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information edge

EMR: 10 Years Later

EXECUTIVE SUMMARY

The arrival of the electronic medical record (EMR) has been 10 years away for as long as most of us can remember. It still is. The difference today is that many of the complex issues surrounding the EMR are being resolved, including technology, people, process and culture.

CERNER

Jeffrey Rose, MD, chief medical officer at Cerner Corp., says the issues surrounding the EMR are the same ones with which we've been grappling for the last decade:

- Physicians lack information on the patients they're seeing;
- Those same physicians have a difficult time keeping up on the explosion of new medical information at the point of care;
- Very few automated processes exist to prevent mistakes;
- There is significantly more attention being placed on medication and patient safety on the parts of government, employers and our patients.

He believes that the term electronic medical record sells the strategy short. "We really need to integrate the information tools into the workflow." The medical record should be defined by the goals that drive it:

1. Make people's clinical information more available.
2. Ensure that the information is good, comparable, coded and analyzable arising from consistent data architecture.
3. Provide just-in-time decision-support and knowledge involving protocols, alerts and guidelines.
4. Integrate information and decision support into physician workflow.

"If you fail at any one of those four issues, you've broken the chain," says Rose.

This issue of Information Edge attempts a snapshot of where healthcare organizations are with the EMR, focusing on Salt Lake City-based Intermountain Health Care, which is replacing its venerable, homegrown HELP system with a new EMR, and Twin Cities-based Park Nicollet Health Services, which has launched a $60-million initiative to build a completely integrated medical record. Both take very seriously the goals mentioned above. And they just might beat the odds and succeed in building an EMR within the next 10 years.

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Intermezzo at Intermountain

INTERMOUNTAIN HEALTH CARE

"Historically, we've had one of the leading inpatient systems," says Carvel Whiting, CIO at Intermountain Health Care in Salt Lake City. That system, dubbed HELP, was jointly developed over 20 years with Minneapolis-based 3M Corp., which purchased it and sold it to hospitals as its flagship clinical-IS product. HELP integrated all the applications of all the departments in IHC's facilities, now numbering 22 hospitals and 80 outpatient clinics.

About six years ago, IHC initiated implementation of an EMR that would link all its sites, building it around the clinical data repository (CDR) component of 3M's Care Innovation product. The CDR de facto establishes the EMR, according to Whiting. Access to it is through IHC's client-server-based Clinical Workstation, initially implemented in the outpatient setting and linked to the IDX practice-management system. The workstation allows doctors at a mouse click to read such information as patient notes and laboratory results.

As a "smart" system, the workstation can suggest alternative treatments or medications for any given patient.

IHC also built a Web-based tool used by its physicians to review laboratory and test results in the CDR, including longitudinal laboratory values and most radiological images except ultrasound, which will be integrated into the system in the next two years.

About three years ago, IHC took on the gargantuan job of building its "master member index," or master patient index, which allows registering people centrally in the CDR so that doctors—whether they happen to be in Salt Lake City or far-flung St. George, Utah—can look up individual patient records without misidentifying the patient from duplicate data.

The Lego approach

The inpatient system, the CDR, the clinical workstation and the Web-based tool provide the infrastructure for IHC to build its system for the new millennium. "All that's in place and not changing," declares Whiting, adding, however, that IHC will replace the venerable HELP system. With CDR as the centerpiece, the new system will be built using a modular "building-block" architecture linked by interface engines from e-Gate, enabling IHC to swap one vendor's laboratory system for another without much trouble.

The new architecture incorporates a healthcare data dictionary, built in conjunction with 3M, that filters information from any system interfacing with the CDR, allowing for a single representation of data in the CDR. "The data dictionary is a very sophisticated translator, keeping all disparate systems talking together in the same language, overcoming the fact that every software firm builds their products with unique embedded concepts," says Whiting.

So much for Phase One. Phase Two at IHC involves another joint development relationship, this time with IDX. "We're a lead development partner, implementing some of HELP functionality in the new system, specifically charting. The concepts haven't died. We're just implementing them differently," Whiting says.

With CDR as the centerpiece, the new system will be built using a modular "building-block" architecture linked by interface engines, enabling IHC to swap one vendor's laboratory system for another without much trouble.

"There's a huge gap between theoretical best practices and actual care delivered," says Paul Clayton, PhD, IHC's chief medical informatics officer and a professor of informatics at the University of Utah. For the last 20 years, IHC and like-minded organizations such as Partners in Boston and Regenstrief in Indianapolis have tried to bridge "The Chasm," as they call it, by incorporating prompts into clinical IS networks to change physician behavior.

Beyond critiquing

"Critiquing physicians with computer prompts is a reactive mode. Now we'd like to be more proactive," Clayton says. Enter the problem-goal-task model, which has its roots in Larry Weed's Problem List, a logical process that involves three steps:

1. Identifying/listing the patient's problem
2. Establishing the goal of care
3. Developing a plan of action

Whether it's coronary artery disease or a runny nose, the same model applies and will generate a task list for someone with that problem and particular goal. Documentation works against the task list which is based upon evidence. "We have a common set of standards of care and can prompt people to adhere to those standards. In our approach every goal must have measurable criteria to determine whether the goal was reached," says Clayton.

For example, the goal for a patient with a total knee replacement may be to have the person walk 30 feet down a hallway. An online outcomes assessment follows; then it's possible to do studies comparing compliance to outcomes.

"It's basically establishing standards of care and weaving those standards into the process of care. Just having a loose-leaf notebook doesn't tell you if you've actually complied with the proper care process. With HELP for 20 years we've documented what providers have done retrospectively. Now we're not doing analysis after they've left the hospital but in real time.

Kicking the variance habit

"We call it the Patient Care Management system. It gives the physicians suggested order sets. The task lists apply to every provider from social worker to physician. IHC's initial implementation will be inpatient, but there's no reason you wouldn't use the same approach with a diabetic or a person with an earache in the ambulatory setting," says Clayton, adding, "This is a five to 10-year journey. What we're trying to do is automate the manual process for defining evidence-based best practice."

How the system works can be illustrated by the case of a person with a myocardial infarction. At discharge, that patient typically should receive beta-blockers, ace inhibitors, aspirin and statins to lower blood pressure. "Four or five years ago, only about 59% of patients were getting the treatment. Today, IHC achieves 90% compliance with the therapy because of the new system," says Clayton.

Not surprisingly, the one-year mortality rate for congestive heart failure patients has dropped to 17.8% from 22.7%; for aschemic patients it's dropped to 3.5% from 4.5%. Clayton estimates that 455 lives a year are saved because of raising compliance to such standards of care by 30%.

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IHC is achieving similar success in the area of induced labor on labor-and-delivery floors. "We've successfully shown we can do this manually in one or two areas. Then the strategy becomes scalable using automation," he says.

New CD player

Safety and quality of care combine to become the driving force behind such initiatives. One of the biggest challenges, Clayton says, was to avoid reinventing studies to establish care standards. "We use the literature of guidelines and transform it into knowledge-based representation. The computer can then give you the goals and list of tasks, including the orders doctors should write." Order sets aren't new, but doctors have often differed on best use. "Now we decide on best use," he says.

However, such work at IHC's flagship LDS Hospital, Regenstrief and Brigham & Women's has resulted in quite similar care standards, according to Clayton. IHC's approach is to use internal-review committees—made up of 10 people, including MDs, nurses and informaticists—which study the knowledge base and approve it.

IHC takes this distilled knowledge and represents it in a computer-processable format. "The work we're doing with IDX is to build the equivalent of a CD player for the knowledge base," says Clayton.

It was important to maintain much of the functionality of the old HELP system in the new one. "Our nurses have been charting and using the alerts in HELP for 20 years. So we didn't want to throw it out."

Off Broadway

IHC expects to go live with the new system early in 2003 in the inpatient environment at a small hospital in American Fork, Utah. "It's our Off-Broadway opening," says Clayton.

The LastWord application runs on Tandem servers but all the front ends will be Web-based so that ultimately 15,000 users—physicians, nurses, respiratory therapists, dieticians, social workers, pharmacists—can access the system from anyplace they can use the Internet.

Clayton says it's difficult to determine ROI but estimates that reducing variance in care by only 2% will pay for the system. He acknowledges that, "We don't know for sure. This is something people haven't done on this scale before. The leadership of IHC has shown a lot of faith."

At home with Park Nicollet

Park Nicollet

Last September, Park Nicollet Health Services (formerly HealthSystem Minnesota) in the Twin Cities launched a $60-million EMR project involving 90 full-time staff people, including a half-dozen physicians. "We're building an integrated medical record that unifies information around the patient, linking the hospital, clinic and home," says David Wessner, Park Nicollet's CEO. "Our goal is to give patients access to their own medical information in their homes."

Park Nicollet, a care system serving the western half of the Twin Cities, last year had $600 million in net revenues, 1.8 million office encounters and 22,000 admissions. It includes Methodist Hospital and 25 clinics in addition to the Park Nicollet Institute and Park Nicollet Foundation. The organization was created through the merger of Park Nicollet Clinic and Methodist Hospital in the early 1990s.

The organization expects to have "some" clinician order entry piloted within a year and expanded gradually after that. "CPOE [computer-based physician order entry] is an imperative," says Wessner, who adds that management understands the inherent intrusiveness of implementing such a strategy among physicians, but that the organization is building strong support for it by virtue of its physician champions and its clinical board of governors.

Park Nicollet's EMR initiative is hardly an IT project. The organization has grounded it firmly in its Six Sigma effort as process discipline within the organization, combining IS staff and Six Sigma staff in a unified team. Six Sigma is a methodology for problem solving, business and quality improvement that arose in the high-tech industry almost 20 years ago. "We have both means and method to create healthcare safety and effectiveness," says Wessner.

Tied up in non-essential work

The strategy includes an organization goal of increasing its operating margin between 4% and 5% from a current 1%, partly by eliminating the duplicate tasks. "About 35% of expenses are tied up in work that's duplicative and not essential," he says.

The emphasis on patient involvement is real. "We're designing the patient component of the EMR to be interactive with reminders and knowledge support," Wessner says. The organization developed a Care Guide that will be integrated with the patient's problem list. Also planned are Web-based disease-management strategies for diabetes and other chronic diseases, involving deep-knowledge support and coaching to encourage life-style changes and patient self-management.

The Park Nicollet Institute is conducting research to identify who among the general population wants access to clinical information. "We're surveying the population to determine how much interest there is in getting medical information and we're finding the interest to be very high," notes Wessner.

He says the organization is heavily emphasizing the process side of the EMR for a reason. "If you don't understand the processes, measure, own and manage them, you end up changing things but will forget a lot about what you did. It won't be as effective," he says.

There's no turning back on the effort. "We have to do it in order to meet the needs of the community in the next 10 to 15 years. We have to drastically improve efficiency in order to create capacity and address the high costs of healthcare. This is all about whether we serve or fail the community. The integrated medical record is the means to do that," says Wessner.

129 systems and counting

David Abelson, MD, VP for strategic improvement at Park Nicollet and an internist, is executive sponsor of the Integrated Medical Record

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Abelson estimates a 2% increase in revenue just from retrieving charges lost under the existing system and that use of CPOE will result in a 50% to 88% reduction in medication-related errors.

With an online system the physician can automatically capture charges for the clinical tasks associated with the problem list. The new system will combine together what are two separate paper processes today.

initiative. "Despite being integrated on administrative levels [as a result of the 1990 merger] we haven't been integrated in the area of patient information," he says.

Besides the two information systems from Methodist and Park Nicollet, the organization has to juggle another 129 electronic systems that contain uniquely identifiable patient information. In addition, patient information is scattered in two main paper-chart systems, as well as multiple department paper chart systems, including homecare, mental health and kidney dialysis. "Even the main systems lack all the information on the patient. It's difficult to have a process work and have staff deliver good care when your information is fragmented," says Abelson.

The integration effort is built around using LastWord from IDX, already in use at Methodist. The goal is to create a single enterprise registration and scheduling system in which all patient information will be viewable online. Eventually other components such as radiology images will also be brought into the system.

"We currently have a homegrown system in the clinics that is archaic. It doesn't meet our needs because it lacks the important functions associated with an EMR: the problem list, medication list and navigation capability. People have to scroll from one test result to the next. We needed a strategy to move away from that," says Abelson.

Code breakers

In terms of ROI, Park Nicollet has "calculated a significant return," he says, much of it from CPOE and savings from transcription costs, which have been manual. There should also be some increased revenue, especially with online charge capture. Abelson estimates a 2% increase in revenue just from retrieving charges lost under the existing system.

He also estimates that use of CPOE will result in a 50% to 88% reduction in medication-related errors. But other sources of medical errors should also be improved, including elimination of duplicate medical records that can result in fragmented information about a patient.

Stop the presses

"Physician acceptance of the new system is absolutely key," says Abelson. Seven physicians are dedicated to building the system to work for clinicians. The organization is also encouraging doctors to use email for administrative purposes, partly to reduce use of paper and partly as a way to prepare for the future EMR.

While all of Park Nicollet's physicians have laptops, about a quarter of them have yet to log in to e-mail. "There's a wide range in how clinicians use computers. In our clinics we have a wireless network. Some physicians take their laptops into examination rooms and others don't even check their email," says Abelson, adding that the organization eventually will stop printing paper charts, eliminating the paper option altogether.

"The paper chart holds lots of information that's online already, such as lab results. In 2003, we'll stop printing information that's online," says Abelson.

That may be sooner than some physicians would like, given that the 'go-live'of Phase One is planned for the end of this year. The online problem list should be ready in late 2003; scanned archiving of paper charts will be complete in 2004.

Looking for workflow in all the wrong places

Cerner's Rose says the starting point for the EMR in any organization should be the workflow, which unfortunately, few organizations pay enough attention to. "Until you understand how doctors make diagnoses and order therapy, you end up with small pieces instead of an integrated, effective and efficient flow," he says.

While clinical workflow and processes are similar from institution to institution, they vary enough that it's usually necessary to design a medical record for a particular facility or organization. Rose says a case in point is CPOE, which organizations often fail to integrate into the workflow process, with the result that the technology has provided little benefit to clinicians at those sites.

"Everybody is behind patient safety, quality and lower costs, but the whole idea is that the systems must save clinicians' time and resources and provide an immediate and tangible benefit if they're going to be widely accepted," he says.

The importance of starting at workflow notwithstanding, the four issues mentioned in the executive summary are equally important. "If we're not collecting comparable data then we can't derive knowledge from the results of our practices, nor can we reliably trigger decision-support actions for clinicians. If we don't have the EMR integrated into the workflow, clinicians will generally not stop activities to go to a computer to look something up. If information isn't available from all sources as clinicians are making decisions, the fragmentation will result in rejection of the otherwise helpful technology. Even though the paper chart is woefully inadequate it still is very familiar, and we seem to rely on it and paper processes because they are so entrenched in our culture. So, we in the IT supplier role really have a responsibility to meet all four goals," says Rose.

Thanks for the memory, but…

"What we have in our heads is inadequate, but as physicians we have this tradition of empirical knowledge. It's like a watch has been wound inside of us. But the Institute of Medicine report [on medical errors] has made it obvious that relying on memory isn't adequate anymore, especially given the frantic pace of medicine today. Not to have all this information imparts critical risk," he says. "Even so, our culture is not one that welcomes the systematic detection of errors. We experience a great deal of shame and guilt when mistakes happen, and we expect perfection of ourselves in a highly imperfect system."

Much of the pure technology infrastructure to enable workflow, such as wireless devices and real-time information processing, are readily available. Slower in coming have been standards in clinical terminology (SNOMED—a systematized nomenclature of clinical terminology) and clinical messaging (HL-7).

However, much work still is required on the part of vendors to integrate such standards into their products. Then the standards must be embraced not only by clinicians but also by data analysts.

Too many variables

In terms of workflow, part of healthcare's problem is its tremendous variability across the enterprise, from the ambulatory setting to the acute-care environment to the intensive care unit. Varying models of care—a team-oriented approach in an urban academic

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hospital or solo practitioners in a community setting, for example—further complicate the situation. All these factors result in more complexity, which is unsafe and expensive. "It doesn't mean we should have no variation, but there is an optimum amount," says Rose.

Suppliers of information systems can better support clinician workflow in their system design by carefully observing how clinicians interact, hand off information and message each other. "We need to ask ourselves how we can streamline those flows and support them with knowledge. That's our job," says Rose. The challenge is to look at workflow processes and provide the technology to support them. However, there's a dynamic at play. Both software and clinical processes have to change and evolve together, he says.

In terms of actual hardware for the EMR, different devices have different utility in different settings. "Don't try to force one hardware platform into every setting. Use different devices where they make sense," says Rose. For example, portable, handheld devices can serve clinicians well as tools for checking drug formularies or prescribing drugs on hospital rounds, but lack the screen-display size and functionality to read complete orders and results of a full longitudinal medical record. "When doctors make decisions we really want access to the complete medical record at the point of care and in our offices. It is essential that the information and workflow enabled with these devices be an integral part of a larger system solution."

A key is to be able to synchronize data with the core clinical system. "As wireless comes along, we're going to have to resolve the exact hardware, security, expense, screen size and data synchronization. We're still a ways off, but we're finding many niches where small devices can work rather than fat-client PCs," Rose says.

Ambulatory comes into focus

Erica Drazen, VP and managing director of Emerging Practices, First Consulting Group's research and development unit in Boston, says most organizations are focusing on the ambulatory side of EMRs today.

"The desire for a longitudinal record [that includes inpatient as well as outpatient information] has not gone away, because of driving forces such as patient safety and the need for chronic disease management," she says. However, good disease management means managing on an outpatient basis the 20% of patients that result in 80% of medical costs to prevent them from becoming more costly inpatients, according to Drazen. Also, because most patient records are ambulatory, improving medication safety—the single most effective strategy in reducing medical errors—involves a clear grasp of the patient's outpatient medication and treatment history, she adds.

Other forces drawing attention to the ambulatory EMR: the need to improve patient service to stay competitive; the increasing role of hospitalists, who require a detailed knowledge of the patient's outpatient history; and the primary care physician's need for access to integrated patient information.

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The growth in use of CDRs has also intensified the focus on ambulatory records because doctors entering medication orders need to know if other orders are pending, or if there are any contraindications or potential adverse reactions with other drugs. "The CDR is a key tool because many pieces of this information exist in electronic form," says Drazen.

One data element at a time, please

Other applications such as CPOE and software for retrospective analysis also require a robust ambulatory EMR. Plus, says Drazen, more EMR vendors are integrating the inpatient and outpatient spheres in their products. For example, Epic, which has traditionally offered one of the most robust clinical systems for large physician group practices, has recently moved into the inpatient market as well.

Similarly, Cerner, traditionally viewed as an inpatient solution, has moved into the ambulatory arena with an integrated product. Eclipsys, IDX, SMS, McKessonHBOC and Meditech have all realized the need to weave together the ambulatory record with the inpatient one and are in various stages of integration.

"True integration asks two critical questions. Does the data element exist only once? Is it accessible across the continuum of care? Any time I have to copy or think, that's an obstacle to integration," asserts Drazen.

In many care-delivery organizations, however, patient safety and disease management are driving adoption of small hardware solutions, including handheld prescribing devices and dedicated disease-management systems that require lots of data input. "These are fairly simple tools that are not long-term solutions. They only solve limited needs," says Drazen, adding, "The long-term solution is not 12 different devices. However, the good news is that some of these technologies actually work as standalone solutions and will push organizations toward comprehensive strategies. The integrated solution will be easier to use."

Perhaps the most important factor driving the move toward the EMR is the empowered patient. "If we don't make these systems available to physicians, the patient is going to know more than the doctor," says Drazen. There's a burgeoning demand from consumers for electronic capability to schedule appointments and to retrieve test results. Consumers want extensive personal medical records that they can maintain themselves, she says.

Marketing advantage

"Results online are going to become extremely common. It's easy for anyone to do with computerization. A hospital that can provide such online information will have a huge marketing advantage. It cuts down on all those calls to doctors," Drazen says.

Another benefit people want is to be able to request prescription refills online, which means that their current medical histories need to be computerized in order to avoid overdoses or adverse reactions. Personal medical records can meet most people's needs by providing online access to their physician-visit history, medication profile and laboratory results.

As if those factors weren't enough to drive providers into the ambulatory EMR camp, the Leapfrog group's next initiative in the area of patient safety and quality is expected to focus on the area of ambulatory medication. While outpatient medication errors likely aren't as

noticeable as inpatient ones, current research is discovering that they may be more widespread, says Drazen.

Conclusion

Despite the ongoing resolution of technical, process-related and cultural issues, the EMR remains an expensive and daunting undertaking for most healthcare delivery systems. Clearly, Intermountain and Park Nicollet are leaders in the field—and even they find it difficult to nail down ROI for the EMR. A less expensive alternative such as a text-only computer-based patient record (CPR), which lacks the searchable and codified data of the EMR, according to Information Edge advisory-panel member Ward Keever, may provide a stop-gap measure. Still, the pressures to reduce medical errors and improve quality have made having the goal of an EMR the price of doing business for most integrated delivery systems.

Kevin Wardell, also an Information Edge advisory-panel member, notes that both Intermountain and Park Nicollet have integrated physicians well into their respective organizations. "I continue to believe that, in most environments, EMRs won't make progress until either (1) the case for clinical improvements becomes compelling and documented, or (2) physician productivity—their own time—is improved using EMRs instead of being decreased, as is too often the case today," he says.

See you in 10 years.