automated and thus reproducible. These functionalities provide information that is crucial for diagnosis and treatment decisions.

“I think patients have a right to get comprehensive information out of their imaging data,” he says. “With *syngo.via*, we as physicians are well equipped to provide our patients with the information they need – in an efficient manner.” ■

Oliver Klaffke is a science and business writer based in Switzerland and France. Among other publications, he has written for *New Scientist* and *Nature* in the past.

syngo.via can be used as a standalone device or together with a variety of *syngo.via*-based software options, which are medical devices in their own right.

Further Information

www.siemens.com/syngovia



Erlangen University Hospital relies on *syngo.via* for increased productivity in its radiology department.

It's All About Time and Quality

Patients anticipating their diagnosis don't like to wait, nor do the radiologists who are expecting their images. And hospital managers don't like the idea of processes that are not well organized, or of workflows that are inefficient.

In the field of radiology, they might consider looking at *syngo®.via*. This software for 3D routine and advanced reading marks a new era in the field. Workflows are standardized and streamlined, and a broad array of time-consuming tasks is taken over by the computer.

Working on medical images has thus become easy and efficient. *syngo.via*'s automatic preprocessing functionalities free radiologists from the burden of doing work that is not directly related to interpreting images.

They can now concentrate on reading images from a number of modalities. Regardless of whether they are created by positron emission tomography, computed tomography, or magnetic resonance imaging, for instance, the images can be assessed with *syngo.via*, offering a great opportunity for prompt diagnosing.

An Efficiency Revolution

Siemens is helping a Scottish hospital's blood sciences laboratory meet the twin challenges of increasing demand and ever-tighter budgets. As the first hospital in Northern Europe to adopt Aptio Automation, Ninewells hospital in Dundee is already reaping the rewards of being at the cutting edge.

Text: Ed Targett Photos: Michelle McCarron







In the past, staff were running around in the lab; now it is a simple, calm process.

“By being able to provide a bigger repertoire of tests in a shorter period of time, we can increase the flow of patients through acute receiving wards.”

Dr. Bill Bartlett, Joint Clinical Director of Diagnostics, NHS Tayside, Dundee, Scotland

Nestled on the eastern coast of Scotland and bisected by rolling hills, the city of Dundee seems an unlikely hotbed for innovation, but its history as a former industrial powerhouse and its thriving biomedical and biotechnology sectors belie its scenic allure. The historic city on the River Tay is undergoing a significant renaissance amid a major regeneration project. On its western edge, the well-regarded Ninewells Hospital is also looking to the future, as it seeks to balance a changing fiscal climate with quality patient care.

Run by NHS Tayside (one of 14 National Health Service regions in Scotland), the hospital is home to one of the country's top-ranked medical schools. Ninewells Hospital also has a hugely busy combined blood-sciences laboratory at its heart, providing diagnostic services for the area's 450,000 residents. Demand for Tayside laboratory services is growing by between five and seven percent annually; with the newly integrated laboratory conducting some 5.9 million biochemistry tests, 850,000 hematology tests, and 55,000 immunology tests each year.

The rising demand – caused by an ageing patient population, as well as protocol-driven increases in test volumes – has placed increasing strain both on lab staff and equip-

ment. This, along with a changing funding climate, has prompted a major review of laboratory services.

The review is headed by Joint Clinical Director of Diagnostics for NHS Tayside, Dr. Bill Bartlett, and it has resulted in changes that have placed Siemens' Aptio™ Automation at the centre of a groundbreaking shift in how the laboratory functions. It has also precipitated a significant geographical reconfiguration of workloads, with NHS Tayside relocating its microbiology and community general practitioner's orders from nearby Perth Royal Infirmary to Ninewells.

At the heart of its cutting-edge blood-sciences laboratory, the hospital has introduced Aptio Automation to provide a full complement of pre- and post-analytical sample processing modules, comprehensive analytics, and effective IT middleware. The ADVIA CentraLink® Data Management System provides a central software platform for automating workflows, as well as the consolidation of lab data and instruments.

Dr. Bartlett is a calmly articulate biochemistry expert, who took his own doctorate at the hospital's medical school in the late 1980s. He knows that early adopters can expect both challenges and opportunities. The first in northern Europe to deploy Aptio Automation, his blood-sciences laboratory is moving to adapt to those challenges and embrace the possibilities of automation.

He told *Medical Solutions*: "We're living in a changing environment in terms of delivery of healthcare, whether that is increasing workloads, new diagnostic technologies, or developments in IT. We really have to start to think smart to use our resources more effectively. This is vital because if you compromise diagnostic testing in any way, you have a major impact elsewhere in the system."

"What we have not been historically very good at doing in laboratories is identifying our impact in terms of a measurable or tangible outcome. But by being able to provide a bigger repertoire of tests in a shorter period of time, we can actually increase the flow of patients through the acute receiving wards. Those are highly pressurized areas. If you are running out of beds there, the whole system just bottlenecks – and we have massive workloads to process."

Improving Efficiency

"You have to get the right investigations, taken in the right context; delivered to the right people, within the right time frame; with commentary that is contextually appropriate, because more than 70 percent of healthcare decisions made about patients depend on the outputs of diagnostics. We need to find ways to increase the effectiveness of that service – and we have a much smaller footprint to play with than we did 15 years ago."

"We went into the review saying we wanted to look at how we could reduce waste and variation in the use of the systems, so we could redirect ill-used resources into better-used resources. There is an ethical imperative on us to reduce waste in a publicly funded service. If we have the bulk [of our] workload delivered more efficiently by ►

The National Health Service Region Tayside in Numbers

3,800 square miles coverage
(9,842 square kilometers)

450,000 residents

91 healthcare facilities **14,000** employees

6,000 test tubes processed each day
5.9 million biochemistry tests annually

850,000 hematology tests per year

55,000 immunology tests per year

five to seven
percent annual growth in demand



Facing 6,000 test tubes every day, automation helps shorten turnaround times.



The heart of the lab is a single, oval track capable of loading more than 1,600 sample tubes per hour.

Freeing Up Skills As Shortages Loom

A shrinking labor force is among the many factors influencing a turn toward automation among clinical laboratories. As demand grows for in-vitro diagnostic testing, recruitment budgets do not always keep pace.

Approximately 16 percent of laboratory professionals are expected to retire over the next five years; while, by 2014, it is estimated that the United States alone will need 81,000 new medical technologists.

A recent survey of more than 4,500 people by the Coordinating Council on the Clinical Laboratory Workforce (CCCLW) found that 75 percent of respondents working within the sector had been completely unaware of the profession when they graduated from high school. Meanwhile, the number of educational pro-

grams available has dropped sharply.

With many laboratories finding they have highly skilled staff tied up in mundane assay processing procedures, the move to automation is an opportunity to free up underutilized capabilities in a team.

Joint Clinical Director at NHS Tayside, Dr. Bill Bartlett said: “The challenge now is to use this instrumentation to deliver the goals of turnaround time and quality, as well as making available the maximum amount of repertoire in the shortest period of time. This can release the knowledge and skills of staff tied up in the old processes to focus on new value-added processes – which will enable us to start increasing the impact of our services as far as the user is concerned.

“The older ways of working required large numbers of HPC-registered (Healthcare Professions Council) staff managing just about every aspect of the analytic delivery. The way things have developed, we ended up with very highly qualified people undertaking tasks that could be better undertaken by other groups of non-registered staff. Automation allows us to start looking at shifting skills through the system.”

“The registered staff team members have very significant training in the pathophysiology, the clinical side of things, and they are not being allowed to use that knowledge because they have been totally focused on delivering the numbers. Here, automation is about redeployment, not disinvestment.”

“More than 70 percent of the decisions made in healthcare around patients depend on the outputs of diagnostics.”

Dr. Bill Bartlett, Joint Clinical Director of Diagnostics,
NHS Tayside, Dundee, Scotland



automated systems, it frees up time to focus more on the quality aspects of the service, and at value-added levels. Siemens' Aptio Automation is the building block for that.”

Putting down his coffee, Dr. Bartlett steps out of his office and dons a lab coat. He is an enthusiastic and erudite guide to the hospital's newly designed laboratory. The center of the facility is defined by a single, oval track for the Aptio Automation system, which runs multidisciplinary tests capable of loading more than 1,600 sample tubes per hour. “Before, we would have had several separate rooms here,” he explains. “We knocked numerous walls out to leave us with a room to contain the tracked systems, which measures 75 feet from one end to the other, and also houses our sample reception areas. Previously, hematology would have had a line of instruments down one side, biochemistry down the other, with flocks of people loading the machines.”

“We get work in bursts here, as community surgeries work from 9 a.m. to 6 p.m. producing specimens that arrive in batches at various points through the day; then we get phlebotomy clinics and so on. In the past, we would have had people running around, but now it is a simple, calm process. Siemens looked at our processes, looked at what we were trying to achieve, then – working with our staff – they helped us design the laboratory. The aim was to get all this workload processed as efficiently and effectively as possible, minimizing the waste and ensuring that the information flows through correctly.”

The projected efficiency increase is not simply a matter of abstract metrics for hospital staff. Picking up a test tube from a rack of samples to be tested, Dr. Bartlett glances quickly at its label: “Here someone is going to have their thyroid function looked at, along with their urea and electrolytes, which can give you a whole range of information. Now, Terri here zaps the bar code and puts it into the Aptio track, and off it goes. Every instrument within the laboratory now knows that there is a specimen coming in that will require specialist investigations.”

Speeding up the Patient's Journey

Watching a rack of test tubes being lifted onto RFID-tagged pucks, before being carried down the track for a raft of tests, Dr. Bartlett muses: “Every tube going around the track is a patient journey, and with Aptio Automation, we've started to get some insight into the speeds at which that journey can be achieved. It's clear that when the system is fully configured, we can start thinking about moving away from classifying some samples as stat samples – which means they have to be managed faster – to saying, ‘well, turnaround times on the system are such that [these samples] no longer have to be managed any differently’.”

“We are developing the metrics now: looking at things like turnaround time; the number of investigations that can be produced per whole-time equivalent; looking at the range of tests that can be provided within a time window. It's not just about the turnaround time for an individual test, but also about the range of tests that can be provided within a time window.

“We are also about to undertake a project to look at how we start building on the flexibility within the Aptio system to redirect critical workloads and prioritize them to improve turnaround times for particular areas in the hospital. As I said earlier, we have an acute receiving ward, the role of which is to triage patients and get a good idea of what's going on with them. The faster they get our results, the faster we can redirect them to another part of the organization; we don't want to be the people who cause the waits that distress patients.” ■

Further Information

www.siemens.com/aptio

An Image in Time Saves Lives

For doctors and technologists at Saiseikai Utsunomiya Hospital, getting images faster and with more detail was key to improving and maintaining the major hospital's 24-hour patient service quality – especially in the emergency room and within the field of cardiovascular imaging and intervention.

Text: Charles T. Whipple Photos: Hans Sautter





syngo.via and *syngo.plaza* not only helps saving Dr. Honda's (right) and his colleague's valuable time, but also improves their ability to provide timely intervention and lifesaving therapies.

Utsunomiya, a city of just over half a million residents, lies 110 kilometers (68 miles) north of Tokyo, on Japan's main island of Honshu. Historically a castle town, the city is now capital of Tochigi Prefecture as well as home to Saiseikai Utsunomiya Hospital (SUH).

SUH first opened in 1972. In addition, it was identified as an emergency center for the entire prefecture in 1981. Today, as the largest hospital in the prefecture, SUH provides medical care to nearly 1,500 outpatients and more than 600 inpatients per day and is responsible for serving the city and the prefecture with cutting-edge medical technology and therapies.

In 1998, when the hospital moved to a new, larger location in the city, administrators seized the opportunity to equip the hospital with the latest imaging equipment. "Looking back," Masanori Honda, MD, the hospital's vice president and diagnostic radiologist and interventionalist, said, "one can see how things have progressed. Take computed tomography [CT] imaging for example: in 1998, we had no multi-slice units; just two single slice ones. It took so long just to get a look at what was going on with a patient. Even later, with 16-slice capabilities, we had to use beta-blockers to get 3D images of the heart, and that meant having a doctor in attendance during the scan." SUH's problem was ▶



While the hospital previously handled around 2,000 CT scans annually, the implementation of *syngo.via* has increased that figure to nearly 2,700.

common throughout Japan's medical community: not enough doctors. Later, the hospital decided to purchase a Siemens SOMATOM Definition. "We were delighted with the SOMATOM Definition," Dr. Honda said. "Because it provided the highest temporal resolution, it gave the sharpest images of any CT unit on the market." After that, SUH purchased two SOMATOM Definition AS systems. Furthermore, the fact that SUH looked for systems that had the highest technological capability based on the most reasonable price brought in a multitude of Siemens systems, such as MAGNETOM® Skyra (3 Tesla magnetic resonance imaging system), MAGNETOM Aera (1.5 Tesla), MAGNETOM Avanto (1.5 Tesla), and the Artis® zeego, and Artis zee biplane angiography systems.

Reliability Earns More Investment

SUH is not solely a specialist hospital. It also plays a key role in acute care for the residents of the prefecture around the clock, every day of the year.

This requires appropriate technology so that staff can perform high-quality diagnosis and therapy; surely the goal of any large hospital with emergency room (ER) facilities. "Fortunately, we have the technology here to support us with this," Dr. Honda added.

"Because all our modalities are now connected to a single, common platform – Siemens *syngo* imaging IT."

"Speed in diagnostic imaging and emergency medical service is of the essence, as they say. The most important point is how quickly diagnosis can be provided to the patient who needs effective medical treatment," Dr. Honda said.

"Establishing this kind of environment was the main reason we chose Siemens IT solutions." Dr. Honda said. "Quick and effective diagnostic imaging in acute care requires that adequate images be transferred faster to physicians after image reconstruction and 3D image creation," he continues. "It's not too much to say that *syngo.via*, with its server-based postprocessing within a client-server architecture

was developed for acute care. It can easily display the prepared images and thereby automatically process the images that the modalities automatically send," Dr. Honda explained.

The combination of *syngo.plaza* and *syngo.via* enables fast reading of both routine and advanced cases. *syngo.plaza* is Siemens' Picture and Archiving Communications System (PACS) that supports high-throughput reading. The tight integration between *syngo.plaza* and the *syngo.via* 3D software for routine and advanced reading helps accelerate workflows across all modalities.

Many Vendors, One Solution

SUH was the first hospital in Japan to install the combination of *syngo.plaza* and *syngo.via*. When SUH decided to update its imaging IT environment, the hospital was using imaging equipment from multiple vendors.

"All our clinical imaging equipment, regardless of vendor, is connected with *syngo.via* and *syngo.plaza*," Dr. Honda said. "But here's the important thing:



Saiseikai Utsunomiya Hospital is well known for its cardiovascular capabilities.

Until we had established the current, integrated system, it took too much time to diagnose using 3D images.”

When asked why, Dr. Honda replied, “Conventionally, processing the 3D images had to be done manually using the 3D workstation. Therefore, it just took too long until postprocessing was completed, especially in the ER. Each second is extremely valuable. To physicians, time truly is of the essence.”

Nobody is willing to wait half an hour for a 3D image to appear. Cardiologists, for example, routinely perform measurements based on 3D images in order to place endovascular stent

grafts and prepare the appropriate stent. In the ER, needing 30 minutes until a 3D image appears on the screen is deadly for a patient with a ruptured aortic aneurysm. The stent has to be measured and prepared as fast as possible.

“Now *syngo.via*¹ has changed all that,” Dr. Honda said. “What used to take 30 minutes now takes two or three to complete the measurements. So in effect, a cardiologist in acute care consults the radiologist while he is looking at the axial image at the CT workstation. We radiologists tell him the precise results of diagnostic imaging by using *syngo.via*. Actually, as

syngo.via already shows the appropriately prepared image, radiologists can immediately start taking and evaluating measurements, such as in pre-procedural planning of stent size. And then, we can discuss treatment based on the detailed evidence.”

Dr. Honda pulled up a 3D image that showed a heart, arteries, and veins in a patient’s trunk. The heart and blood vessels are color-coded: “Look,” he said, and pulled up another image of the same patient’s system, post therapy. “This patient now has multiple stents, and is doing well. What’s more, the merit of the drug-eluting stent graft is that the patient doesn’t need platelet aggregation inhibitors.”

Satisfaction at giving patients life-saving therapy is evident in the smile on Dr. Honda’s face. “Not long ago,” he said, “an ambulance brought in a man with a cardiopulmonary arrest [CPA]. Thanks to our life support, his circulation returned spontaneously. After the CT scan, we realized that this patient had a ruptured abdominal aortic aneurysm. As soon as diagnostic imaging was finished, he was transported into the angiography room with the Artis zeego, and an aortic occlusion balloon catheter was inserted into the descending thoracic aorta. In this case, as this patient was transported to the angiography room, we had already measured the appropriate stent size with *syngo.via*. We were able to easily select the necessary materials and start the emergency operation. ▶

“I’m pleased to say that no one had a problem working with the platform.”

Masanori Honda, MD, Vice President and Cardiovascular Specialist, Saiseikai Utsunomiya Hospital, Utsunomiya, Japan



Several days later, this patient was discharged from the hospital without being aware that he had been between life and death.”

Doing More With Less

According to Dr. Honda, part of the objective for both *syngo* solutions was to achieve a more efficient and effective workflow. The ultimate way to avoid human error is to automate any procedure. Automatic image processing and analysis with *syngo.via* enables optimal workflow efficiency, and it assumes quite an important role in medical safety. This allows healthcare personnel to focus on their patients and spend less time on image processing, which in turn supports the hospital in its objective to find the appropriate balance between automation and human interaction.

So what does SUH see as the benefits of introducing the *syngo* platform, comprised of *syngo.via* and *syngo.plaza*?

“From the technologists’ workflow point of view, *syngo* can help them

get accustomed to the respective examination even if no experts in the specific field are here. From the radiologists’ workflow point of view, as the user-interface of *syngo.via* and *syngo.plaza* is newer than that of the current scanner, the look and feel is a little bit different. But as functional

tools are similar to those on the scanner, every stakeholder can start using it easily.

“Frankly, it was a matter of concern whether or not diagnostic radiologists could adequately handle *syngo.via* because it was the first server-based postprocessing solution Siemens



The hospital’s registration area offers room for up to 1,700 outpatients and 650 inpatients that use the hospital every month.



Healthcare in Japan

While Japan spends only half as much on healthcare as the United States, Japanese people live significantly longer. Life expectancy for the average Japanese citizen is 83 years.

Japan has a universal insurance system. Around 60 percent of Japanese people are members of corporate insurance systems, with employers paying a large part of their premiums. The remaining 40 percent join municipal or prefectural insurance systems. Everyone is required by law to be part of a healthcare scheme. Only undocumented immigrants fall through the cracks of healthcare provision.

National Health Insurance covers outpatient and inpatient treatments, prescriptions, and most dental care. Eyeglasses, however, are excluded. Local governments administer a further insurance system, which covers long-term care.

Patients under the age of 70 must pay 30 percent of any medical cost, up to a monthly ceiling of around ¥80,000 (around US\$ 860). On anything above this, their liability is limited to 1 percent. Annual medical

costs up to a total of ¥2 million (US\$ 21,500) are tax deductible.

Local clinics are usually the primary healthcare providers. On average, the Japanese make 13.9 physician visits per year (2009), versus 6.2 in Europe and 3.9 in the U.S.

Emergency care can be problematic. Japan has around 30 percent fewer doctors per capita than other OECD countries. This dearth of doctors has caused some hospitals to close emergency facilities or severely limit the emergency care they provide.

Doctor may see as many as 100 patients a day without appointments and patients do not have to wait long to be seen. Most clinics are open five-and-a-half or six days a week, and often have radiological and endoscopic facilities.

Despite some weaknesses, Japan’s system has much to recommend it. Basic care is affordable and of a high standard. Although the system can take some credit for Japanese longevity, there is also much to be said for the country’s healthy eating and exercise habits.

installed in Japan and it has complex multitudes of clinical applications," Dr. Honda said. "But Siemens stepped in to help, providing greatly appreciated training and follow-up support. I'm pleased to say that no one had a problem working with the platform."

And we are certain its capabilities give our patients and us additional health-care benefits: I can list at least three," Dr. Honda said.

1) By combining *syngo.plaza* and *syngo.via*, all stakeholders can work easily with a single platform. This means that they can intuitively operate not only the Siemens scanners, but also the IT system.

2) By linking modalities with *syngo.via*, and sending modality data automatically to the server, images can be seen in virtually real time, already pre-processed and ready for diagnosis. For the ER, this is especially important.

3) With *syngo.plaza*, these images can be easily accessed throughout the entire enterprise with the *syngo.plaza* Web² client, archived, and conveniently called up for follow-up exams.

"We have been quite satisfied with *syngo.via* and *syngo.plaza* so far," said Dr. Honda. "It has enabled a nearly 50 percent increase in the number of patients we see. We are looking forward to new versions with even more capabilities." ■

Charles T. Whipple is an international award-winning author and journalist based in Japan. His articles have appeared in magazines and newspapers such as Time, Newsweek, the Chicago Tribune, and the International Herald Tribune. He has lived in Japan since 1977 and is fluent in Japanese.

¹ *syngo.via* can be used as a standalone device or together with a variety of *syngo.via*-based software options, which are medical devices in their own right.

² Diagnostic reading of images with a web browser requires a medical grade monitor. 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.



Their experience with Siemens led the hospital to purchase further biplane angio and cardiac systems and a system for vascular work.

Management Summary

Challenge:

Japan's population is rapidly ageing, putting tremendous pressure on hospitals – Saiseikai Utsunomiya is no exception. Yet the size of hospital's medical workforce has remained largely unchanged. Therefore, the challenge the hospital faces is handling more patients, using a limited number of doctors and technicians. This, in turn, raises more challenges: How can it use a single platform to link numerous modalities from a variety of vendors? How can it provide images – including 3D images – quickly and thoroughly, for fast diagnoses? How might it flatten learning curves to save time? And how can it achieve a paperless system wherever possible, and limit the time and effort needed by physicians?

Solution:

Saiseikai Utsunomiya Hospital chose Siemens' *syngo.via* and *syngo.plaza* systems to help meet the challenges. Because SUH runs imaging systems from various suppliers, the Siemens systems must provide an automatic data flow from modalities produced by different manufacturers. Doctors

can access images from *syngo.plaza* and *syngo.via* immediately for diagnosis and therapy prescription.

Result:

Now SUH provides consistent, high quality healthcare, around-the-clock – without the need for additional medical staff. Its *syngo.via* system provides diagnostic images within minutes. Quick detection of life-threatening problems enables prompt intervention, improving patients' chances of survival. With *syngo.plaza*, there is no paperwork; therefore, no need for archives of film and documents. All modalities are linked, providing physicians with the best possible imaging data. SUH can now admit, diagnose, and treat a greater number of patients than it previously was able to.

Further Information

www.siemens.com/syngo



“Being Back on the Cutting Edge Feels Good”

Johan Dehem, MD, is Chief MR Radiologist at the Jan Yperman Hospital in Ieper, Belgium. He chose to keep pace with innovation, first by upgrading his hospital’s Siemens MAGNETOM Symphony system, then by buying a top-of-the-line MAGNETOM Aera. The resulting enhancement to MRI capabilities is benefiting hospital management, staff, and patients alike.

Text: Erika Claessens Photos: Mauro Bottaro

“We purchased our first Siemens magnetic resonance imaging [MRI] system in 2000,” Dehem recalls. “It was one of the very first MAGNETOM® Symphony systems with Quantum gradients. In 2004, the launch of MAGNETOM Avanto brought with it the release of a new technology – Tim®. I heard about the possibility to upgrade and wanted to give it a try.”

Tim (Total Imaging Matrix) is Siemens’ unique integrated coil technology that allows for seamless integration of up to 102 coil elements with up to 32 radio frequency (RF) channels, enabling up to whole-body coverage without patient repositioning.

“In 2006, our Symphony system was finally upgraded to Tim. The Siemens business manager, supported by the expertise of an outstanding application team, planned and scheduled the upgrade carefully. The old system was stripped – leaving only the magnet and gradient coil – and the new system was built from scratch. The very short downtime, together with the modest effort required on both the technical and the financial levels, was a no-brainer for the hospital management and administration team,” Dehem states firmly. “One should see it to believe it. Some might think that upgrading means compromising on performance, but this is far from the truth. From the very beginning, the system has performed at the highest level. It has always been fully equipped, but every time a new technology came out and upgrades were available, I was willing to reach for higher performance. If a solution could speed up the imaging process, while helping ensure greater image quality, why stay behind?”

Love at First Sight

“I still remember looking at the first images from the new Tim system. To begin with, they were remarkably homogeneous, and of high resolution from head to toe. Secondly, the speed of the scanning process was amazing, parallel imaging of all body parts providing a real boost. You might say it was love at first sight. My colleagues laughed at my enthusiasm – until they saw the image results for themselves.”

“Being back on the cutting edge feels good; especially because there was no need to change the entire system. My staff and I could continue relying on our previous knowledge, but all of a sudden we could scan faster – which was good news for our patients, as well. We no longer had to make a trade-off in quality; furthermore, with this upgrade, *syngo*® BLADE enabled us to dramatically reduce sensitivity to movement in MRI scanning. Even if patients moved during the scan-

ning process, *syngo* BLADE enabled us to diagnose and report accurately. The *syngo* TWIST option also provided dynamic information to MRI angio – bringing new tools to referring physicians.”

Window of Opportunity

According to Dehem, the Jan Yperman Hospital used to face productivity and workflow challenges prior to the upgrade. “Within the timeframes available to us, it was sometimes hard ▶

The Need for Sustained Investment

COCIR – the European trade association for manufacturers of radiological and electromedical equipment, and medical IT systems – promotes the improvement of efficiency among healthcare entities, through sustained investment in innovative technologies. Concluding its analysis of the age profile of medical devices in Europe, COCIR states that a general investment in medical technology would improve current diagnostic and therapeutic quality, as well as the effectiveness of medical health services across the continent.

The heavy cost of containment policies in the healthcare sectors of most European countries means that a lot of electromedical equipment is outdated. An analysis of the current age profile of medical devices by COCIR shows an increase in the amount of equipment aged over five years. If this trend is not reversed through investment in advanced technology, it will have a negative effect on future medical services. Older equipment has a higher risk of failures or breakdown, which can lead to significant delays in primary medical interventions while the equipment is out of service. It can also endanger the health and safety both of patients and

medical staff. Moreover, the operating costs of such equipment tend to be higher than those of newer technology. Insufficient investment in replacing equipment ultimately leads to higher costs in providing medical services. New X-ray equipment, for example, achieves remarkably low levels of total radiation exposure through its use of digital imaging technology. Implementing this advanced technology is better for the health of patients and staff in general, and it decreases medical costs in the overall health sector.

Therefore, consistent investment strategies are recommended. COCIR urges responsible institutions across the European Union to put a greater emphasis on a sustainable age structure for their electromedical equipment. Immediate action to correct the current situation is the only answer. Failure to act will leave Europe’s healthcare systems unable to fulfill the increasing demands it faces over the next decade.

Source: http://cocir.org/site/fileadmin/Publications_2009/new_members_ws_-_del_3_-_cocir_age_profile_17_june_2009.pdf, Last accessed July 12, 2013

Very Well Equipped – Despite Cost Pressure

By offering upgrade options for hard- and software as well as additional functionalities, Siemens Healthcare supports hospitals and practitioners operating under tight budgets. Thus, customers in different modalities can bring their existing systems up-to-date.

Latest MRI Technology – Available for Existing Customers

In the field of magnetic resonance imaging (MRI), Siemens makes the latest technological innovations available to its customers as so-called “fit upgrades.”¹ With Tim[®] 4G (Total imaging matrix) and Dot[®] (Day optimizing throughput), customers will be able to upgrade their existing MAGNETOM[®] Verio to MAGNETOM Skyra^{fit, 2}, MAGNETOM Trio, A Tim System, to MAGNETOM Prisma^{fit, 3}, and MAGNETOM Avanto to MAGNETOM Avanto^{fit, 2}. Tim 4G offers ultra high-density local coils combined with the highest number

of receive channels. Dot is a new way of scanning in MRI providing a suite of customizable engines, which enable high consistency, productivity, and greater ease of use.

The MR software platform *syngo*[®] MR D13 offers a range of new functionalities for image acquisition as well as new features on the existing Dot engines. *syngo* MR D13 is available for MR scanners MAGNETOM Aera 1.5T and MAGNETOM Skyra 3T and for MAGNETOM Avanto 1.5T and MAGNETOM Verio 3T systems – for new systems as well as for field upgrades.

¹ The products/features (here mentioned) are not commercially available in all countries. Due to regulatory reasons, their future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

² Under FDA review. Not available for sale in the U.S.

³ MAGNETOM Prisma^{fit} is currently under development; is not for sale in the U.S. Its future availability cannot be guaranteed.

obtaining the right information from patient images; especially if patients were physically unable to cooperate during the scanning process,” he recalls. “The new system was, in a very real sense, a window of opportunity. We were now able to collect all the data we required during the allocated scan appointment – even when a patient could not cooperate. This was also helping us to stay on schedule, so that other patients did not have to spend any more time than necessary in the waiting room. We managed to scan the same number of patients – more, even – while staying on schedule; thereby, reducing stress for my staff members. Take for example, a scan of the lumbar spine: the new Tim system allowed us to include a coronal STIR sequence in the examination, yet still have a shorter scanning time. This meant that we got more information in less time.”

Rock-solid, Proven Technology

In 2011, Dehem decided that the hospital should venture into the world of Dot[®] (Day optimizing throughput) and

Tim 4G, the 4th generation of Tim. Tim 4G is available with up to 204 coil elements, which can be combined with up to 128 RF channels. Dot is a new way of scanning in MRI by using a suite of customizable engines that allow the user to personalize exams according to patient needs, build in step-by-step user guidance, and automate MRI exams – either “out of the box” or based on the institution’s standards of care. Dehem again made a huge step forward by purchasing MAGNETOM Aera: “I choose a 1.5 Tesla system because the hospital owns only one MRI license. This means that every patient is scanned using the same system,” he explains. “As it runs on a daily basis, it has to be extremely reliable while offering a full range of applications and a patient-centered design. My staff and I cannot do without this rock-solid proven technology. Since we had such good experiences with our upgrade to Tim, going for Tim 4G was the next logical step. I believe in the saying, ‘Never change a winning team.’ The radiographers in my team have a good overall experience with the existing system.”

As it turned out, the move from Tim to Tim 4G was a leap in progress every bit as impressive as the upgrade to Tim back in 2006: with improvements in acquisition speed and image quality. “One might think that scanning faster takes the image quality down, but it is quite the opposite,” Dehem says. “For abdominal imaging, patients now only need to hold their breath for ten seconds; whereas, in the past, it took 20 seconds. This is a phenomenal difference. The high coil element density of Tim 4G’s coils allows for higher signal-to-noise ratio and speed. Patients appreciate when the scanning procedure is short; thus, they cooperate even better.”

The new system comes with a 70-centimeters Open Bore and a very short system length of only 145 centimeters. Dehem says that this makes it easier to scan even obese patients. It also makes the scanning procedure less stressful for claustrophobic or pain patients. Furthermore, the provision of a dockable table leads to higher patient comfort as they are being moved from their beds to the scanner: “It not only brings benefits to the comfort of my staff members, but also to the well-being of patients,” he states.



Jan Yperman Hospital upgraded its existing MRI system – with benefits for patient care and hospital processes alike.

A New Way of Scanning in MRI

Dot has allowed the hospital to make what Dehem says are quite dramatic improvements to how the scanner is utilized. MRI workflows are optimized; there is a customizable framework enabling the user to adapt examinations quickly according to patient needs, providing step-by-step image and text guidance, and automation. Dehem believes that this makes it easier for staff members to manage the complex scanning process: “It guides the user with images and text, helping novices to scan more expertly and experts to scan more efficiently,” he enthuses. “The result is that we can pay more attention to the patients.”

The Auto Coverage function is able to scan the entire anatomy of a patient, at maximum resolution and in the shortest time – ultimately resulting in a very thorough examination. According to Dehem, the result is greater efficiency on all levels and better image consistency.

“One of my patients had a cardiac scan and was enthusiastic about the swiftness. In the past, this process took one hour, now we accomplish it in half the time,” he says. “My staff members used to dislike doing cardiac examinations, so I did them myself – putting the tele-

phone on hold to make sure I would not be disturbed. Since we have the new system, my nurses beg to do the cardiac scanning themselves. They are glad they can operate it autonomously, and that I only have to take a quick glance at the results.”

“By offering our hospital the possibility to stay on top of the latest MRI technology, Siemens has helped us to save time and make healthcare available to more patients,” Dehem says. “The Siemens business manager and the company’s support team have built a sustainable, long-term relationship with us; helping us to remain up-to-date with the latest innovations either with an upgrade or with a new MRI system. It is a breakthrough solution for patients and a milestone result for staff.” ■

For more than 20 years, journalist and editor **Erika Claessens** has contributed to numerous print and online publications in both Belgium and the Netherlands. Her principal topics are entrepreneurial innovation and sustainability. She works in Antwerp, Belgium.

Further Information

www.siemens.com/redefineMR

Management Summary

As longevity increases and age-related illness and mobility issues become more widespread, a growing number of patients are having difficulty in cooperating with imaging processes. Consequently, medical services require improved procedures and better image quality to achieve satisfactory diagnoses. Unfortunately, most healthcare providers have a shortage of money when it comes to purchasing advanced technology. Of those that are eager to invest, many consider the installation of new systems as time-consuming and complex. Upgrading by purchasing a license for next-generation software or a hardware update might be a solution if the organization is unwilling to accept significant downtime or substantial financial outlay. During the upgrade procedure, having a standby technical and business support team to plan and organize is of considerable help. Upgrading imaging technology will result in staff having greater confidence in conducting the scanning procedure. This results in better and faster diagnoses, and a reduction in the average time required for patient examinations and reporting. Additional benefits of investing in new technology are reduced waiting times and greater comfort for patients, and also a higher quality and better resolution images. This makes diagnosis easier – especially when patients are less able to cooperate.



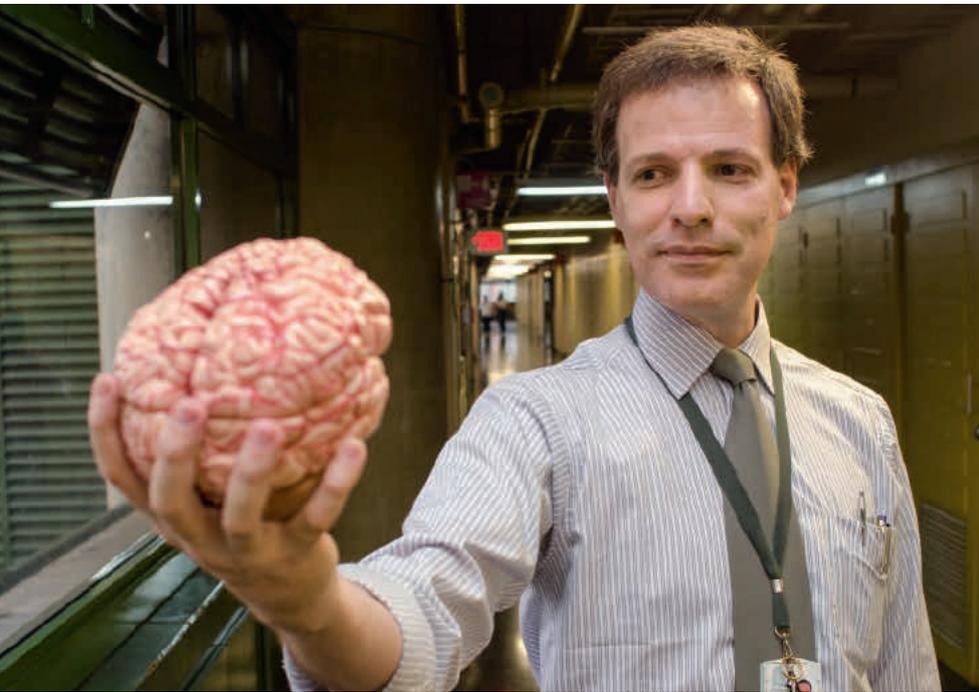
Forgotten in Colombia



A large number of unusually young people in the mountainous region of Antioquía in Colombia suffer from a hereditary form of Alzheimer's disease. International researchers are testing medication to be administered long before any symptoms appear. If it proves effective, it would be a major breakthrough in the treatment of Alzheimer's.

Text: **Andreas Kleinschmidt**
Photos: **Mateo Bernal**

Early-onset Alzheimer's is very similar to the typical form of the disease – with one major difference: in some cases the first symptoms occur before the patient turns 40.



Dr. Andrés Villegas dissected dozens of brains searching for causes of dementia.

Dr. Andrés Villegas takes off his digital watch and his wedding ring and carefully attaches the ring to the same clip that also holds his ID card. He slowly rolls up his shirtsleeves and puts on a blue smock that covers everything except his shirt collar and gray tie. Villegas now puts on a pair of latex gloves and – just to be on the safe side – a second pair over them. Only after he has done all this does he remove the cover from a white plastic tub in front of him and immerse his hand in a yellowish liquid. The tub contains half of a brain – and brains are Villegas' specialty. Andrés Villegas is the director of the Biobank at Universidad de Antioquía in the north-western Colombian city of Medellín. It has a collection of about 200 human brains. Villegas has personally dissected and prepared around three quarters of these brains for further study.

He now carefully places the dripping half brain onto a stainless steel tray. "This brain has shrunk considerably," he says as he turns it over and around. "Look here and you can see some conspicuously deep grooves that look

like the wrinkles in a dried-out grape." He pauses briefly and then gives the diagnosis. "This patient was only 56," he says, "and what you see here is the result of early-onset Alzheimer's disease." Nowhere else in the world are as many people afflicted by this special form of dementia as here in Colombia, in the department of Antioquía.

Effects of a Genetic Defect

Although early-onset Alzheimer's is very similar to the typical form of the disease, there is one major difference – namely, that in some cases the first symptoms occur before the patient turns 40. It begins with forgetfulness and progresses to disorientation and delusional ideas. Individuals afflicted with this form of Alzheimer's reach the final stage of the disease at the age of 47, on average. By contrast, the more common form of Alzheimer's sets in at the age of 65 or older. Early-onset Alzheimer's is caused by a simple genetic defect on chromosome 14. Over a period of around 300 years, this defective gene has spread throughout a widely branched family that now has around 5,000 members.

Experts refer to it as the "Paisa mutation" because the people living in the region around Medellín are known in Colombia as Paisas.

Villegas gets to know many of the patients while they're still alive. After they die, he removes their brains and studies them. "A brain can tell you a lot, but it can't tell you everything," he says as he places the half brain back into the formalin solution. "The ideal research case is when you can follow the course of the disease while the patient is still alive." The other half of the brain he's studying is stored along with hundreds of others in a large freezer. Villegas does the same thing with all the brains: He puts one half in a solution and the other in ice. Human destinies frozen at -78 degrees Celsius.

These tragic fates now form the foundation of one of the greatest hopes harbored by Alzheimer's researchers around the world. Dr. Adam Fleisher from the Banner Alzheimer's Institute in Arizona has traveled from Phoenix to Medellín specifically to contribute to the launch of an ambitious prevention trial, which is part of a program known as the Alzheimer's Prevention Initiative. "We want to develop a preclinical treatment for Alzheimer's," Fleisher explains. "In other words, we're aiming to come up with a treatment that can prevent the disease or delay its outbreak, or at least slow its progress."

Most drugs for treating Alzheimer's that have been tested to date have proved to be more or less insufficiently effective for fighting this terrible disease. Fleisher and his research colleagues believe this may be due to the fact that the medications were administered after it was too late for the patients. "You may have to start the treatments before the onset of symptoms," Fleisher explains. "We've been able to show that Alzheimer's causes changes to the brain long before patients display the first signs of dementia – in some cases, 20 years before the first symptoms occur. For example, researchers have discovered that the onset of Alzheimer's is preceded by the accumulation of plaques of beta amyloid proteins. These plaques form a type of crust in brain cells, which then slowly die as a result.

By the time patients become forgetful, their brains may already be irreparably damaged." Indeed, in many cases the patients' brains have already significantly shrunk by the time they and those around them notice the first signs of forgetfulness. "We think it's likely that we have the right weapon for fighting Alzheimer's even now – the problem may be that we are not using it until it's too late," says Fleisher. The weapon being tested in the study in Medellín is called crenezumab, being developed by the San Francisco based biotechnology company Genentech. This medication is designed to attach itself to the amyloid and allow the patient's immune system to render the protein harmless before it begins forming plaques.

Perfect Population

Still, how can the researchers know whether their hypothesis is correct? Should they give crenezumab to healthy people, for example? If they did, they could find out decades later whether the test subjects displayed fewer cases of Alzheimer's than a control group that would not have been given any medication. Such a plan would be monstrous and impractical. This is where the patients in Antioquia come in. That's because the early-onset Alzheimer's that is so common among them is hereditary, which means that all it takes is a genetic test to reliably determine which individuals will become afflicted with the disease. In other words, patients with this special form of dementia are particularly well suited for clinical studies. After all, doctors could be sure to give the medication only to those they know are genetically programmed to develop Alzheimer's later on. Although patients with early-onset Alzheimer's are also to be found in other parts of the world, the large number of cases in the region around Medellín helps to ensure a high level of reliability for the results of the clinical study. That's why the study in Antioquia will soon be under way with 300 participants, all of whom are between the ages of 30 and 60 and have not yet shown any symptoms.

Improved imaging technology was also required for the sophisticated research design. The Banner Alzheimer's Institute



Doctors, including Héctor Zuluaga of the Pablo Tobon Uribe Hospital (PTU), Francisco Lopera and Lucía Madrigal of Universidad de Antioquia, and Adam Fleisher and Eric Reiman of Banner Alzheimer's Institute are providing new hope.

made use of Siemens' latest generation of state-of-the-art PET-CT devices (a combination of a computed tomograph and a positron-emission tomograph) to make amyloid plaques and their continuing growth in Alzheimer's patients visible in detail for the first time (see *Medical Solutions*, February 2013, p. 20). Fleisher and his colleagues are now hoping that such plaques will never form to begin with in the patients in Antioquia who will

be treated with Crenezumab at an early stage. "We divided the participants into two groups," says Fleisher. "One group will be given the drug, the other group will get a placebo. Repeated MRI, PET-CT scans, spinal fluid assessments and cognitive testing in Medellín will help us to draw conclusions over the next two to five years regarding the effectiveness of the medication."

Tied to a Chair

The tragedies caused by the frequency of Alzheimer's in the region can be seen in towns like Belmira, Angostura, and Yarumal, all of which are about a two hours' drive north from Medellín. Most of the people afflicted with early-onset Alzheimer's live here, and this degenerative brain disease has cut down many in the best years of their lives. There are no adequate facilities to care for Alzheimer's patients in these areas. They are usually taken care of by relatives or family members. Maria is one of these caregivers.

Maria is 83 years old. Her life has been shaped by Alzheimer's, despite the fact that she herself doesn't carry the Paisa mutation. Maria's husband died over 20 years ago from Alzheimer's, and four of her 16 children suffer from it. Her son Alejandro died three years ago from Alzheimer's at the age of 56. It was so difficult to care for him that he was sometimes tied to a chair to keep him from wandering around aimlessly. "This is not an isolated case," says Claudia Madrigal, a psychologist at the hospital in Yarumal. It has barred windows, a few horses are tied at the hospital's entrance, and a poster in the reception area advertises for Alcoholics Anonymous. "Thirty years ago, nobody knew what was going on here," Madrigal says. "People got used to their middle-aged relatives becoming forgetful, then aggressive, and finally demented and wasting away. At the time, many people believed a supernatural force was destroying people's souls, so the sick individuals were locked away and their meals were shoved to them under the door. Only rarely did families allow an autopsy after the patients died. However, attitudes have changed over the last ►

20 years.” This change was mainly due to Dr. Francisco Lopera.

Bisected Brains

Lopera works in the Department of Neurosciences at Universidad de Antioquía. When he was a child, he used to live in Yarumal, where he began noticing the strange frequency of occurrences of dementia during the early 1980s. “It was a puzzle that I wanted to solve,” he explains. Lopera and Lucia Madrigal, Claudia’s aunt and a nurse at the time, went from house to house asking for blood samples from afflicted patients. He also visited wakes and asked family members for permission to examine their loved ones’ brains. Amazingly, he did all this during a time when violent drug gangs controlled the region. Lopera was the first to discover that the sick people of Yarumal were suffering from a special hereditary form of Alzheimer’s.

It’s not just Colombians who urgently hope for progress to be made in the treatment of Alzheimer’s. The number of people afflicted with the disease worldwide will increase dramatically over the next few decades, largely as a result of higher life expectancy. That’s because more than 95 percent of Alzheimer’s cases around the world correspond to the typical form of the disease rather than early-onset Alzheimer’s, and the likelihood of a given individual becoming afflicted with Alzheimer’s doubles every five years from the age of 65. “If we could delay the average age when Alzheimer’s sets in by five years, we could reduce the absolute number of cases by 50 percent,” says Lopera. This would be a huge help not only to many Alzheimer’s patients and their families but also to healthcare systems, because proper care can be quite expensive. According to estimates, the total cost of dementia illnesses worldwide in 2010 was more than US\$600 billion, which corresponds to around one percent of the gross world product.

Madelyn Gutierrez knows figures like that by heart. She sits in her windowless office in Medellín located not too far from the Biobank and its halved brains. The air conditioner rattles



At Universidad de Antioquía in the northwestern Colombian city of Medellín, researchers are searching for causes of early-onset Alzheimer’s.

lightly as patients assemble for a study that will begin shortly. Gutierrez is the young psychologist who is coordinating the study and ensuring that it adheres to clinical trial standards. Among other things, the 300 participants will undergo tests to determine their cognitive capabilities and will also be sent on a regular basis over the next few years to the nearby Pablo Tobón Uribe Hospital for brain scans carried out with PET-CT devices from Siemens.

The Search for Answers

Gutierrez will make sure the patients come to Medellín from their villages and show up on time for the examinations. “We need to comply with the highest standards for clinical studies, including ethical standards,” she explains. “I’m the one in charge of reminding everybody to be meticulous with their documentation, because everything we do must be transparent.” Even seemingly minor methodological errors could jeopardize the results of this sophisticated and costly study.

“The big question is whether the beta amyloid in the brains of Alzheimer’s patients actually causes the disease, or if it’s merely an additional symptom,” Gutierrez says. “If it’s the cause, then drugs that inhibit its accumulation

should help to prevent the disease, but if the plaques are a secondary sign, you would expect that the drugs would be ineffective even if they are administered at a very early stage. So far this has been a matter of discussion, but through this study we want to settle the issue once and for all.”

Some scientists doubt that amyloid holds the key to understanding Alzheimer’s, wondering whether the key may rather be a protein called tau that makes up neurofibrillary tangles. Changes in other biomarkers, such as the tau proteins, have in fact been observed in Alzheimer’s patients but they need not contradict the amyloid hypothesis.

“One of the goals of our trial is to provide a better test of the amyloid hypothesis than the trials that have been conducted in clinically affected patients, when the treatment might be too little too late,” says Dr. Eric Reiman, Executive Director of the Banner Alzheimer’s Institute.

Institute researchers did in fact conduct an initial small-scale study that involved flying a few dozen patients from Colombia to the institute in Phoenix, in the United States, where among other things they were examined with Siemens’ PET-CTs for signs of

amyloid plaques. The patients had to come to Arizona because the complex examinations couldn't be carried out in Medellín at that time.

International Attention

However, no one has to be flown to the U.S. for the more extensive current study, because the complex imaging technology is now available at Pablo Tobón Uribe Hospital in Medellín. The hospital is considered one of the best in Colombia and is well prepared for the study's numerous participants. Dr. Héctor Zuluaga offers a look at the Siemens magnetic resonance tomography unit, which reveals brain shrinkage in dementia patients, as well as the recently procured Siemens PET-CT, which makes amyloid plaques visible. The radioactive isotopes needed to operate the units are still being flown in from Colombia's capital, Bogotá, but a Siemens cyclotron will soon go into operation in Medellín to supply the hospital with isotopes. "We wanted top-of-the-line radiological equipment at an affordable price, and Siemens was able to offer us both," Zuluaga explains. "We often ask our patients to rate the hospital's technical equipment, and we have an average grade of 4.99 – from a maximum score of five."

For decades, Lopera has been laboriously processing data, some of which he collected in life-threatening situations in the mountains of Colombia, and he has done all this largely unnoticed by the international research community. His first research project related to this strange disease had a budget of US\$500. Then, a few years ago, the floodgates opened as Alzheimer's researchers from around the globe suddenly became interested in Lopera's patients. The clinical study that is now beginning has a budget of more than US\$100 million. Lopera's hair has by now turned white, but he's full of energy and optimism. "We believe in the amyloid hypothesis," he says, "and if it turns out to be correct, the study would be a huge success, because it could bring us closer to an effective treatment for Alzheimer's." And if the hypothesis cannot be confirmed? "The study would still be a success," Lopera explains, "because we would at least then know that we have



Yarumal is one of the villages where most of the people afflicted with early-onset Alzheimer's live.

to start all over again in Alzheimer's research."

In the best case, there might be a drug in a few years that could for the first time slow down the progress of Alzheimer's. This mysterious disease that attacks one of the most mysterious organs in the human body. "When I was a kid, I was very interested in UFOs and I wanted to be an astronomer or an astronaut," Lopera recalls. "Then somebody told me UFOs only exist in one's brain. So I became a doctor – a doctor who looks into people's brains."

Villegas is now cleaning up his lab. Hygiene is extremely important – the tissue samples might, for example, be contaminated with highly infectious prions. Villegas closes the top of the tub containing the half brain disfigured by Alzheimer's. The smell of formalin still lingers in the air. "Some people look at a brain and see only a wrinkled mass," Villegas says.

"I look through the microscope and see complex structures and entire landscapes." After a brief pause, he adds, "Brains are marvelously beautiful." ■

Dr. Andreas Kleinschmidt has been writing on innovation topics for more than ten years. In 2005 he received the CNN Journalist Award for a radio feature from Russia. His degrees include one in International Political Economy from the London School of Economics. He works for Siemens Corporate Communications in Munich.

Names of patients have been altered.

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Further Information

www.siemens.com/alzheimers



Surgery and Imaging Working Together

Text: Irène Dietschi
Photos: Daniel Martinek

Imaging is becoming vastly more important to orthopedic and trauma surgery: A trend that is changing the educational requirements in this broad medical field. Impressions from the AO Davos Courses 2012.

The first thing you notice is the noise. The cavernous conference hall is ringing with the sounds of hammering, drilling, and metal being beaten into shape. Countless screws and plates are arranged on worktables, where dozens of young men and women are at work putting them together. If you didn't know better, you might think you were in the middle of an enormous metal factory. But of course we do know better: This is one of the many hands-on training courses for orthopedic surgeons on offer at the AO Davos Courses (AO is a German abbreviation for a study group looking at questions relating to osteosynthesis). This sophisticated two-week event is held each year in Davos at the beginning of December. For the AO Courses 2012, 1,500 surgeons traveled from 74 countries to the Swiss alpine city, which is perhaps best known for its role as host of the World Economic Forum.

The surgeons came to expand their medical training. They are here to attend the numerous orthopedic trauma, spine, veterinary, and craniomaxillofacial training courses and lectures that are at the heart of the AO Davos Courses event. The AO Foundation – established in 1958, and today the world's largest medical network – is "built on a commitment to advance medical education for better patient care," says Jaime Quintero, the AO Foundation's current president.

An Important Partnership

Siemens Healthcare has always maintained a special relationship with this renowned organization. As exclusive imaging partner, the company has been supporting the training and education provided by the AO Foundation since 2007. With good reason: Imaging is vastly gaining in significance to orthopedic and trauma surgery. This trend is increasingly influencing the courses on offer in Davos, as Urs Rüttschi, Director of AO Education points out: "Imaging expands the scope of the whole educational program we have to create because surgeons need to understand more and more about this technology and how to deal with it."

Or as AO Foundation President Jaime Quintero puts it: "Nowadays, imaging is a tool for a surgeon, just like the scalpel, a clamp, or a screwdriver. It belongs to the basic set of instruments in the operating room."

Tuesday, December 4, 12:30 in the "Aspen" room of the Davos Congress Center: Professor Martinus Richter, head of the foot and ankle surgery departments at Nuremberg and Rummelsberg hospitals in Germany, is giving a lecture on intraoperative 3D imaging in foot surgery with mobile C-arms. Introducing his topic, Richter explains that he has conducted more than 3,000 intraoperative 3D scans, the vast majority of them exclusively on feet. When asked the reason for his reliance on technology, the 43-year-old physician – who specializes in trauma surgery as well as orthopedics – replies, "Intraoperative three-dimensional visualization provides useful information in foot and ankle trauma care that cannot be obtained from plain films or conventional C-arms."

Surgical Challenges

This is also the conclusion that Richter and his colleagues drew from a study they conducted in 2003 and 2004,

when the Siemens ISO-C 3D system was used for intraoperative visualization in 62 cases. Nowadays, Richter uses a Siemens ARCADIS Orbic 3D in his department. He tells his audience that the main problems in foot surgery are the malpositioning of implants and incorrect reduction (repositioning of a fracture). Foot surgery is complex because the anatomy of the foot is complex. It is composed of 25 bones and contains many three-dimensional structures: "Therefore, without seeing, even a very experienced surgeon cannot be sure whether his positioning of extraosseous or intra-articular screws is correct," he explains.

During his study, Professor Richter first used a conventional 2D X-ray to judge the reduction and implant position. Then he performed a 3D scan with the Siemens ISO-C 3D. Based on the 2D images, the surgeon would have decided that the positioning was correct. But in 39 percent of cases, the 3D scan revealed that it was necessary to correct the reduction and/or implant position: "However, this did not prolong the operation unnecessarily," Richter adds. On average, operations were interrupted for 330 seconds: 120 seconds for the scan ▶

Participants at work on dog cadavers, using C-arms systems provided by Siemens.



New material for cranio-reconstruction presented at AO World.



and 210 seconds for evaluation of the images by the surgeon. “This is much less than if another surgery were needed,” he notes.

Obvious Benefits

In everyday practice, however, there are trauma clinics where even a control scan is not carried out following surgery. One reason for this is the reimbursement policy: The DRG system (diagnosis-related group, a system to classify hospital cases), which, for example, German and Swiss hospitals use to run their billing, does not reward the quality results that can be achieved by using intraoperative imaging: “A case is a case, whether you operate well or not,” Richter says bluntly. On the other hand, if a patient has to come back for re-operation because his or her fractured ankle has remained crooked, the DRG system does not sanction this. Instead, it regards the second surgery as a “new” case.

The other reason that intraoperative 3D imaging has not been accepted as quickly as Richter once imagined is a scientific one: There is no randomized prospective study that proves the effectiveness of the procedure. The reason why some hospitals do not conduct a study is simple, Richter explains: “In my hospital, for example, the ethics committee didn’t believe that such a study was even necessary. They thought the advantages of the device were so convincing it would have been unethical not to use it for the control group.”



AO Foundation President Prof. Jaime Quintero (right) is appreciating the benefits of imaging in surgery, attended by Siemens representative Dr. Alexander Grafenberg.



The AO Courses took place in Davos from December 1 through December 14, 2012.

“Scanning in the operating rooms will develop much as navigation systems in cars did.”

Professor Martinus Richter, Head of the Foot and Ankle Surgery Departments at Nuremberg and Rummelsberg hospitals, Germany



Nevertheless, Richter is convinced that intraoperative 3D imaging will prevail in the long term – providing benefits not just for foot surgery, but also for many other orthopedic fields, such as the spine, hands, and joint fractures: “Wherever you have three-dimensional bone structures and the position really matters,” he notes. Richter even believes that in 20 years, conventional C-arms for 2D scanning will not exist anymore: “Scanning in the operating rooms will develop much as navigation systems in cars did,” he predicts. “At the beginning of the nineties, satellite navigation was rarely seen in cars, and it worked very poorly; whereas nowadays, you couldn’t imagine a modern vehicle without this excellent device.”

A Win-Win Situation

At the AO Davos Courses 2012, participants were offered several opportunities to become acquainted with intraoperative 3D imaging: not only through lectures, but also in practical hands-on courses and experiments. For Siemens, the two-week event provided a tremendous chance to share its know-how directly with customers. Dr. Alexander Grafenberg, Siemens’ representative in Davos, is very satisfied about the company’s strong presence at the AO Courses: “In Davos, with its unique concentration of surgeons from all over the world, we have a fantastic opportunity to bring imaging into focus as one of the rising topics in surgery,” he says, noting that imaging used to

be only of minor interest to the trauma and orthopedic surgeons. In recent years, however, Grafenberg has observed a definite change in attitudes. He believes that the collaboration between Siemens and the AO Foundation is partially responsible for this trend.

AO Education Director Urs Rüetschi confirms that Siemens’ commitment has contributed substantially to the arsenal of educational material available for the training of (future) trauma and orthopedic surgeons. “In the future, we want to prove that our courses will lead to a change in practice and better performance,” he says. “This will then, of course, result in better patient outcomes.” ■

Irène Dietschi is an award-winning Swiss science and medical writer.

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.

Further Information

www.siemens.com/surgery

The AO World in Davos

From December 1 through December 14, 2012, the AO Foundation provided 21 orthopedic trauma, spine, craniomaxillofacial, and veterinarian courses to more than 1,500 surgeons from 74 countries. The surgeons were taught by 422 expert faculty members from around the world. The AO World comprises four clinical divisions: AO Trauma, AO Spine, AO Craniomaxillofacial, and AO Vet. The annual Davos Courses are the highlight of the organization’s activities, and they are highly valued by surgeons from numerous countries. Besides this major Swiss event in December, the AO Foundation is globally active throughout the year. It currently offers more than 690 courses and seminars worldwide, including those for operating theater personnel; various faculty education programs; as well as a comprehensive online and face-to-face program, aimed at improving the teaching skills of AO Faculty members.

Healthcare in China

Despite Progress, Challenges Remain

Text: William Hsiao, K.T. Li Professor of Economics at Harvard University School of Public Health

Illustration: Orlando Hoetzel

In 2009, China launched an ambitious healthcare reform plan that has already resulted in health insurance coverage for nearly 95 percent of its citizens.¹ The reforms also include efforts to reduce costs while improving quality of care, but progress toward meeting these important goals has been hindered by inefficiency, waste, and corruption. The healthcare system in China has made remarkable strides in recent years, but the world's most populous nation needs to fully address the contentious incentives in its healthcare model and governance of its public hospitals before it can achieve its goal of creating a healthy and harmonious society.

When the Communists came to power in 1949, they nationalized the healthcare system and set out to improve the health of the nation's population by putting their scarce resources toward improving hygiene, reducing

rates of infectious diseases, and providing access to basic primary care. Minimally trained "barefoot doctors," who generally had a junior high school education plus six months of medical training, provided immunizations and treatment with low-cost antibiotics that were manufactured in China. These drugs didn't match Western standards for purity, but their efficacy was sufficient to reduce mortality from common illnesses such as pneumonia. By the mid-1970s, nearly two million barefoot doctors provided first-level care as well as education on basic hygiene to more than 90 percent of China's villages.²

Second-level care was provided in rural community and township health centers, while third-level care was provided in government-owned county and city hospitals. Healthcare in rural areas was financed by taxes on agricultural communes and work

brigades, while the government set up insurance programs for officials and state employees.

Although China's investment in healthcare was modest, the results were dramatic: The infant mortality rate dropped from 250 in 1,000 births in 1949 to 38 in 1,000 in 1984, while life expectancy increased from 35 years to 67 years during this period.²

Erosion and Crisis

The gains in health that China experienced began to erode rapidly in 1978, however, when the marketization of the Chinese economy eliminated agricultural communes and the primary source of financing for China's rural healthcare system. The responsibility for financing healthcare depended on provincial and local governments, with wide disparities in funding capability between richer urban areas and poorer rural areas resulting in similar disparities ►

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in cost, quality, and availability of healthcare. By 2003, only half of the urban population had health insurance, while 90 percent of the rural population had none.³ Catastrophic healthcare expenses were pushing people into poverty. In 1998, for example, my colleagues and I found that out-of-pocket healthcare spending in China increased the number of rural citizens living in poverty by 44 percent.⁴

In an effort to keep healthcare costs low, the government permitted providers to charge only modest fees for their services. To make up for the below-cost reimbursement they received for services, however, healthcare providers were allowed to earn up to 15 percent mark-up on the drugs they dispensed. The government later allowed providers to earn a similar profit on diagnostic tests such as ultrasounds and CT scans, with the goal of encouraging them to offer advanced technology care. The unintended consequences of this incentive system are painfully evident today in China, where healthcare providers routinely enrich themselves at the

expense of their patients by over-prescribing drugs and conducting unnecessary expensive diagnostic tests. A 2009 study, for example, found that 79 percent of hospital patients in China were prescribed antibiotics, compared to an international average of just 30 percent.⁵ Another study that used a panel of physicians to review the treatments given to appendicitis and pneumonia patients found that 20 percent of expenditures were considered unnecessary.⁶

By early 2000, China's economy had been growing at an average annual rate of 10 percent for two decades and was lifting millions out of poverty.² The nation's healthcare system, on the other hand, was clearly not serving the needs of patients. Widespread public discontent with the healthcare system was reflected in opinion polls and in increasingly common and dramatic protests in which relatives of ailing family members who could not afford admission into a hospital would carry them to their local government's headquarters and shout, "Treat him!"

The 2002 outbreak of severe acute respiratory syndrome (SARS), which infected more than 7,000 people in China and killed nearly 650, exposed the weaknesses of the nation's healthcare system and finally spurred the government to action.⁷

A New Era for Healthcare

In addition to allocating more money for prevention and to the Chinese Center for Disease Control and Prevention in the wake of the SARS outbreak, the central government established two new insurance programs to increase access to care.

In 2003, China introduced the New Cooperative Medical Scheme (NCMS), a voluntary insurance program for the nation's 850 million rural residents. The program operates at the county level and is funded mostly by government subsidies and some by enrollee contributions. The government also launched a program for the poor known as the Medical Safety Net in 2003 and, in 2007, launched the Urban Resident Basic Medical Insurance Scheme for residents not covered by other insurance programs. As with NCMS, premiums ▶



William Hsiao is the K.T. Li Professor of Economics at Harvard University School of Public Health in Cambridge, Massachusetts, USA.

He regularly advises U.S. government agencies, foreign governments, and nongovernmental organizations such as the World

Bank, UNICEF, IMF, and the World Health Organization on health systems policy and financing. During the late 1980s, Hsiao led the effort to create the Resource-Based Relative Value Scale (RBRVS), a standardized physician payment scale used by federal programs and private insurers.

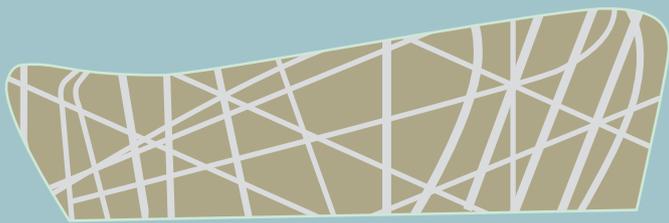
He has assisted Taiwan, Cyprus, Mexico, Colombia, China, Sweden, and other nations in their health systems reforms and helped Vermont create its plan to become the first state in the USA to adopt a single-payer health system.

With the support of UNICEF, Hsiao collaborated with eleven universities in China to conduct a nationwide study on healthcare financing and provision for 100 million poor Chinese. With the support of the Gates Foundation, he has launched

a large-scale social experiment to develop innovative rural healthcare models involving more than 100 communities and 1.6 million people in rural China.

Hsiao was as an actuary for a private insurer and later served as Deputy Chief Actuary for the U.S. Social Security Administration before leaving government service to enter the graduate program at Harvard University, where he earned a Master of Public Administration, and PhD in Economics. Hsiao joined the faculty of the Harvard School of Public Health in 1974.

He is a member of the U.S. National Academy of Sciences and is an honorary professor at Beijing and Fudan Universities in recognition of his work to improve healthcare in China.



Number of Nurses and Midwives per 10,000 Resident Population (2009):

13.8



Male Life Expectancy at Birth (2009):

72

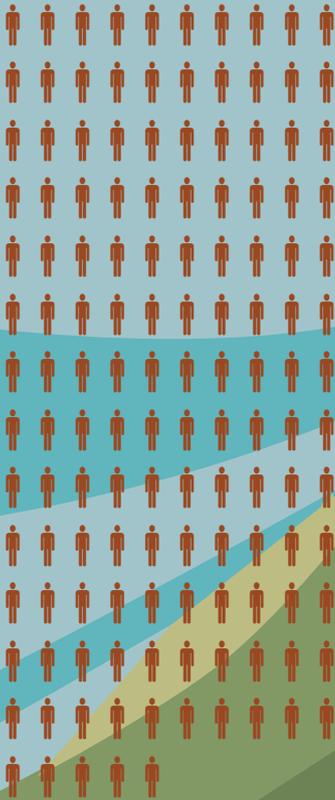


Female Life Expectancy at Birth (2009):

76



Population in Thousands (2010): 1,348,932



Total Expenditure on Health per Capita in (2010): US\$221

\$\$

Government Expenditure on Health as % of Total Expenditure on Health (2010): 53.6%

Total Expenditure on Health as % of GDP (2010): 5.1%

Number of Physicians per 10,000 Resident Population (2009): 14.5



Number of Hospital Beds per 10,000 Resident Population (2009): 42



Facts and Figures on the Chinese Healthcare System

China has substantially increased its investment in healthcare in recent years, and several health indicators have improved accordingly. Between 2000 and 2010, for example, total life expectancy jumped from 71.4 to 73.5.¹ The maternal mortality rate per 100,000 live births was 26.1 in 2011, down from 36.6 just five years earlier. The reduction in maternal mortality has been particularly pronounced in rural areas, where it dropped to 26.5 per 100,000 live births in 2011, down from 41.3 in 2007.

Investments in Healthcare

In 2009, China committed to increasing its annual government spending on healthcare by 850 billion Chinese yuan (about 125 billion U.S. dollars, or 105 billion euro) in the ensuing three years.² As of 2011, nearly 70 percent of the population was covered by the New Cooperative Medical Scheme, a government-subsidized insurance program for rural residents launched in 2003. Twenty-four percent of the population is covered by government-subsidized insurance programs for urban residents, and only 5.2 percent of the population lacks insurance coverage.

China also has invested substantially in its healthcare infrastructure in recent years. In 2011, there were more than 954,000 healthcare institutions, including hospitals and public health centers such as the Chinese Center for Disease Control and Prevention. China had nearly 22,000 hospitals in 2011, an increase of

18 percent since 2005. Most of these hospitals have fewer than 100 beds, although more than 850 hospitals have 800 beds or more. The number of grass-roots health institutions, such as township health centers and community clinics that serve rural areas, has increased by nearly 10 percent since 2005, to 918,000.

China is the world's most populous nation, with 1.3 billion residents, or nearly 20 percent of the world's population. China has 8.6 million healthcare personnel, 2 million of whom are doctors, and 2.2 million of whom are nurses. Village doctors and other minimally trained professionals make up the bulk of the nation's healthcare work force, however. China has 4.6 healthcare workers per 1,000 population, with the ratio of registered doctors and nurses being 1.5 and 1.7 per 1,000 population, respectively.

Westernization of Diseases

Although maternal deaths and those associated with poor sanitation have decreased, chronic diseases associated with the Western diet and lifestyle are rising rapidly. Non-communicable chronic diseases are the leading cause of death in China and account for more than 80 percent of the 10 million deaths caused by all diseases annually.³ The four leading non-communicable diseases in China are cardiovascular diseases, diabetes, cancer, and chronic obstructive pulmonary diseases. The World Bank notes that more than half of the non-communicable disease burden is preventable by modi-

fying risk factors such as tobacco use, excessive alcohol consumption, poor diet, and physical inactivity. Unfortunately, data suggest that the number of cases of cardiovascular diseases, chronic obstructive pulmonary diseases, diabetes, and lung cancer in China will double or even triple over the next two decades unless effective prevention and control strategies are implemented. China also has one of the highest rates of mental illness in the world, with 17.5% of the population reporting some form of mental illness,⁴ and must do more to recognize and address the seriousness of this problem.

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for the urban insurance programs are subsidized by the government, with greater subsidies going to poorer provinces.

These new insurance programs were just the beginning of more comprehensive reforms that would come later. A working group created by the central government in 2006 sought the input of academics, international organizations, and other policy experts and, two years later, published a draft report on healthcare reform and invited public comment. More than 30,000 comments were received, and the revised report was finalized in 2009.⁸

China committed to increasing its annual government spending on healthcare by 850 billion Chinese yuan (about 125 billion U.S. dollars, or 105 billion euro) in the ensuing three years.³ In addition to increasing spending, the reform package sought to reduce health expenditure by improving efficiency and quality.

One of the main planks of the reform was expanding coverage to more than 90 percent of the population. China made the strategic decision to cover as many people as possible with shallow benefits and to expand the depth of coverage as more funding became available. As of 2011,

nearly 95 percent of China's citizens had insurance coverage.¹

To rein in costs associated with irrational drug use, the government eliminated the 15 percent drug mark-up for rural providers and set up an essential medicines list based on factors such as affordability, safety, and clinical efficacy. Primary providers can prescribe only the drugs that are on the list, which contains more than 300 generic medications, approximately one-third of which are Chinese herbal preparations.⁹ Procurement of the drugs is centralized on a provincial level, and the central government sets price ceilings that control costs.

Another component of the reform is to improve primary care and public health, particularly in rural areas. The government now pays rural providers a generous capitation for public health that has boosted provider incomes enough to make practicing in rural areas more appealing. The government also offers tuition waivers to medical students who agree to practice in rural township clinics for at least three years following graduation. Primary care providers are also intended to act as gatekeepers who manage referrals to more costly specialist and hospital care.

Challenges Ahead

Perhaps the most challenging of China's goals is the reform of its public hospitals, which deliver more than 90 percent of the country's inpatient and outpatient services.¹⁰ Several ministries are responsible for the governance and oversight of hospitals, an inefficient arrangement that can result in conflicting demands. Two ministries control insurance payments, for example, but prices are set by a different commission. Oversight of hospital administrators is the responsibility of the Ministry of Health, but the directors are appointed by a party organization department. Civil service rules set by the Ministry of Personnel give job guarantees to physicians and other personnel, regardless of how well they perform their duties.

China has designated 16 cities to test various public hospital reforms. Some have relaxed civil service rules so that personnel are employed on limited-term contracts, with reappointment or promotion based on performance. Others have established new commissions to coordinate the numerous organizations that finance and regulate their public hospitals. Others have sold their hospitals to private investors or turned over their management to hospital employees. The results from these experiments have the potential to significantly reshape China's hospitals in the coming years.

China's healthcare reforms are undoubtedly ambitious, but some daunting challenges remain. The expansion of insurance has increased the use of healthcare, but it does not appear to

have measurably reduced the financial risks associated with high out-of-pocket costs.³ One study conducted in China's western region found that the rural insurance program actually increased catastrophic healthcare costs – defined as more than 20 percent of annual income – among households.¹¹

Increasing access to health insurance is an important goal, but costs are likely to continue to burden patients and their families until the incentive structures and governance for providers are reformed. When physician bonuses are tied to hospital profits, as they commonly are in China, the fee-for-service payment system encourages expensive diagnostic testing and overtreatment. Although township health centers and other rural providers are prohibited from earning a profit on prescription drugs, urban hospitals, whose administrators are politically powerful and well connected, are currently exempted from this rule and still have incentive to overprescribe costly drugs.

Perhaps most importantly, healthcare providers and administrators in China need to abandon the culture of corruption that has reduced patient trust while increasing costs, and prompted patients to physically assault physicians. Fortunately, China's central government is well aware of these challenges and strives to introduce new reforms for a healthcare system that can achieve harmony between the needs of patients and healthcare providers. ■

“Costs are likely to continue to burden patients and their families until the incentive structures and governance for providers are reformed.”

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Further Reading

Siemens offers a variety of customer magazines and information channels. “Further Reading” introduces a selection of articles and topics featured that may be of interest to you. To learn more, follow the link below each article. To subscribe to any of the magazines, see page 80.

Introduction to Advanced Techniques in MR Neuroimaging

In the magnetic resonance expert magazine *MAGNETOM Flash*, Bernhard Schuknecht, MD, and Krisztina Baràth, MD, from the Diagnostic, Vascular and Interventional Neuroradiology department at Medizinisch Radiologisches Institut MRI, Bethanien Hospital in Zurich, Switzerland, give a short introduction as well as tips and tricks for several advanced techniques in neuroimaging with MR.

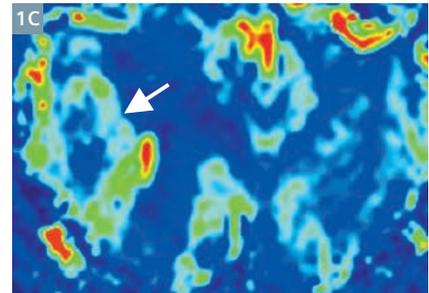
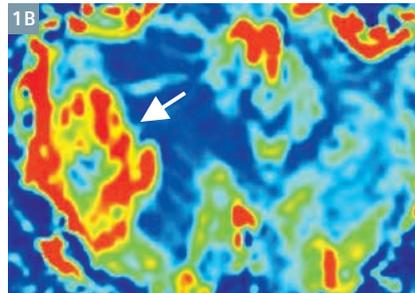
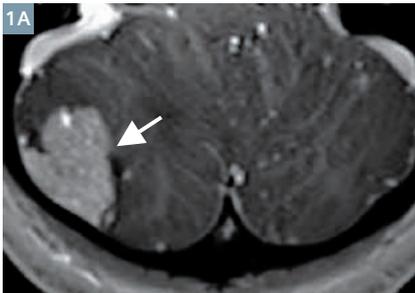
Techniques include:

- BOLD functional MRI (fMRI)
- Diffusion Tensor Imaging (DTI)
- Diffusion-Weighted Imaging (DWI)
- Perfusion-Weighted Imaging (PWI)
- Arterial Spin Labeling (ASL)
- MR Spectroscopy (MRS)
- Susceptibility-Weighted Imaging (SWI)
- Advanced imaging in cerebrovascular diseases and vascular lesions
- Time-resolved MR Angiography

- Advanced MR imaging of inflammatory demyelinating diseases of the central nervous system
- 3D FLAIR SPACE
- 3D T1w MPRAGE
- 3D Double Inversion-Recovery (DIR)

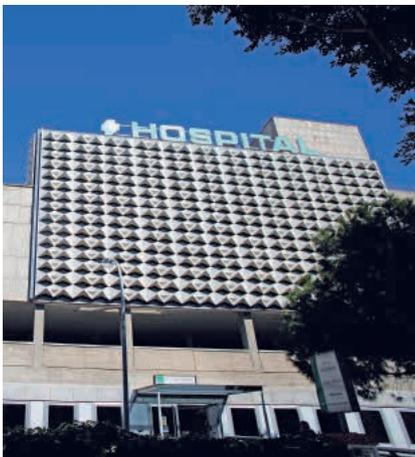
Further Information

www.siemens.com/mr-neuroimaging



Treatment monitoring with MRI. Cerebellar metastasis of renal cell carcinoma as indicated on the ce T1w image (1A). DSC perfusion MRI depicts increased vascularity within the entire metastasis with high rCBV values before (1B) and reduced rCBV values following radiotherapy (1C).

Case Study on Efficiency in Laboratory Diagnostics



The Hospital Materno Infantil, part of the Universitario Carlos Haya Hospital system, provides healthcare for mothers and infants and houses the core laboratory that serves as the reference lab for all four hospitals within the hospital system. This lab provides testing across a wide spectrum of disease states, performing seven million tests a year for approximately 660,000 patients.

Over the years, the hospital accommodated growing demand and limited budgets while staying true to its mission to provide the highest pos-

sible quality care. It did so through a Siemens customized workstream with the implementation of Siemens Aptio™ Automation together with the Siemens CentraLink™ Data Management System in 2012. This solution provided extensive automation capabilities, customization, and traceability for the hospital.

Read the full story online by following the link below.

Further Information

www.siemens.com/aptio-case-studies

Precision and Flexibility on Rails

Wels Clinic in Austria owns the world's first SOMATOM® Definition AS with sliding gantry. Wels purchased it for use in two rooms and for two fields of application – the trauma room and routine CT scans. The mobile gantry can be moved to the desired position via a rail system serving both rooms with a single click. When severely injured individuals are admitted, the lead-lined partition between the adjacent rooms is simply opened, allowing the gantry to slide from the routine to the emergency area with the rail system, where the patient is waiting on a special treatment couch equipped with a carbon plate. After use, the scanner returns to the radiological section at the touch of a button.

During post-processing, the Wels Clinic counts on *syngo.via*¹ software, which is fully integrated within its acute diagnostic routine. "A great support," reports Thomas Muhr, MD, radiologist

and the clinic's acting medical director, "as we can use it to reconstruct images and create 3D reconstructions in a matter of seconds." The trauma division and its patients benefit significantly from the faster automated processing: "We used to require around an hour from the patient's arrival to the completion of the final image. The new system has allowed us to reduce this to 35 minutes," adds Muhr.

All in all, the sliding gantry solution, combined with *syngo.via*, represents a giant step forward for both patients and colleagues, reports the Wels-based radiologist.

Watch a 360° view of Wels Clinic's mobile gantry solution and read more on Thomas Muhr's experiences by following the link below.



Wels Clinic in Austria is equipped with a sliding gantry solution designed for use in two rooms, which can be moved to any desired position via a rail system.

¹ *syngo.via* can be used as a stand-alone device or together with a variety of *syngo.via*-based software options, which are medical devices in their own right.

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.

Further Information

www.siemens.com/sliding-gantry-austria

Concentrated Expertise Against Coronary Heart Disease

The University of Erlangen-Nuremberg and Siemens Healthcare jointly participate in a Leading Edge Cluster competition organized by the German Federal Government within the "Medical Valley – European Metropolitan Region Nuremberg" cluster. One project within this cluster is dedicated to developing new technologies and procedures for noninvasive examination of the coronary arteries. New procedures for computed tomography are to be developed and validated, proce-

dures that will improve the obtained images of the coronary arteries and enable the detection and quantification of atherosclerotic plaques with improved spatial and temporal resolution, while also reducing exposure to radiation. The ultimate goal of the project is to improve prevention of coronary heart disease, which would potentially include preventive care approaches. Read comments by the project's researchers Prof. Stephan Achenbach, MD, Prof. Dieter Ropers,

MD, and Prof. Michael Lell, MD, to find out more on their findings in the full article on SOMATOM Sessions Online, accessible under the link below.

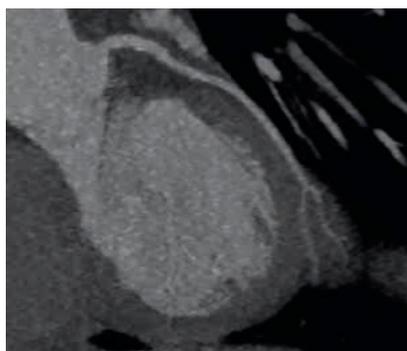
Further Information

www.siemens.com/somatom-sessions-cluster-2

One project under the Leading Edge Cluster competition aims to develop and validate techniques that will allow high-quality imaging of the coronary vessels with a radiation dose below 1 mSv. In this case, an extremely low radiation dose of 0.078 mSv was sufficient.



Courtesy of University Hospital Erlangen-Nuremberg, Germany

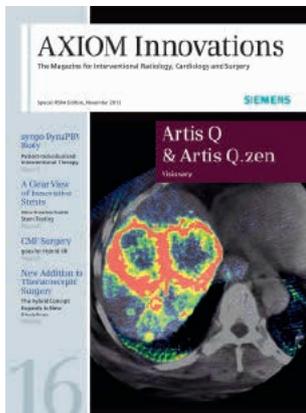


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Our publications offer the latest information and background for every healthcare field. From the hospital director to the radiological assistant – here, you can quickly find information relevant to your needs.



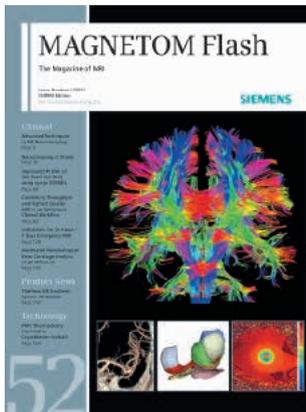
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Everything from the world of interventional radiology, cardiology, and surgery.



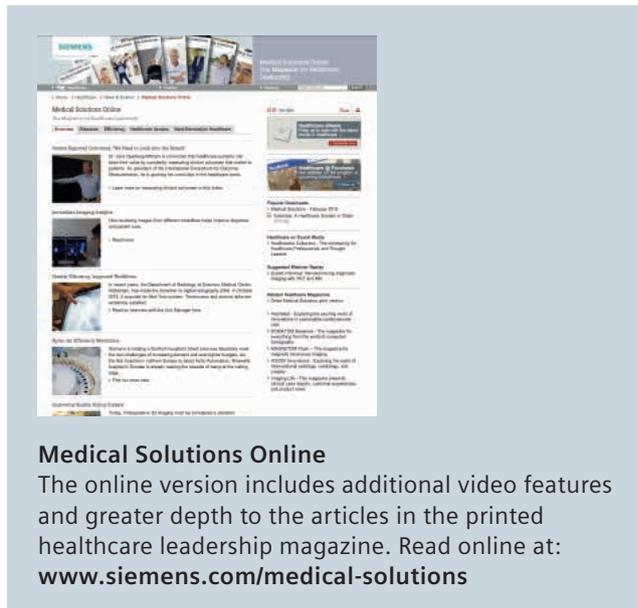
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MAGNETOM Flash
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SOMATOM Sessions
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