WIRED FOR HEALTH

WITH INFRASTRUCTURE IN PLACE, HEALTH CARE PROVIDERS HAVE NEW POSSIBILITIES FOR IMPROVING HEALTH. ◇◇◇◇◇ STORY BY DALE SMITH ◇◇◇◇◇ ILLUSTRATIONS BY JUSTIN WOOD

THE UNITED STATES is flunking out on health care, according to a recent article in the *New England Journal of Medicine*. In 2006, we spent more per capita on health care than any other country but ranked 39th for infant mortality, 43rd for adult female mortality, 43rd for adult male mortality and 36th for life expectancy. "For the amount of money we're spending, we should be able to create more health," says Michael LeFevre, chief medical information officer at MU Health Care.

LeFevre thinks that adapting information technology, or IT, to health care can help Americans get more bang for their health care bucks, which made up 17.6 percent of the gross domestic product in 2009. LeFevre, a 2011 inductee into the Institute of Medicine (See "Members of the academies" on Page 28 for more on National Academies members at MU), has led MU's decade-long partnership with IT giant Cerner to improve care through technology. MU's progress is well ahead of newcomers in the nationwide rush set off by the federal government's 2009 American Recovery and Reinvestment Act, which paid $19 billion to help wire hospitals and doctors' offices. University of Missouri Health Care is one of the nation's "Most Wired" hospitals, according to a survey released in the July 2011 issue of *Hospitals & Health Networks* magazine. And in May 2011, Healthcare Information and Management Systems Society (HIMSS) Analytics, a company that evaluates hospitals' progress in implementing electronic records, announced that MU Health Care had reached several milestones in its transition to integrated electronic records, including:

- using computers to reduce medical errors by eliminating handwritten doctors' orders and medication prescriptions;
- adopting computerized systems that alert medical professionals to potential problems with care or medications;
- giving caregivers immediate access to patients' most up-to-date medical information;
- allowing faster ordering of laboratory tests and quicker access to results by caregivers.

FOR PATIENTS

What might all this hardware and software mean to patients? For starters, LeFevre says, "Rather than carry a paper record into the examination room, I have a computer with a big screen, and I'm using it to share information with the patient. When we finish the visit, I type right into the computer the orders for a return visit and, say, a consult to ENT and a lab test for blood cholesterol. The patient carries no paper to the front desk or to the lab. When they show up, the orders are in the computer."

Most patients at MU can get wired now, too, with secure online accounts they use to access portions of their medical record. About 5,000 are registered now. "Not a day goes by that I don't trade messages with my patients," LeFevre says. "It's fairly common, for instance, that a woman gets a mammogram in the morning, the radiologist reads it in the afternoon, sends the result to my inbox in the electronic medical record and, before going home that night, I send on the result telling my patient that the mammogram she had in the morning is normal. That's efficient!"

GETTING CURRENT

Karl Kochendorfer has more sobering news about the state of American medicine. "When it comes to information, physicians are only following 50 percent of current recommendations for most conditions. On average, it takes 17 years for new information to become common clinical practice." Kochendorfer, director of clinical informatics in the Department of Family and Community Medicine and medical director of the Tiger Institute's Living Lab, is looking for ways to reduce the lag time. MU faculty and Cerner software engineers collaborate in the lab to create ways to improve health.

One of several of the lab's projects is Physician Express, a new iPhone app that gives clinicians remote access to patients' clinical information, including problems, diagnoses, allergies, medications and vital

signs. Although having such information at physicians' fingertips is convenient, the benefits go much further, says Joanne Burns, executive director of the institute. "For instance, a nurse at the hospital may call a physician about a patient who is developing a problem. Without Physican Express, the nurse fills in the physician, who has to work with second-hand data and anecdotal information. The nurse may not know to look at all the things a physician wants to know. But with the iPhone app, physicians can see the data for themselves. They may clue in on other vital signs or lab results, or they may notice something else that's changing, and say, 'You know, this creates a different picture than what I got through a third party.' So, they get more information and can make a better-informed decision."

Through Kochendorfer's own company, he developed a search engine keyed to physicians' needs. "Doctors have lots of questions," he says. "For every three patients doctors see, they have two medical questions." Physicians also need nuts-and-bolts information about the hospitals and clinics they deal with. "For instance, when admitting a patient to the hospital, you quickly need to know which physicians are on call and their phone number, so you can communicate with

> 'A COMPUTER CAN'T PRACTICE MEDICINE. THE RELATIONSHIP, THE HUMAN TOUCH IS ESSENTIAL. BUT PHYSICIANS SHOULD BE AIDED IN THE WAY THEY MANAGE INFORMATION.'

them." To serve such varied demands in a hurry, the Living Lab produced a one-stop search box where physicians can locate an array of key information. It looks not only "inside" at patients' electronic medical records and hospital administrative data, but also "outside" at databases packed with the latest recommendations on medical topics.
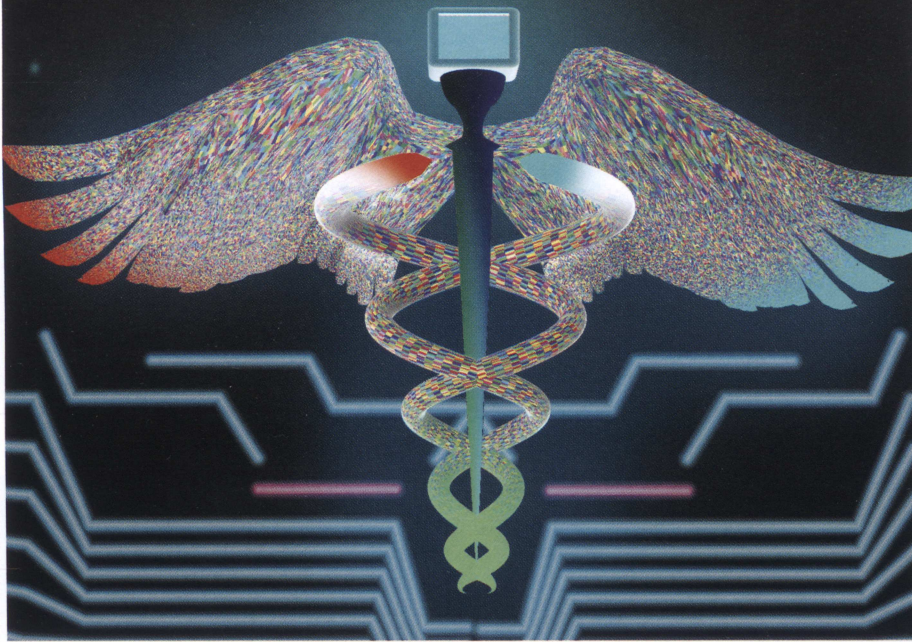
DASH TO DASHBOARDS

As the population ages, complex and costly chronic diseases including diabetes are on the rise. Taking care of diabetes patients efficiently is key to improving their health and controlling costs. Unfortunately, Kochendorfer says, at even the most renowned institutions, physicians and their diabetes patients manage to accomplish only five percent of recommended care. Information is key to doing better, but in earlier versions of MU's electronic medical record (EMR), it was time-consuming to dig out important data about blood sugar, blood pressure, urine tests, foot and eye exams, and so on. "Our studies showed that it was taking physicians 60 clicks in the EMR to gather and review the appropriate data," Kochendorfer says. In response, the Living Lab developed a screen summarizing the data and whittled the tasks to two clicks and two minutes.

Organizing data in useful ways is a welcome development in health care IT, Burns says. "For years we focused on getting info into the system — orders, vital signs, lab results. Now providers are saying, 'We need to see what those data look like in context for me as I take care of patients. Show it to me as a trend or in relation to other data.' So, if I give insulin to a patient, I should see if the blood glucose goes down in a few hours, rather than, 'Oh, we gave insulin, and oh, here's a glucose score, let me put them together to put the information in context for this patient.' "

The summary screen knocks down but one of several barriers to improving diabetes care through IT, says David Mehr, a researcher in family and community medicine. Mehr recently wrapped up a study of diabetes care that looked at 10 outpatient clinics, 106 physicians and 3,259 patients. The ques-

tion: Will physicians improve diabetes care if given regular updates summarizing how many of their patients have met certain milestones? In the study's first year, he divided the clinics into four groups.

Group one: Mehr emailed, or pushed, each physician monthly reports summarizing percentages of their patients who had completed each of eight key tests that serve as an indicator of diabetes care. The push reports offered a quick snapshot of a physician's diabetes caseload, but nothing more. Group two: Mehr provided access to more detailed "pull" reports, in which physicians could access a diabetes dashboard and drill down for data on individual patients. Group three received both push and pull reports, and group four was a control group that got no reports.

Physicians looked at the push reports, but that didn't improve the overall score for diabetes care, Mehr says. "However, clinics that could access reports and drill down to individual patients' data had a significant improvement in relation to others," he says. "Our study suggests that having actionable data — information that points you toward doing things — can lead to improved care." Unfortunately, he says, most off-the-shelf health care IT software does not provide actionable information. That's fixable, though.

The dashboard shows promise, but Mehr learned by interviewing clinic physicians and staff that the capacity to act on data

depends on workplace culture. "Clinics that showed improvement had team meetings to talk about the data. They decided they were embarrassed at their deficiencies and took actions. At clinics that didn't improve, they never met as a group to discuss the data and saw it as each provider for him or herself. There was not enough leadership to improve care."

FOLLOW THE DOLLAR

LeFevre calls for another sort of leadership to push health care IT forward — payment reform. Current payments to providers are for episodes of care, such as patient-care visits, hospital stays and procedures. But IT could help providers look after whole populations of people, an approach that could yield more health and greater savings.

"Population management means I will pay attention to you, even if you don't show up in the clinic," LeFevre says. "Let's say that I have 10 people with high blood pressure, but the database tells me I haven't seen three of them for 18 months; I need to find out why and do something if I can."

That's an efficient way to go about medical care, but building the database is costly. "Right now there's no reimbursement for paying attention to populations, so what is the motivation for a hospital to spend a million dollars getting its computer system up to speed to provide this service, which reduces

its revenue stream by two million dollars by reducing hospitalizations and ER visits."

Taking care of populations proactively is the right thing to do, he says, but it won't happen until insurance pays for it.

THE DREAM

Health care IT is in its infancy, LeFevre says. When asked about his hopes for its future, he begins by describing providers' tasks: build relationships, apply technical skills and manage information. "The way we have historically managed information was quite limited. We carried everything about you and about the literature in our heads."

But as medical information grows exponentially, providers could use IT not only to treat individual patients but also add to medical knowledge. "You bring to a patient encounter information about the patient, and medical knowledge, and neither of those things can you carry in your mind alone. And then you gather information about what's going on with that patient and make a plan of care. That plan is information. You set it in motion and look for outcomes. You get more information about that particular patient to feed back into the process, but you also should feed information into the larger knowledge base of medicine. Imagine the knowledge we could gain from all the one-on-one encounters providers have every day over large populations of people."

Someday, LeFevre says, all that data could inform artificial intelligence for providers to help them make good decisions about diagnoses and therapies. "A computer can't practice medicine," he says. "The relationship, the human touch is essential. But physicians should be aided in the way they manage information. By using IT to gather outcomes across populations, we could learn, for instance, that in a certain sort of patient with stroke, a particular medication doesn't work as well as another one." That would go beyond standard research methods. "We're still years away from reaching out into the deep knowledge of medicine." Ⓜ