

Healthcare 2010: A Scenario

Siemens has a vision of our healthcare future that connects all the dots. It includes pre-disposition testing, screening for specific illnesses, diagnostics, treatment, information harvesting, and continuous improvement.

An exclusive interview with Dr. Mohammad Naraghi, by Arthur F. Pease



DR. MOHAMMAD NARAGHI is head of business development at Siemens Medical Solutions.

MEDICAL SOLUTIONS: Dr. Naraghi, you're the head of business development at Siemens Medical Solutions. What's your vision of healthcare? In what ways do you expect healthcare to advance by, say, 2010?

NARAGHI: We must further improve the quality of care while increasing the efficiency of healthcare delivery. We envision to achieve this goal through a holistic, integrated healthcare system that stresses preventive care and early detection, uses IT to seamlessly integrate workflow across participating providers and improves outcomes based on clinical evidence. The idea is that long before we develop clinical symptoms, our predisposition to certain illnesses – as well as any existing pathology – can be identified, diagnosed and treated. Furthermore, each of these steps will rely on medical databases that integrate all data relevant to a person's health status and enable comparisons with similar reference cases.

MEDICAL SOLUTIONS: How do you plan to get from here to there?

NARAGHI: The key is a combination of molecular technologies and IT with imaging.

We will have a disease-focused view of healthcare. We will choose those diseases in areas like oncology, cardiology or neurology – to name just a few strategic disease areas – where the potential and also the need for improvement is biggest and ask ourselves: What solutions do we need to offer to enable integrated disease management across all phases of the disease process? We will identify actions to take and act accordingly. In doing so, we will work closely with partners around the world because we acknowledge and appreciate the huge amount of innovation which is also happening outside our company. Together with our partners, we must push the associated technologies out of the lab and into clinical practice. And we will set the stage for this by developing gene chips for diagnostic applications, for example.

MEDICAL SOLUTIONS: What does the scenario for this look like?

NARAGHI: Think of tomorrow's healthcare system as a funnel. As a first step, everyone could be encouraged to undergo a simple test to determine their genetic predispos-



| “We envision a holistic, integrated healthcare system ... that uses IT to seamlessly integrate workflow ... and that improves outcomes.”

ition to a wide range of potential illnesses. Your general practitioner will take a few drops of blood and place them on a gene chip less than half the size of a credit card. The chip will be placed in a reader and a comparison will be made between your genetic fingerprint and a library of genes

and genetic mutations associated with conditions such as, for example, breast or colon cancer. A few seconds later the reader will indicate its findings.

MEDICAL SOLUTIONS: Identifying a predisposition isn't the same as detecting an illness. What's the value of that step?

Biography of Dr. Mohammad Naraghi

Mohammad Naraghi was born in Iran and grew up in the U.S.A., Germany and Austria. After studying mathematics and medicine in Aachen, Bonn and Vienna and earning his M.A. and M.D., he did his residency in cardiology at the University Hospital in Aachen. An M.S. in computational neuroscience from the California Institute of Technology in Pasadena followed. A former research fellow at the Max Planck Institute for Biophysical Chemistry in Göttingen, Dr. Naraghi also completed his Ph.D.s in both physiology and biophysics under the direct supervision of Nobel laureate Dr. Erwin Neher at the Universities of Halle and Würzburg. A former consultant and manager at McKinsey & Company in Hamburg, he has been vice president in charge of global business development at Siemens Medical Solutions in Erlangen since September 2002.

NARAGHI: Don't forget the funnel! Today, for instance, all women over a certain age with a family history of breast cancer are encouraged to have a regular mammogram. But if we had genetic testing, we'd limit this procedure to those women most likely to contract the illness – in other words, those with a genetic predisposition which actually have a high chance of getting breast cancer.

MEDICAL SOLUTIONS: Suppose you identify a predisposition. What's next?

NARAGHI: Well, if, for instance, you have a genetic fingerprint indicative of breast cancer, it doesn't mean you have breast cancer; it just means that you have a higher probability of contracting it. So, the doctor would at regular time intervals again take a blood sample, but this time place it on a system that screens the sample for proteins indicative of presence of breast cancer. Depending on what's known about the molecular fingerprint of specific tumors, it may even be possible for the system to distinguish between benign and malignant tumors. As with the genetic test, the sample is placed in a reader and the findings, along with an estimate of their accuracy, are displayed after a brief interval. The data is automatically transmitted to the doctor's office and integrated in the patient's Electronic Medical Record. Moreover, the data is interpreted by a clinical decision support system and the results are presented to the doctor in a mode which is easy to understand and clinically actionable.

MEDICAL SOLUTIONS: Let's say that a very early stage breast cancer is detected. How will we localize it?

NARAGHI: Since the screening test works on a molecular level, if it does detect cancer, the disease could be at a stage that would not be capable of being imaged with conventional technology. The challenge, indeed, then would be: how do we localize a very early stage cancer so that we can treat it? The answer will, for instance, be in developing contrast agents composed of molecules that will specifically bind to the target cancer cells' receptors and also signal generating molecules for visualization of

their location. Depending on the contrast agent's characteristics, it will allow us to visualize the cancer cells it attaches itself to using traditional imaging technologies, such as PET, SPECT, MR, or optical imaging. Once you've localized the cancer, you might cut it out, attack it with drugs, or treat it with a combination of both. Maybe in the future, we can also tailor the adjuvant drug therapy to the genotype of the patient. So to sum it up, we have a vision of the medical future that goes from predisposition testing to screening for specific illnesses, all the way to early diagnosis and personalized treatment. Compared to today, the entire disease management timeline will be moved forward.

MEDICAL SOLUTIONS: How will all of this help physicians?

NARAGHI: Based on my own experience as a physician, I can tell you that every physician bases her or his decisions on an incomplete database of experience, a limited set of "personal" data mining, and an imperfect portfolio of pattern recognition tools. As physicians, our medical knowledge database as well as our decision making tools are fed by medical education as well as clinical practice and coaching – which may include thousands of patients. What physicians will need are solutions that help them to make efficient decisions at the clinical point of care to cope with the complexity outlined above. We at Siemens can address this need by leveraging our assets, by combining the integrated solutions outlined above with a clinical, database-driven decision support system which integrates existing medical knowledge with empirical clinical evidence and advanced pattern recognition tools. Such a system will not say "do this". Instead, it will say, "we found this, and, by looking at our database, we can say that patients with this condition responded well to the following treatment". In other words, we will be moving in the direction of increasing personalization.

MEDICAL SOLUTIONS: So IT is the key?

NARAGHI: Yes, because the collective body of information becomes a source of new empirical knowledge when based on novel



“If we had genetic testing, we could limit expensive preventative programs to those people most likely to contract the respective illness.”

data mining applications. Such an integrated IT system is a huge potential source of health and wealth. Health because we can improve the quality of personalized care. Economic wealth because this is a source of efficient delivery of high quality care. The

important thing is that efficiency will be maximized throughout the entire healthcare field.

The interview was conducted by Arthur F. Pease, editor-in-chief of Siemens' Picture of the Future magazine.