On the Record

By Amos Esty

Dartmouth-Hitchcock is one of a very small number of health systems to have adopted a comprehensive electronic health record. In every single clinical unit. In a changeover that happened in just one day. Here's how that gargantuan task was accomplished.

Implementing the transition has required changing *how* 7,400 people work—all from one day to the next, and without disrupting the care of patients. The most recent rigorous survey of hospitals, published in 2009 in the *New England Journal of Medicine*, found that less than 2% of hospitals use EHRs in every clinical unit—as DH now does.

Early in the morning on Saturday, April 2, a woman arrived at the DHMC Emergency Department suffering from abdominal pain. Her case marked a turning point for Dartmouth-Hitchcock: she was the first patient admitted using a new, comprehensive electronic health record (EHR).

Many DH staff compared this transition to an earlier milestone: the 1991 move from Hanover, N.H., to the then-brand-new campus in Lebanon. Twenty years ago, however, the primary change was in *where* people worked. Once they figured out where to go, their jobs remained largely the same. By contrast, says Todd Vogt, senior director of the conversion to the EHR system, implementing that transition has required changing *how* 7,400 people work—all from one day to the next, and without disrupting the care of patients.

To those outside the world of medicine, a new format for health records may not seem of great significance. But the change was about much more than record-keeping. A key goal of the switch to the new system, dubbed "eD-H," was to improve the care patients receive; the process took years of preparation, thousands of hours of staff time, and an investment of about $80 million.

Despite the pervasiveness of technology in almost every facet of modern life, health care has remained surprisingly reliant on paper to keep track of patient care. A 2010 survey by the Centers for Disease Control and Prevention found that 50% of physicians use some form of EHR, but only about 10% use a system considered comprehensive. And the most recent rigorous survey of hospitals, published in 2009 in the *New England Journal of Medicine*, found that less than 2% of hospitals use EHRs in every clinical unit—as DH now does.

There are a number of reasons for this slow pace, including the complexity of patient care and the high cost of adopting EHRs. Dr. David Blumenthal, the national coordinator for health information technology in the U.S. Department of Health and Human Services, believes that "the widespread use of electronic health records in the United States is inevitable." But, he admits, "inevitability does not mean easy transition."

Federal legislation passed in 2009 allotted up to $27 billion over 10 years to encourage the switch to EHRs. Organizations that meet certain standards—called "meaningful use" requirements—will be eligible for significant payments from Medicare and Medicaid. In the case of DH, that could mean recouping about $30 million over the next few years. This legislation, explains Dr. Andrew Gettinger, a leader of DH's transition, is just one of many reasons that now was a good time for DH to make the change to a new system.

Gettinger is an enthusiastic early adopter of personal technology, and he's enthusiastic about the benefits of technology in health care, too. An anesthesiologist by training, he is also DH's medical director of information systems and informatics. Having worked at DHMC since 1983, he has seen—and helped lead—a number of technological changes.

In the mid-1980s, DHMC developed its own software, known as CIS for "clinical information system," to handle basic medical record-keeping functions, such as patient demographics, in some departments. Other units, including nurses on in-

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A self-proclaimed technophile, Andy Gettinger was one of the leaders of Dartmouth-Hitchcock's transition to a comprehensive electronic health record system.

GEOFFREY HOLMAN

The months leading up to the transition to the new EHR were intense. Every one of DH's 7,400 clinical employees had to take up to 16 hours of training on the system—requiring over 1,300 hands-on classes, like this one—and then pass a proficiency test before being allowed to use it.

Vogt explains that it is no small thing to ask very accomplished clinicians, particularly senior physicians who are experts in their fields, to become beginners all over again. In fact, they might have more trouble learning to use the complicated new system than younger, more tech-savvy residents and junior faculty.

patient units, continued to use paper records. Over the years, DH computer programmers improved CIS, adding a number of capabilities. Doctors and nurses could look up patients, see the results of lab tests, write notes, and perform many other tasks using the system.

But about four years ago, Gettinger says, it became clear that CIS did not have the power to meet the institution's future needs. He says consultants estimate that developing and maintaining a comprehensive EHR system costs between $500 million and $1 billion, making a custom system something few organizations can afford. Using off-the-shelf software, though still a significant investment, seemed to be the more cost-efficient option.

Settling on which new software was itself a major undertaking. After evaluating the available options, the DH leadership decided on a system developed by Epic, a Wisconsin-based company. With that decision made, the push was on to prepare for the big change.

In the months and weeks leading up to April 2, 2011, there were plenty of concerns. One was how well everyone would adapt to the system. Every clinical staff member spent up to 16 hours in training classes and had to pass proficiency tests. Even so, it was impossible to perfectly mimic using the system in a real-life clinical setting.

As the go-live date approached, Gettinger and Vogt talked excitedly about the benefits of eD-H. "It's not just installing a new information system to replace those that we already have," said Vogt. "It's changing the way we deliver care."

For one thing, the system would be implemented not just at the main DH campus in Lebanon, but also at all of the sites that are encompassed by DH-Manchester and DH-Nashua in southern New Hampshire. Patients who receive care at any of these locations would have a single medical record, making it easier to coordinate their care.

Gettinger also pointed out that the new system uses a number of evidence-based order sets, meaning it should be easier for caregivers to pull up the best available information about how to treat patients. For example, if a patient is admitted to DHMC because of a heart attack, eD-H will list all of the treatments that would typically be provided to such a patient, according to the very latest evidence. A doctor may decide to change some of those treatments based on the condition or history of an individual patient, but the expectation is that the evidence-based order sets should help standardize care and cut down on medical errors.

And the fact that the data that's entered into the system will be consistent regardless of the patient, caregiver, or location should make it easier to track the care provided across DH sites, to bill for the services provided, and to report on the quality and outcomes of care.

Vogt says it should also help make handoffs from one caregiver to another easier, because everything is documented in the system, so there is only one place a clinician needs to look to see everything about a patient.

In addition, the switch to eD-H is intended to improve patients' own ability to access information about their care. Using a website dubbed "myD-H," patients will be able to schedule appointments, look over their medical records from home, and see the results of various tests, among other functions.

But despite the benefits, it was clear that the transition was not going to be easy. Gettinger concedes that the strategy for the transition involved rolling out eD-H before it was perfect. "We're going to go forward with a methodology that involves putting it out there when it's not quite fully baked, but it's good enough for clinicians to use it," he said a few weeks before April 2. Vogt added that doctors and nurses had many good suggestions for improvements to the software, but that at some point it was essential to move forward, even if the system was not yet perfect. The plan is to continue to optimize it, first by fixing any pressing problems and then, over the long term, by figuring out how the system needs to be changed to make it work more effectively and efficiently. "The reality is, just get it out there and then see what you need to do to fix it," Gettinger said before go-live. "It will be a little bumpy over the next couple of months."

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Many departments conducted dress rehearsals before the April 2 "go-live."

Gettinger also realized that not everyone was enthusiastic about the change. "There are a lot of folks who don't fully comprehend why we're doing this," Gettinger says. "They're pretty comfortable with CIS." He adds that there are many challenges that face health-care organizations like DH, including declining resources, the national push to reduce the cost of health care, and diminishing reimbursements from payers. "All of those put tremendous pressure on clinicians," he says. "So we're taking a group of folks who are feeling pretty overwhelmed and saying, 'Oh, by the way, we're going to completely retool your workplace.'"

Vogt explains that it is no small thing to ask very accomplished clinicians, particularly senior physicians who are experts in their fields, to become beginners all over again. In fact, they might have more trouble learning to use the complicated new system than younger, more tech-savvy residents and junior faculty. "That's extremely hard for someone with years and years of experience, be it a nurse, a physician, anybody," Vogt says.

Dr. James Bernat, a neurologist, said in the days leading up to the transition that he was a bit apprehensive about how it would go. "I must say that the complexity of it and the learning curve to become well-versed in it is greater than I'd anticipated," he said. "It's very complicated." But, he added, "what's amazing to me and reassuring is the number of hours that dedicated people have put into this, planning it and executing it."

Bernat, an expert on medical ethics, also expressed concerns that are relevant to the use of any EHR system. He is very conscious of the need to make patients feel that they—rather than the computer—have the attention of doctors and nurses. "I think engaging with the patient, looking at the patient, making the patient feel that this is about them is important," he said. Although he—like every other doctor and nurse at DHMC—went through hours of training to learn to use the new system, he acknowledged it would not be until he was using it with real patients that he would know with any certainty how it would go. "Until you're actually doing it, you're not going to feel confident about it," he said.

It did not take long on April 2 for the new system—and the doctors and nurses using it—to be put to the test. Soon after the official switch, Drs. Edward Merrens and Joseph Perras were paged to the emergency room. There they admitted the woman suffering from abdominal pain using eD-H. Merrens says that he and Perras may have consciously taken a bit more time than usual working with the patient's record but that they didn't have any significant problems. Perras adds that despite some difficulties that slowed them down, "there were certainly hints to the potential power and utility of Epic."

At the same time, dozens of Dartmouth-Hitchcock staff sat in a conference room at the Medical Center and waited for the phones to start ringing. They were there to ease the transition by answering questions as clinicians called for help in using the new system. And, particularly in the first few days, there were many calls to answer. The "incident command center," as the conference room was called, was filled around the clock for two weeks.

Deanna Orfanidis, the nursing director of the intensive care unit

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Over 1,500 employees participated to varying degrees in the selection of DH's new EHR system; the chosen software was widely preferred by both physicians and nurses. And some 600 employees got extra training so they could support others in their departments during the transition.

Merrens acknowledges that actually finding information in eD-H can be frustrating. He compares the transition to driving a car in England. "You're still driving a car, but the rules are totally different," he says. Overall, he adds, "it was a little bit bumpy at the beginning," but within a few weeks he had seen significant progress in his colleagues' facility with the system.

and the intermediate surgical care unit, describes the first week as "pretty hectic." But, she adds, "I feel like it's smoothing out. . . . It has gone better than I anticipated." She was impressed by how quickly the staff have picked up the system. "It's a steep learning curve," she says.

Sandra Dickau, the vice president of patient care, arrived at DHMC at 5:00 a.m. on April 2. She says the staff she talked to in the days leading up to the switch were both excited and apprehensive. In the end, she observes, it went well. "It's a huge change for us, but in the inpatient side of the house we've done very well," she says. "It has gone incredibly smoothly."

One reason for that success, Dickau says, is that everyone remained focused on patient care despite whatever problems arose with the new system. "Our motto has been the patient first, each other second, and the chart third," she says.

Both Orfanidis and Dickau cite a number of benefits of the new system, particularly the fact that every piece of information about a patient is now available within the electronic record, making it unnecessary to hunt through pages and pages of paper records to find relevant details.

"The information will be so much more readily available at your fingertips," Dickau says. And, Orfanidis adds, having electronic records gets around the infamous problem of doctors' handwriting.

Merrens believes that eD-H also makes it easier for physicians to discuss a patient with nurses, as all the necessary information is readily available. But, he acknowledges, actually finding the information in eD-H can be frustrating. He compares the transition to driving a car in England. "You're still driving a car, but the rules are totally different," he says. Overall, he adds, "it was a little bit bumpy at the beginning," but within a few weeks of the transition he had seen significant progress in doctors' and nurses' facility with the system.

A few physicians expressed deeper skepticism about the benefits of eD-H. One described the system as "clunky," noting that it is less intuitive than CIS. The primary problem, he adds, is that it takes much longer to get anything done than it did before. He concedes that additional experience may make using eD-H more efficient, but he predicts that it will always take longer to get most things done in eD-H than it did before.

Another physician worried that every task requires so many steps that it will be difficult to conduct effective patient meetings, noting that a 15-minute appointment does not leave a lot of time to fill out all of the fields required by the system.

One resident was happy about the ability to access patient information from anywhere in the Medical Center but was finding it difficult to maneuver among the program's many tabs and fields. Indeed, many doctors appreciated having so much data at their fingertips, but they seemed overwhelmed by the process of trying to find the most relevant information.

Gettinger acknowledges that learning to navigate in the new system is not easy. "It's very complicated," he says. "You can get lost very fast." He thinks it will just take time for doctors and nurses to feel comfortable using it. He says he reminds them that it takes a lot of work to develop the ability to interact effectively with patients, regardless of whether a computer is part of the process.

Some of the precepts are pretty simple, he says—don't look at the computer during the first few minutes of an interaction with a patient, make eye contact, try to establish good rapport early on. "The computer is an easy fall guy" for bad interactions with patients, he adds.

Some physicians have also expressed doubts about the long-term benefits of the system, pointing out that there is not a lot of published evidence showing that EHRs actually improve patient care. But Gettinger believes that the ability to gather standardized data will eventually lead to improvements in care. He says that being able to show

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mater. Like most surgeons of the day, Crosby almost certainly entered wartime service holding conventional, even primitive, ideas about the nature of psychological illness.

Yet by 1864, he was able to recognize these invisible wounds of war, writing in a letter to a colonel that one of his patients had a disease "rather mental and moral than physical" and that he did not recommend releasing the soldier from the hospital.

And many soldiers continued to bear emotional scars when they returned to civilian life. Anecdotal evidence of associated problems abounds: domestic abuse, divorce, alcohol and drug abuse, and more. It is clear that Civil War veterans' combat-related mental-health tribulations did not stop with the end of the war.

Recent research has made us even more aware of just how debilitating such injuries can be. (And it bears mentioning that much of the research about what we now call PTSD has come from the Veterans Affairs National Center for PTSD, which is housed at the Dartmouth-affiliated White River Junction, Vt., VA Medical Center.)

Remembrance

The nation was not long in waiting to commemorate the Civil War after the cessation of hostilities. Memorials were built and encomiums were offered to the living and the dead of both the North and South.

In 1913, the Dartmouth Class of 1863 raised funds for a large bronze plaque listing the name, rank, and unit of all 56 classmates who had served in the Civil War—including three who had fought for the Confederacy. The College then had a similar plaque made, as a companion piece, listing by class the 73 alumni who had died in the war—63 for the Union cause and 10 for the Confederacy. Including the names of troops from both sides is "very rare on war memorials," according to the late Charles Wood, Dartmouth's Daniel Webster Professor of History, in *A Guide to Dartmouth's War Memorials*. "It must be remembered, though," Wood explained, "that this memorial was created only in 1913, a half-century after the event and at a time when the elderly veterans of both sides were beginning to hold joint encampments at major battle sites where for the first time they found it possible to salute each other's valor and honor."

Today, 150 years later, the Civil War still maintains an almost unmatched hold on the imagination of Americans. Each year, millions of people visit Civil War battlefields and museums, research ancestors who fought in the war, participate in re-enactments, watch Civil War-related films and television programs, read a seemingly unending stream of books and magazine articles (including this one!), and collect artifacts, photographs, and ephemera.

The Civil War sesquicentennial, which runs from 2011 to 2015, will likely spark, renew, and intensify interest in the now long-ago struggle. Thankfully, recent scholarship has resulted in a shift in attitude among informed Civil War enthusiasts toward the conflict's medical casualties and caregivers and the challenges they faced.

Nevertheless, myths still prevail among the general public. There is more yet that can be learned, and shared, about those "years of change and suffering." ■

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doctors how their patients fare compared to patients cared for by other doctors is a powerful way to inspire changes that can lead to better care. "The value of an electronic health record is that you are able to acquire that actionable data and then feed it back to the clinical community for them to make changes," Gettinger says. He notes that CIS was able to track some basic measures, such as a list of medications and a patient's height, weight, and other similar information, but it could not be used for more sophisticated data-gathering.

The ability to collect and analyze data is also integral to DH's involvement in a new national group—the High Value Healthcare Collaborative, a collective effort by 14 leading health systems to compare the quality, outcomes, and costs of care for a number of common conditions, such as knee replacements. (For more about this initiative, see dartmed.dartmouth.edu/sp11/v02.)

Following go-live for eD-H, Bernat said that the transition had gone about as he had expected. It was taking time to master all of the features available in eD-H and to figure out how to use the system efficiently. But, he added, "once we all learn how to use it well, I'm sure it will go smoothly."

An early test of eD-H will come when the organization attempts to qualify for federal "meaningful use" payments later this year. The initial standards that must be met in 2011 and 2012 include keeping track of patients' demographic information, as well as safety features such as checking for potentially dangerous interactions among the medications a patient is taking.

Starting in 2013, there will be still more requirements, which could earn DH and other institutions additional payments. And, by 2015, the Centers for Medicare and Medicaid will likely penalize organizations that remain unable to meet the meaningful use requirements.

Vogt says eD-H has everything needed to earn meaningful use payments—it's up to staff to be sure the system is used effectively. "It's not a technical issue, it's getting folks to change the way they deliver care," he says. "And I think we're going to be successful."

Gettinger admits, as he shows off his iPad and smartphone, that he's a technophile. He believes technology can be used to even greater effect in health care in the future. "Technology is going to become much more user-friendly," he says. "It's going to be much easier to bring it in to clinical care."

"This is a golden opportunity," agrees Vogt. "You don't often get the funding and the staff for two years to think about how you want to improve what you're doing. . . . I think we've done a good job of really leveraging all of the resources that Dartmouth has committed to making this a successful project."

Despite the difficulty of the transition, Bernat points out that the limitations of CIS made it essential to change. "There are many really valuable features in eD-H," Bernat adds, mentioning the evidence-based order sets as but one example.

And Merrens believes that merely making the transition was beneficial. "You look for challenging experiences to test your group," he says. And this one, he maintains, "has strengthened our culture." ■