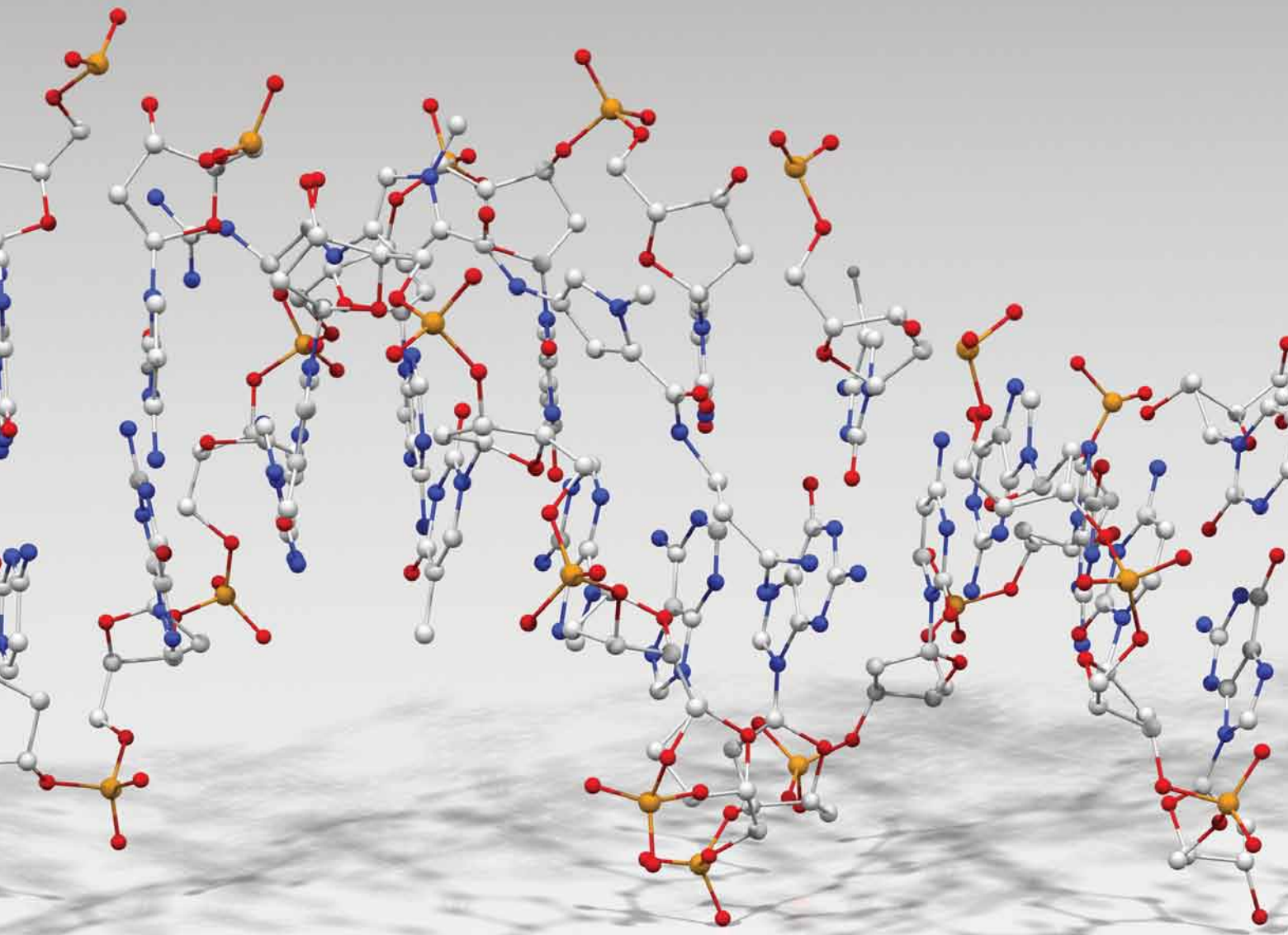
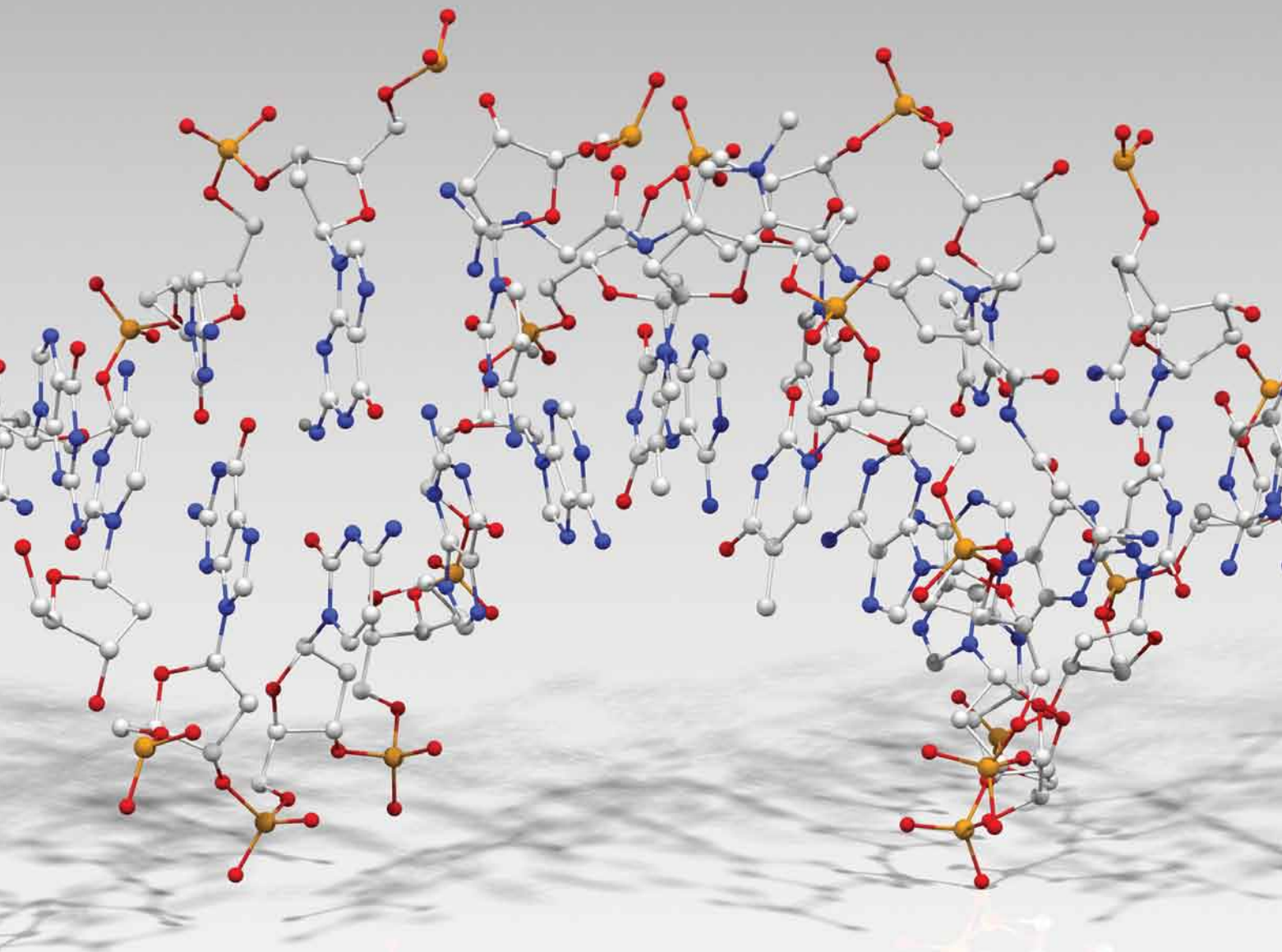


THE DIGITAL MEDICINE REVOLUTION IN HEALTHCARE

By John M. Buell



With billions of people using wireless technology globally and the sequencing of the human genome complete, the unlikely convergence of these two worlds sets up a unique opportunity in medicine to provide healthcare on a personalized basis.

Within the past seven years, technology such as the iPod, BlackBerry, iPhone, iPad, Facebook and Twitter have profoundly impacted the way we communicate. And when healthcare providers combine that kind of wireless technology with genomics, it will cause a disruption that is needed in medicine, according to experts.

Many hospitals already use wireless and digital technology in the delivery of care and report improvements in patient safety, satisfaction and disease management. And a handful of organizations are beginning to combine wireless and digital technology with genomic medicine to deliver personalized care. "The Digital Medicine Revolution in Healthcare," sponsored by ACHE and funded in part by the Fund for Innovation in Healthcare Leadership, examined these and other benefits. The program was held in Atlanta last September in conjunction with ACHE's Atlanta Cluster (see sidebar about the Fund on page 33).

The program's keynote speaker, Eric J. Topol, MD, director of the Scripps Translational Science Institute, professor of Translational Genomics at The Scripps Research Institute, and vice chairman of the board of directors and

chief innovation officer of the West Wireless Health Institute, San Diego, opened the program with an overview of the effect of wireless innovations and genomics on preventive care and treatment of chronic disease. "Medicine is about to go through its biggest shake-up," he said.

When healthcare executives understand biology from genomics and physiology through wireless phenotyping, this will set up a unique ability to understand each individual at the granular level, and enable prevention and optimal management in a precise and efficient manner, said Topol.

And because more than 100 major diseases have been deciphered at the genomic level, more has been learned about the underpinnings of diseases during the past three years than ever before.

Although few hospitals currently check patients' genotype overall, healthcare executives favor using the technology. According to a study in *Futurescan 2010: Healthcare Trends and Implications 2010–2015* (Health Administration Press, 2010), 72 percent of healthcare executives believe gene testing will make medicine more predictive and preventive, making it possible to diagnose and treat illnesses of some diseases in younger people.

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>
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Topol said the top 10 chronic diseases will have wireless applications available for them: Alzheimer's, asthma, breast cancer, chronic obstructive pulmonary disease, depression, diabetes, heart failure, hypertension, obesity and sleep disorders.

Understanding these diseases from a genomic standpoint and treating them using wireless technology can have dramatic results. With a simple genotype, physicians can determine whether a patient will respond to a particular drug. Wireless sensors could be directed to the right patients as an outgrowth of knowing the genomic risk such as for asthma or heart arrhythmias.

Topol said another wireless technology that can be used in combination with genomic medicine is a Band-Aid-like sensor that captures heart rhythm data for a week. This information can be e-mailed or mailed in to get analyzed at a fraction of the cost of current monitoring techniques. "This could be the end of the Holter monitor," Topol said.

WIRELESS TECHNOLOGY IN HEALTHCARE

Topol turned the program over to a group of hospital executive panelists who showcased how their organizations are using wireless technology.

New York University Langone Medical Center is implementing several wireless innovations that include an asset locator system, cell phone boosters for smart phones, computer tablets to access the EMR and devices such as smart infusion pumps, which can transmit alerts if the pump has been programmed outside of safe limits.

The medical center's asset tracking system uses radio frequency identification (RFID) and Wi-Fi technology to locate equipment, such as crash carts, IV pumps, wheelchairs, gurneys, cell phones and laptops. This has improved the organization's inventory management and facilitated interdepartmental equipment sharing so that employees don't horde supplies.

"I want to attach RFID tags to everything that costs $300 or more," said Marc J. Bloom, MD, PhD, clinical associate professor, director of the Neuroanesthesiology Program and director of Perioperative Technology, Department of Anesthesiology, New York University Langone Medical Center.

"That will be thousands of tags, but that's my goal," he said. "So far, the system has almost paid for itself in just finding lost equipment."

The medical center's ORs were the first areas Bloom explored when he considered using wireless applications. He was amazed at the amount of wires that cluttered the room, which looked as if bowls of spaghetti had been thrown about.

Devices, such as wireless infusion pumps and laptops (connected to the EMR via Wi-Fi), were installed in the OR.

To make communication in the OR more efficient, cell phone use was again permitted. A complete telephone ban had been in place because surgeons considered them an intrusion. Instead of using a phone to reach someone outside of the OR, personnel used a small intercom in the corner of the room to call out to the desk, for example, if they needed help with a piece of equipment.

"The problem, though, was the person at the desk outside the OR would send a page to the technician that his help was needed," said Bloom. "He would invariably arrive empty handed because he didn't know the nature of the problem."

With cell phones now allowed in the OR, booster devices were installed throughout the hospital to increase coverage, especially for smart phones, said Bloom.

Texas Health Resources, Arlington, one of the largest faith-based, nonprofit healthcare delivery systems in the United States, has a digital medicine strategy that is designed to flexibly deliver network, computing and application services to any device and transform the way these services are used to impact quality of care. Texas Health Resources' digital and wireless strategy is extensive. It includes remote health monitoring, a real-time locating system (patients and equipment), access to the EMR system and a list of area EDs via a smart phone.

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>
> —Marc J. Bloom, MD, PhD, New York University Langone Medical Center

Some of these systems are already in use, such as a pilot phase of Texas Health Resources' remote monitoring system, which has already improved patient outcomes, reduced readmission rates and increased referrals. Its real-time locating system includes RFID tags, sensors and software that have seen cost savings of $100,000 per year.

"Once you have your infrastructure in, your ROI incrementally skyrockets," said Edward W. Marx, senior vice president and CIO, Texas Health Resources.

The organization's wireless innovation goals are to improve quality of care and patient safety, reduce costs of care, and provide access to real-time and historical information, according to Marx.

"Going wireless also is a huge strategic investment that will allow us to better compete and differentiate ourselves," he said.

For Piedmont Healthcare, Atlanta, its digital and wireless strategy is part of the organization's 10-year goal to be among the top 10 community healthcare systems in the country—where patients want to go for a superior healthcare experience, dedicated professionals want to work and the best physicians want to practice.

"We have nine years to go," said R. Timothy Stack, FACHE, president and CEO, Piedmont Healthcare.

Included in its goal is to be as sophisticated as possible when it comes to technology. "Patients expect it, which means we have to always adapt," he said. "Right now

we have more than 1,000 wireless connections, and the key to our success is keeping everything connected."

The organization's major wireless innovations include electrocardiography monitoring and transmission from ambulance to hospital, medication distribution, infusion pumps and real-time equipment tracking.

The smart pump system is an automated IV drug delivery system that reduces the possibility of errors in administering drugs. Piedmont has 490 pumps that are connected to a wireless database, and the system interfaces to a server that allows changes to be made wirelessly to the medication formulary. The pumps send alerts if a drug dose or rate is outside of approved limits and will not deliver the drug until corrected.

"The smart pumps are expensive, but they do a great job," said Stack. "From a safety standpoint, the result is great care and better safety."

Piedmont's future wireless plans include continued expansion of bandwidth technology and Wi-Fi across the system and physician offices, increased usage of Internet protocol phones, use of centralized bed alarms and expansion of smart pumps to all facilities.

"Technology, however, is only as successful as the processes and people who support them," said Stack. "We can't do this without support from our physicians and nurses."

GENOMICS IN DIGITAL MEDICINE

Following the wireless innovation panelists, experts in genomic medicine explained the benefits of genotyping and advised healthcare leaders they will need to be aware of how genetic data will affect their IT systems.

The human genome sequence was complete in April 2003, giving

Fund for Innovation in Healthcare Leadership

"The Digital Medicine Revolution in Healthcare" was funded in part by the Foundation of the American College of Healthcare Executives' (ACHE's) philanthropic initiative, the Fund for Innovation in Healthcare Leadership.

An article on the second of two Fund programs for 2010, "Ethical Wisdom: Doing the Right Thing Every Day, Everywhere in the Organization," which was held in October at the San Francisco Cluster, will appear in the May/June 2011 issue of *Healthcare Executive*.

The Fund was established in 2006 to bring innovation to the forefront of healthcare leadership by developing and enhancing its focus on future healthcare leaders, ethics in healthcare management and healthcare management innovations. In its commitment to developing future leaders, the Fund also has provided scholarships for ACHE's Senior Executive and Executive Programs. Since the Fund's inception, nearly 900 generous donors have made contributions. This support has enabled the Fund to strengthen the field of healthcare leadership by providing educational opportunities on important trends and issues.

For more information on the Fund, including ways to contribute, please visit **ache.org/Innovation** or contact Laura Wilkinson, assistant director, Development, at (312) 424-9305 or lwilkinson@ache.org.

scientists around the world access to a database that greatly facilitates and accelerates the pace of biomedical research.

Although the cost of sequencing has dropped considerably, sequencing an individual's genome for medical purposes is still prohibitively expensive, according to the National Human Genome Research Institute (NHGRI), Bethesda, Md.

But much work needs to be done, said W. Gregory Feero, MD, PhD, special adviser to the director for Genomic Medicine, NHGRI, National Institutes of Health, Bethesda, Md. "We are in the infancy of evidence-based medicine and genomic medicine," Feero said. "The next wave of genome sequencing will help us learn the full extent of variation in the human genome and how that variation relates to health and disease."

The key point healthcare executives need to consider with genomics is whether the organization's IT systems will be robust enough to handle the enormous amounts of data generated through genetic sequencing, according to Feero.

"Will your informatics be up to snuff 10 to 15 years from now," when genotyping becomes more prevalent? "That's what you need to be thinking about," said Feero.

Consider this: the data sets produced so far by the international 1000 Genomes Project—an international effort to sequence the genomes of at least a thousand people from around the world to create the most detailed and medically useful picture to date of human genetic variation—are measured in terabytes and, in aggregate, petabytes. With computer networks typically running at 1 gigabit per second, it could take nearly five days to download a 1000 Genomes Project data set—

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—W. Gregory Feero, MD, PhD, National Institutes of Health

and that assumes the laboratory has a hard drive array large enough to hold and manipulate it all, according to NHGRI.

Even though the information bottleneck is a barrier for hospitals wanting to incorporate genotyping in the services they offer, the healthcare field supports it, said Edward R.B. McCabe III, MD, PhD, executive director, Linda Crnic Institute for Down Syndrome, and professor, Department of Pediatrics, University of Colorado–Denver.

"Personalized medicine is approaching implementation, but we can't oversell it," said McCabe.

Besides IT, another roadblock healthcare executives face with genotyping is physicians are not equipped enough to conduct genotyping—medical schools teach little about genetics, according to Feero and McCabe.

"We are not preparing doctors," said McCabe.

Paul R. Billings, MD, PhD, director and chief scientific officer, Genomic Medicine Institute at El Camino Hospital, Mountain View, Calif., which offers free genetic counseling, said surveys show that 90 percent of physicians want to use genetics in how they treat patients, but only 40 percent are comfortable ordering a genetic test. In addition, there is no evidence yet that personalized medicine has a significant impact on common, chronic diseases.

But Billings said investing in personalized medicine will yield positive results. "Individualized and targeted medicine is good medicine."

John M. Buell is a writer with Healthcare Executive.