

Computerized Physician Order Entry: How to Make It Work

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Published by:

Inside Information Group, Ltd.

3600 S. Harbor Blvd., Suite 220, Oxnard CA 93035
(800) 294-6032, (805) 984-8500, Fax (805) 984-8504.

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This report was written by William Donovan, publisher of Inside Healthcare Computing, based on his own research, research by Suzanne Corrales, editor of the biweekly hospital information systems newsletter, Inside Healthcare Computing, research by Rachel Ross, an independent researcher for Inside Healthcare Computing, and public presentations of others; those outside sources of information are cited in each case.

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A study by the staff of Inside Healthcare Computing

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Introduction

A. Why CPOE Now, After All These Years?

"What is your CPOE strategy?" Over several months of posing this question to hospital information technology executives, we have yet to run into one who did not have at least the beginnings of a plan. In recent meetings we have attended, the Healthcare Information and Management Systems Society summer meeting in Las Vegas in June 2002, heavily focused on computerized physician order entry (CPOE), and the Association of Medical Directors of Information Systems meeting in Ojai, Calif., in July 2002, focused almost entirely focused on CPOE.

Physicians are acutely aware of CPOE, and are deeply divided in their views. While researching this study and writing the report, we've asked virtually every physician we've encountered in both our business and personal settings what they thought of CPOE. A clinical professor we visited at UCLA said she'd be thrilled to have a CPOE system, citing ease in entering complex orders and having them available and universally understood. On the other hand, a highly respected community-based specialist expressed the view that CPOE is a management tool to control physicians' decisions (a topic discussed in this report). Also, as reported in *Inside Healthcare Computing (IHC, 10/28/02)*, we ran into a physician who seems to dislike computers so much that he refused to accept one of the authors of this report as a patient because the only available formats for the relevant diagnostic images were digital—as a CD or as files on the computer hard drive of a diagnostic center 50+ miles away from his office. This M.D. demanded "the" film (of which there is one) or no visit.

In October 2002, Sheldon I. Dorenfest & Associates, which surveys hospitals, said that in interviews of the first 441 interviewed for the 2002 survey, patient safety and CPOE initiatives are "motivating large growth in plans to purchase new clinical systems." Regarding CPOE systems, Dorenfest says these first surveys show:

	Number of IHDSs	% of 441
Considering Acquisition of CPOE System	164	37.19%
Reviewing New Clinical Systems But Uncertain of Features	56	12.70%
Not Sure Yet Of How IT Systems Will Play Into Patient Safety Program	221	50.11%
Total IHDSs interviewed	441	100.00%

Dorenfest says that purchases of certain other new clinical software systems are "skyrocketing," especially in PACS, surgery, radiology, emergency room, pharmacy, and document imaging. (Sheldon I. Dorenfest & Associates, Ltd., 515 N. State St., Suite 1801, Chicago, IL 60610, (312) 464-3002.)

Why did this focus on--and possibly rush to implement -- computerized physician order entry (CPOE) come about? After all, physician order entry has been around since El Camino Hospital went live with the Technicon system in 1971 with physician order entry for pharmacy orders, and has been in wide use in major teaching hospitals for well over a decade.

An often-cited reason is that the heat has been on to reduce medical errors since November 1999, when the Institute of Medicine released what is widely perceived to have been a landmark report,

To Err is Human. This report codified what has been increasingly obvious to perceptive patients for a decade or more -- that there are too many medical errors despite the dedication of care professionals. While the report calls for a "systems approach" to reducing medical errors, we believe its facts lend themselves equally in support of our view that the more fundamental issue is this: as the financing of health care has deteriorated since the late 1980s, so has the quality.

However, regardless of whether a systems approach, or reversing the slow fiscal starvation of caregivers, is the more fundamental response, the release of the report was extremely timely.

Soon after the IOM spoke up, an organization called the Leapfrog Group was funded by the Business Roundtable, a trade association of leading industrialists. Leapfrog leapt to, and has acted on conclusions including these--

- (1) medical costs can be significantly reduced by reducing medical errors; and
- (2) CPOE is a central, valid tool to reduce medical errors.

Leapfrog began economically pressuring health care providers in 2001 to implement CPOE. Its method was to seek to steer patients covered by its sponsor industrialists to hospitals with information systems which provide CPOE with clinical alerts to physicians.

We believe that there is ample reason to be skeptical that Leapfrog's core goal is to improve care -- if, for no other reason, than the fact of who is paying for it to speak up. The Business Roundtable, as far as we can tell, has never left the forefront of those entities which, in the political arena, wage constant war against corporate spending on health care benefits for employees. We believe that--

1. Leapfrog's focus on medical errors is, quite validly, a focus on reducing the high costs resulting from medical errors; but that--
2. A likely greater interest of Leapfrog's sponsors in CPOE is as a management tool to clamp down on physicians' consumption of hospital resources covered by health insurance; and that
3. There is good reason for provider organizations to embrace this motive -- to make care more effective and also to head off its potential for abuse.

For more on this view, see the "Our Observations" section at the end of this report. However, regardless of its motivations, Leapfrog has emerged as a highly visible, and therefore important, source of pressure to implement CPOE.

However, many CIOs tell us they are implementing CPOE primarily because good patient care is their organizations' mission, and they simply cannot tolerate the notion of inflicting avoidable harm. User reports gathered for this study strongly support the view that the reduction of medical errors and faster treatment turnaround (and thereby, less avoidable harm to patients) are both motivating factors, and indeed likely, if you implement CPOE well.

Some CIOs also see CPOE as a cost of staying in business. If you don't implement CPOE now or in the near future, you won't have to worry about finding funds for that new building, because you won't have any patients to put in it, said Ken Clarke, CIO at Central Maine Medical Center, which is in the selection process. "Who," he asks, "wants to go to a hospital that is unsafe?"

Another cited reason: in 5-10 years, hospitals will be bursting at the seams even more so than they are today, said Greg Walton, CIO for Carilion Health System. Hospitals that do well financially will make a priority out of shortening lengths of stay. A way to reduce lengths of stay is making treatment and information available to the patient as soon as possible. A well-functioning CPOE system helps meet that goal, he believes.

However, building the perfect system is, in the words of First Consulting Group's medical errors guru David Classen, M.D., "a very high-risk, difficult initiative." You need deeply committed top executives, and close synchronization between your top clinical leadership and your top executive

leadership. You need to go to great pains to engineer your software for flexibility, so that if, during the course of implementation, you realize that the net effect of your efforts is to dump heaps of new work on someone, you can apply a just-in-time corrective measure, so you don't suddenly have a revolution on your hands. You need to decide up front how you will measure success, so that down the road when the going gets tough, as it surely will, you will have a way to convince your clinical staff to continue.

Moreover, Dr. Classen and others note, making the process of care faster and more "efficient," like a computer-managed industrial production line, can be a direct pathway to worse, not better, outcomes. See "Many Hospital Pharmacies Shut Off Patient Safety Software Alerts" below, and the "Our Observations" discussion at the end of this study, for additional views on this topic.

B. Questions And Issues Addressed In This Report

This study has revealed to us that while institutions have succeeded at CPOE have taken varied paths to successful CPOE implementations, most have done a great many things similarly, and all have had to find ways to surmount the same hurdles.

A small portion of this report focuses on the "why" of CPOE. To a degree, your course of action will vary depending on whether or not you're planning to use CPOE to influence or control resource consumption decisions by physicians in situations in which such decisions are not, strictly speaking, questions of erroneous or correct medical practice, but of resource consumption. As we have said, we believe that addressing resource consumption is the hidden agenda behind some CPOE advocacy. It is also a significantly more ambitious undertaking than that of reducing errors. If you take it on, it will put CPOE implementation smack in the middle of major governance issues, and political issues both internal to your organization and national in scope.

However, in at least the early going, judging from what implementers have told us for this report, your course of action (that is, successfully getting CPOE working and stable without a physician or nursing rebellion) will be largely the same regardless of how far you intend to eventually push the potential of a CPOE system.

Most of the content of this report deals with this early-going "how-to," and the "how to avoid our mistakes" commentaries of organizations which needed to make mid-course corrections in their CPOE implementations. These are the issues and questions this study seeks to address:

- The real costs of CPOE above and beyond software, hardware, and implementation.
- How many order entry devices you will really need.
- Who should be on the CPOE physician advisory team.
- Challenges and hidden costs of CPOE in best-of-breed information systems
- Why CPOE may be easier to implement at a rural hospital.
- User self-assessments of what they did right
- What went wrong at some sites, emphasizing avoiding troubles they encountered.
- Implementers' views on why and how they succeeded, and benefits derived.
- How much physician order entry is done on wireless devices.
- Whether care providers are using departmental and individual order sets.
- How and how widely "live" on-line decision support is used.
- How many FTEs and which job skills are needed to implement a CPOE system.
- What early implementers would do differently if they were to do it again.
- The greatest benefits and payoffs of CPOE systems.
- How much training you should expect to do.
- Convincing physicians of benefits to them.
- Why CPOE screens will need to vary for some departments.

- Whether CPOE systems really pay for themselves.
- Clinical decision support: why careful management is needed.

Closing Notes:

(1) This report steers clear of evaluating or specifically comparing vendors. Some of the comments herein may be useful to you in drawing conclusions about individual vendors and systems, but this is not intended to be a vendor-to-vendor comparison of capabilities. Most of those interviewed for this report are early adopters. Thus, they both had to discover and deal with unforeseen new-system problems, and had the benefit of extra vendor attention. Neither a glowing report nor report of trouble should be assumed to be a likely universal experience with that particular system.

(2) This report is written without footnotes. We are journalists, not academicians. We write in news style, in which most of the time, the attribution is contained within the paragraph in which a source is quoted. We believe that this makes for easier, less distracting reading.

II. Overview: Key Lessons Learned On Implementing CPOE

This overview quickly summarizes some of the broad lessons your colleagues have drawn from their implementations of computerized physician order entry:

1. Be prepared to have to tailor CPOE screens and work flow to some departments' special needs or face system rejection in those departments.

A key crossroad: when you witness physician resistance, it may well be just resistance to change by physicians who are accustomed to doing things their own way. However, a highly likely alternative possibility is that the CPOE system, as designed or implemented, truly interferes with the ability of physicians to get their jobs done.

Asif Ahmad, CIO at Ohio State University Medical Center, winner of the 2001 Davies Award for outstanding computer-based patient record implementation, goes so far as to say that more frequently than not, when a CPOE implementation runs into trouble, "It is the CIO [who] is the problem." Most CIOs don't understand clinical process well enough to design a workable implementation. (For more information, see the Ohio State Case Study below.)

2. Take care in selecting a physician advisory committee.

a. Ahmad suggests including ancillary department physicians, not just surgeons and internists. You need physicians who think analytically and understand workflow, not necessarily MDs who are technically proficient with a computer.

b. Gary Strong of Fairview Health Services in Minneapolis, Minn., has recruited early users by specialty area, focusing those specialties which, by their nature, have the greatest potential for disastrous medical errors.

c. Holland, Mich., Community Hospital recruited physicians who are closely aligned with hospital management to test the system. They are likeliest to speak directly about what they think of the system, and to be forgiving if does not work perfectly right out of the box.

d. Meditech's Hoda Sayed-Friel recommends including a champion, a pessimist, and a devil's advocate, because that way, all physicians on your staff will feel represented. The IT department may find it easiest to communicate with physicians who are in roles of administrative leadership. They are likeliest to be willing to tell you if your system stinks, and you may find it easiest to tell them if their expectations are unrealistic.

e. Bill Van Dornik, director of information systems at Holland Community, used physician administrators to beta-test the first version of new QuadraMed CPOE software. They didn't like it, and they told him so, without walking away from the project.

f. However, if your committee is comprised only of physicians who are in positions of administrative leadership, you could be in trouble, because rank-and-file physicians do not necessarily respect administrative leaders. Similarly, you want to send your top clinicians on site visits, said Bart Lally, an MD with El Camino Hospital, Mountain View, Calif., which was shopping for a system to replace its 31-year-old TDS (now Eclipsys) installation as this section was being written. "They are your real users." And if they resist? Tell them that if they don't like the change, this is their chance to be part of the process.

3. Clinical alerts should not be too weak, but should not be too intrusive.

Plan on testing them with caregivers to achieve a balance.

Ohio State has implemented the Siemens Healthcare Dashboard, which fires alerts for abnormal results. The OSU implementation "triages" the alerts, so the MD can tell when an out-

of-range result or other event is truly urgent.

(Also see "A Cautionary Tale: Pharmacy Alerts Shut Off.")

4. Honestly assess your organization's readiness for CPOE.

Here's a yardstick: look at your organization's track record for medical chart completion. Look at your rules, and look at what actually occurs. The greater the gulf between the two, the harder time you will have enforcing CPOE. (This comment came from an audience member at a seminar. We suspect that he was onto something, because he drew wide applause from a mostly physician audience.)

The group of physicians staffing the emergency room at Mount Carmel St. Ann's, Columbus, Ohio, picked up physician order entry on the A4 HealthMatics system easily, said Frank Orth, DO, group president. All 19 ED docs enter their own orders, along with 8-10 physician assistants. Training was fairly easy. Today, physician order entry is the single most popular application among St. Ann's ER physicians. One reason is that an interest in using cutting-edge technology to improve patient care is within the group's culture. But getting your average hospital's general medical staff on board with CPOE? He thinks that would be a much greater challenge. (See more details below in our Mount Carmel Case Study below.)

5. Rapid response to physicians' problems is a key to success.

A corollary is:

6. Build on what you already have--and especially what you understand well and can adjust in house.

If you have a long relationship with a vendor, consider sticking with it. Most implementers say that the success of a CPOE implementation is one-quarter the system you choose, and three-quarters the way you implement it. To the extent that you already know the vendor and the system, you may be way ahead of the game. See, for example, the Case Studies below of Lehigh Valley Hospital and Health Network, Allentown, Pa., and St. Francis Care, Hartford, Conn.

Your vendors will not be able to make major system modifications as rapidly as your medical staff wants. Therefore, you will be much better off if your information technology department can make some changes in house and promise quick turnaround. For example, perhaps partly because of its extensive experience with IDX LastWord, Lehigh Valley Hospital and Health Network's IT department is able to respond rapidly and effectively to physician requests.

7. Integrated systems are probably your best bet.

Many organizations which have CPOE manually re-enter their orders into their pharmacy information systems, said William Bria, M.D., an Assistant Professor of Medicine at the University of Michigan School of Medicine in Ann Arbor, and a longtime leader in medical informatics. That is inefficient, less safe, and obviously best avoided.

David Classen, M.D., of First Consulting Group offers another reason to avoid non-integrated systems: they lack integrated decision support. Bruce Elkington, CIO at Overlake Hospital Medical Center, Bellevue, Wash., adds: maintaining interfaces is difficult and expensive, and many organizations will install Meditech CPOE for the simple reason that "it's installable."

8. Be sure that sure you have enough data entry devices.

Physicians are angered if they want to make rounds, and can't place orders because there's a line at the terminal. Remote access, allowing physicians to place orders from out of the ward and even from out of the hospital, is a big plus. However, there is no hard-and-fast figure on how many terminals make an ideal number; see the discussion of the numbers in case studies and in the survey response section.

9. Wireless data entry is widely used, but far from universal; PDAs are not a device of choice for wireless CPOE.

Most of the wireless devices used are PCs or laptops on carts which are moved through hallways. Physicians widely use personal digital assistants (PDAs), but the use of PDAs for CPOE is virtually nonexistent, probably because as devices, they're too simplistic for complex order sets. Microsoft's Table PC software and the various hardware packages that go with it are getting some attention from a couple of CPOE vendors, however.

10. Get the strong commitment of executive and clinical leadership.

Be sure there is a single, shared vision for CPOE. We would add: share your vision with the troops--your clinical users, from physicians and nurses to departmental allied professionals--and listen to what they have to say about it.

11. There is more than one way to win physician support.

Some institutions, with the power do to so, don't win it--they force CPOE on physicians. See the section below, "Six Views on Winning Physician Acceptance of CPOE" below.

12. Return on investment: hard, replicable data is lacking; big savings are quite possible but present political and governance challenges.

Much of the discussion of benefits to date has to do with reduction of errors due to legibility of orders, error reduction due to decision-support in medication ordering, and improved time turnarounds to treatment. It is our view that these improvements, while clear-cut and useful, will eventually be seen as among the relatively routine functions of clinical systems with CPOE.

CPOE does offer a clear and unambiguous pathway to significant hard-dollar savings. The chief benefit of CPOE may well not be in reducing errors and speeding turnaround of treatment, but as a management tool to standardize and limit resource consumption by physicians. However, a key question looms: to what degree does your organization's management have the clout with physicians to take this path? A second question: who will ultimately control the decision-making process over resource-consumption –

- the administrative management of the caregiver organization?
- individual physicians?
- the medical management of the caregiver organization?
- or the payer?

More information: See the "Return on Investment" subsection immediately below. See also the benefits discussed by some early users in Case Studies and in the survey responses in Section IV, and especially the Vanderbilt responses at the end of that section. See the "Our Observations" section for our discussion of the political, governance, and resource-control issues.

Return On Investment From CPOE: Anecdotal Information Is Real, But \$\$ Data Is Soft

Big Possible Savings: Provider Management CAN Use CPOE To Change Physicians' Resource Use

Most of the information we have seen to date on cost savings directly attributable to CPOE is either soft on numbers or anecdotal. Some savings are based on a single-department system with more limited costs; some stated savings are for single applications which comprise only part of the overall CPOE or clinical system package. In many cases, improvements in turnaround time on care and reduction in errors can be documented, but no one has enumerated the savings.

Some savings and returns on investment from CPOE systems discussed in this report are:

1. Several survey respondents report payoffs and benefits in both the aggregated survey responses and in the Vanderbilt survey response in the Survey section below.
2. See the Mount Carmel St. Ann's case study for some details on savings. Officials there have estimated that direct savings will pay for their Emergency Department CPOE system in two years. The savings listed seem to be quite concrete and measurable. Note, however, that this is a single-department system.
3. Gary Strong, CIO of nine-hospital Fairview Health Services in Minneapolis, Minn., has said that Fairview expects a return of 27% per year on its \$27 million investment in a clinical system with CPOE. (We did not obtain details for this report.)
4. A rare event to date—time saved in entering orders: at Lehigh Valley Hospital and Health Network, Allentown, Pa., IDX LastWord, seems to work well. The word in "hallway conversations," according to Allentown's Physician Liaison Don Levick, M.D., a pediatrician, is that proficient physicians can enter orders in LastWord in slightly less time than it takes to hand-write orders.

This seems to be significantly better than what users are reporting from other CPOE systems, so it is a valid question to ask: Is this really likely to be replicated by other LastWord users? We will ask IDX for other sites that might be having a similar experience; we hope to provide an update in a future edition of this report and in an issue of Inside Healthcare Computing.

5. Ken Clarke, CIO at Central Maine Medical Center, predicts that his organization will see these three kinds of cost savings:

- a reduction in adverse drug events;
- a reduction in drug costs; and
- a reduction in losses from payer audits.

Here is his logic:

- An adverse drug event costs \$2,000-\$4,700 (depending on which study you believe).

Other studies suggest the number of adverse drug events an organization is likely have in the absence of CPOE. A rate of five hundred adverse drug events per 25,000 cases is a pretty solid ballpark estimate of the number, he said. It is a reasonable assumption that CPOE will reduce adverse drug events.

● He notes that studies at Partners Healthcare have shown that physicians will choose the less costly alternative if presented with equally beneficial drugs. Central Maine plans to seize the opportunity to capture these savings by inviting physicians from Partners Healthcare to come

to Maine and discuss how they approached medication substitution.

- You should boost insurance pay-up rates because the system will capture documentation on orders.

Mr. Clarke does not anticipate savings in FTEs, although he does expect to free up nurses to spend more time on patient care.

III. Case Studies

These 14 Case Studies of individual implementations are largely based on interviews which Inside Healthcare Computing conducted in 2002. For these Case Studies, all of those interviewed were some identical basic questions. However, a core purpose was to let interviewees discuss what they, not we, deemed significant. As a result, the Case Studies are wide-ranging, do not offer a common data set or answers to all the same questions, and follow no specific presentation template.

We sought to augment these Case Studies with a more formal survey asking exactly the same questions on 15 CPOE topics. The survey respondents were offered anonymity, and were allowed to respond in writing as well as in voice surveying, conducted by researcher Rachel Ross. The survey section appears below the 14 Case Studies.

The Case Studies are of these institutions:

1. Ohio State University Medical Center, Columbus, Ohio (Siemens Invision)
2. Fairview Health Services, Minneapolis Minn. (Eclipsys Sunrise)
3. Holland, Mich., Community Hospital (Per-Se Patient1)
4. Cottage Health System, Santa Barbara, Calif. (Eclipsys Sunrise at center of multiple vendors)
5. University of Texas M.D. Anderson Cancer Center, Houston, Tex. (IKnowMed CPOE with Per-Se Patient1 clinical information system)
6. Lehigh Valley Hospital and Health Network, Allentown, Pa. (IDX LastWord)
7. Great Plains Regional Medical Center, North Platte, Neb. (QuadraMed Affinity)
8. Multi-Site Survey by an IS executive (various systems)
9. Mount Carmel St. Ann's, Columbus, Ohio (A4 HealthMatics)
10. St. Francis Hospital Health Care System, Hartford, Conn. (IDX CareCast)
11. Montefiore Medical Center, Bronx. N.Y. (IDX LastWord)
12. Stanford, Calif., Hospitals and Clinics versus Lehigh Valley Hospital and Health Network's experiences with CPOE screens in the same vendor's system--a comparison. (IDX LastWord)
13. Cambridge Memorial Hospital, Cambridge, Ontario, Canada (Meditech Provider Order Entry)
14. Overlake Hospital Medical Center, Bellevue, Wash. (Meditech Provider Order Entry)

Case Study 1: Implementation of Siemens CPOE Succeeded House-Wide...Except In Medical ICU, Where Initial Fixes Didn't Fully Satisfy Physicians

Ohio State University Medical Center

1375 Perry Street

Columbus OH 43210

Phone: (614) 293-8000

Size: 923 total beds

CEO or Administrator: R. Reed Fraley

Chief MIS Executive: Asif Ahmad, CIO

Medical Director: Hagop Mekhjian, M.D.

CPOE System: Siemens Invision

Sources of information: Asif Ahmad, CIO

1. Tailor CPOE screens and work flow to each department's needs.

The #1 reason that CPOE projects fail has nothing to do with shortcomings in the technology or the medical staff. According to Asif Ahmad, CIO at Ohio State University Medical Center, winner of the 2001 Davies Award for outstanding computer-based patient record implementation, **"It is the CIO that is the problem."** Most CIOs, analysts and other IT employees do not understand clinical processes well enough to design a clinically workable implementation. When problems do arise, they chalk them up to physician resistance, rather than recognizing that they have a real issue on their hands.

Mr. Ahmad cites a problem in his own implementation: the CPOE needs of the medical ICU and the surgical ICU turned out to be so different that it was necessary to take the medical ICU system down for six months and redesign the implementation (see below). If he hadn't understood the problem, "I would have had a failure." To help understand, 40% of the people in Mr. Ahmad's 170-person IT shop have clinical backgrounds. Mr. Ahmad's background is in biomedical engineering. He also has an MBA.

2. Which physicians to involve in managing an implementation.

Physician support is a different story, he said. The physicians in the project don't need to be technical at all. They must be open-minded, analytical people, who can discuss workflow and care paths in a global way. "These are often some of the best physicians." Often hospitals box themselves into a corner with physician teams that are not sufficiently broadly based. "Too many surgeons and internists, not enough ancillaries," he said. OSU went live March, 2000 on a pilot in the transplant unit. It went live in all units in a "big bang" in May, 2000. The beauty of a so-called "big bang" is that it saves the cost of running double systems and the adoption rate is higher because, from a physician point of view, there is no switching between systems.

Implementation was preceded by two years of awareness training. Mr. Ahmad estimates that he personally participated at least monthly. Physician training was mandatory for the medical staff, and was a condition of medical center privileges.

Mr. Ahmad discounts the lore suggesting that CPOE implementation is relatively easy for academic medical centers because they have more power over their staffs than community hospitals. OSU's largest-volume service by DRG, women and infant care, is wholly dependent

on community Ob/Gyns, he said.

3. Clinical alerts: should you? How and how many?

OSU's system is Siemens character-based Invision. As an older system, it is more stable than some newer-generation products. However, it is also based on a financial system, which makes it less flexible, he said. OSU has implemented the Siemens Healthcare Dashboard, which fires alerts for abnormal results. The OSU implementation "triages" the alerts, so a physician can tell when an out-of-range result or other event is truly urgent.

As the recipient of last year's award, Mr. Ahmad sat on this year's Davies award committee. His opinion: so far, there aren't yet any new systems that fill the bill. "I don't see huge success stories out there," he said. "I see huge promise."

4. Medical ICU -- the exception to a successful house-wide implementation.

Buried in all of the well-publicized successes of the Ohio State University Hospital's implementation of Siemens Invision CPOE was one significant initial failure: the medical ICU.

The system went up house-wide in June 2000, following pilot testing on a transplant unit. It came down in the medical ICU one month later, after medical staff complained that it interfered with patient care so badly that it was creating a potentially dangerous situation.

This is the system that worked well enough to earn OSU a Nicholas E. Davies award, the most prestigious award in healthcare information technology. How could something work so well elsewhere throughout a 586-bed hospital, and fail so miserably in a 37-bed ICU?

Inadequate training was one problem, said Steve Hoffman, M.D., a pulmonologist who prefaces every conversation on this topic by noting that he does not consider himself computer-smart (but who was obviously up to his neck in this project). Insufficient hardware was another.

However, the biggest problem was one that many organizations could slam into: the workflow in University Hospital's medical ICU was fundamentally different from the workflow in most other inpatient areas. In most areas of the hospital, physicians evaluate one patient, then sit down and enter as many as 10-12 orders for that patient, then go on to the next patient. However, in University Hospital's MICU, care is far more random, and is more likely to be based on multiple, disjointed orders, rather than order sets given together.

Patient care was being delayed because it was taking too long to get orders into the system. Dr. Hoffman and others hoped that administration would relent, and decide that they did not have to use the system after all. Instead, they were given six months and considerable support from the information technology department to fix the problems.

Here are some steps that helped:

- They created order "pick lists." For example, a physician can choose "antibiotics with renal failure" and call up a list of appropriate orders.
- They created protocols. Rather than write a large series of orders, a physician now writes a single order to place a patient on a protocol—for example, a ventilator-weaning protocol.
- They created a direct route to patient orders of a particular type. Physicians can now call up a patient in the system, see all current ventilator orders, and modify them.

The re-implementation came off on schedule and with minimal difficulties, he said. Vastly more data entry hardware was crammed into the ICU, and 24 nurses were trained as "super-users," compared with the three who had been trained six months earlier.

However, even these fixes did not completely solve the problem of time-consuming order entry, he said. Residents and interns were still hand-writing orders, and then transcribing

them into the system as of mid-2002. They still spent more time with the computer, and less with the patient.

Second problem: changing orders with transfers in or out of the ICU

A second significant problem was found: transfers in and out of the ICU were not handled well within the system. Treatments change when a patient transfers from one unit to another. That means that some nursing orders become inappropriate or irrelevant because the patient's physical surroundings have changed or because the medical interventions they support have been changed or stopped.

On a paper-based system, the orders are taken off the clipboard, and that's the end of that. However, in an electronic system, open orders go into a queue and sit there until someone cancels them. The system does include commands for canceling orders upon transfer, but the sequence of steps was complex, and in the early days, interns and residents rarely got it right. As a result, nursing was beset with open orders that did not make sense and could not be carried out. **That problem was still not entirely solved as of mid-2002, he said.**

His attitude toward the system is best described as lukewarm. He said he does believe that CPOE can work in a medically complex environment, such as an ICU. There is even some evidence that it speeds up patient treatment in the ICU:

- Turnaround time on radiology orders appears to have been cut from about 7.5 hours to about 4.5 hours. (That figure is based on a comparison of the electronic system with a retrospective review of only about 20-25 paper charts on which the time the order was noted, but even the small sample size may point to a valid conclusion.)

- Turnaround time on lab orders was reduced from a 31-minute wait from time of order to time of draw, to 24 minutes elapsed. That number is based on a comparison of 683 handwritten lab orders generated by the medical ICU after the system was taken down in the Medical ICU, and 1,100 electronic orders generated in the same time period by the Surgical ICU, which had kept it running.

- Turnaround time on medication orders was reduced from five hours to two hours, based on a comparison of 46 paper records from prior to the implementation and 70 after. (NOTE: this study was conducted on the transplant unit by the nurse who championed the project.)

These studies were not done to prove the system's value, but to attempt to dispel provider concerns that it was slowing treatment down, he said. He also said he can tell empirically that turnaround times on X-ray and echocardiograms is vastly improved under the new system. However, "We have no idea why." As to improvements on laboratory and medication order turnaround times, he was guarded, saying only, "We clearly confirmed" that "things did not slow down."

"I think we can say for sure that the system did not add to the time," he concludes. If there was an improvement, it came "with a good deal of angst."

Case Study 2: CIO of 9-Hospital Chain Expects Alert Capability To Make CPOE Attractive To Community Physicians

Fairview Health Services
2450 Riverside Avenue
Minneapolis MN 55454
(612) 672-6300

Size: eight hospitals

CEO or Administrator: David Page

Chief MIS Executive: Gary Strong, CIO

CPOE System: Eclipsys Sunrise

Sources of information: Gary Strong, CIO, (612) 627-6339

Gary Strong, who was CIO of nine-hospital Fairview Hospital & Healthcare Services in Minneapolis, Minn., at the time of this report, said he was leery of turning on physician order entry for 1,700-bed Fairview-University Medical Center, because he believes that he knows what is coming: a thousand residents will want full use of every speck of functionality that Eclipsys' Sunrise Physician Order entry offers, and want it now. "These people are computer-literate," he said. Also, they are accustomed to the bugs, annoyances, and freezes of the Windows operating system. For them, "We have to be so ready."

At Fairview's community hospitals, he said he expected a different response. Community physicians tend to have a greater depth of medical knowledge than hospital interns, and they tend to be less tolerant of the headaches computer system dish out. They will have to expect to spend two minutes electronically entering orders that might take one minute to hand-write, Mr. Strong said. That presents a bigger challenge.

But their appetites were whetted by an interesting source. Fairview also operates a large ambulatory care practice, which is rolling out Epic Systems' EMR. Physicians who have used Epic on the outpatient side are likely to be more receptive to Sunrise on the inpatient side because they are already familiar with the benefits of an order entry system.

Mr. Strong gave sales pitches for the system at numerous physician gatherings. He figures he's made at least 100 presentations and recruited a core group of 125 early adopters. He pitches CPOE on two grounds:

- that it will make patients safer; and
- that it will make care more efficient.

We didn't ask, but presumably, he means more efficient for the physician.

He has recruited early users by specialty area, focusing those specialties which, by their nature, have the greatest potential for disastrous medical errors.

The early adopters are "anxious to get on," he said. They seem to agree that the extra time they will spend on order entry will be compensated in the long run. "But we haven't hit the masses yet. That's where the walls will go up."

He mentions two factors that will help tear the walls down:

- First, and foremost, is the systems' ability to generate on-line alerts. For example, Fairview expects to set up its Eclipsys system to alert physicians if a piece of equipment a test order requires is out of order.

- Second, Fairview is rolling out first by giving physicians access to electronic results, then taking away paper results. Forcing physicians to look up results on line may help encourage them to enter orders electronically.

The estimated cost of the project is \$27 million, including hardware, software, installation, and training across four organizations. The anticipated return on that investment is 27% per year. "We are talking about very direct savings," he said.

Mr. Strong, by the way, moved on from the CIO job after the interview for this report. In a rare move up for a CIO, he became President of one of the hospitals in the group, Fairview Southview.

Case Study 3: A Pilot-Site Approach: IT Department Takes A Neutral Position , Lets Physicians Decide

Holland Community Hospital

602 Michigan Avenue

Holland, Mich 49423

(616) 392-5141

Size: 230 beds

CEO or Administrator: Judith Newham

Chief MIS Executive: Chuck Kohlruss, CIO

Chief of Staff: Roger Phillips, M.D.

CPOE System: Per-Se Patient1 Computer-based Patient Record System

Sources of information: Bill Van Doornik, MIS Director, (616) 394-3449

If CPOE were generally faster than handwritten orders, implementing it at 230-bed Holland Community Hospital, Holland, Mich., might be a no-brainer. But MIS Director Bill Van Doornik has concluded that it will take physicians an extra 30 minutes per day to enter their orders electronically through the Per-Se physician order entry system--or, for that matter, any electronic order entry system. And, unlike teaching hospitals, Holland cannot compel physicians to do much of anything. "I don't have the tools to ram this down anybody's throat," Mr. Van Doornik said.

With one failed beta project under its belt, Holland's IT staff is avoiding coming out a "loser" if its medical staff ultimately rejects the system by taking a fairly neutral position on whether it should be adopted. IT will provide "the best system we can," he said. Whether or not it is rolled out will be entirely up to the discretion of executive management and the medical staff. "Hopefully, that is an empowering message," he said.

In a departure from the philosophy followed by many organizations, Holland deliberately recruited physicians who are closely aligned with hospital management to test the system. They are likeliest to speak directly about what they think of the system, and to be forgiving if does not work perfectly right out of the box, Mr. Van Doornik said.

Designing Screen Flows to Meet Physician Needs: Branching Structure for Order Sets

So far, the approach seems to be working. Holland Community beta-tested an earlier version of the Per-Se physician order entry system, found the screen flow cumbersome, and sent it back for a rewrite, he said. Holland is working with Per-Se on a branching structure for physician order sets, so that a basic order template will customizable for multiple orders, Mr. Van Doornik said. The project is still alive and Holland plans a second beta test.

Case Study 4: Best-of-Breed Approach: How Do You Integrate Clinical Decision Support?

Cottage Health System
Pueblo at Bath Street
Santa Barbara CA 93105
(805) 682-7111

Size: 3 hospitals. Flagship: Cottage Hospital, 445 beds

CEO or Administrator: Ronald C. Werft, CEO

Chief MIS Executive: Alberto Kywi, CIO

Medical Director: Robert A. Reid, M.D.

CPOE System: Mixed, with Eclipsys Sunrise Clinical Manager (SCM) as the core CPOE, interfacing with IDX radiology, McKesson pharmacy, Misys laboratory, and others.

Sources of information: David Classen, M.D., Vice President, First Consulting Group; Alberto Kywi, CIO, Cottage Hospital.

When a best-of-breed shop implements computerized physician order entry with on-line decision support, how does it integrate clinical decision support?

For example, suppose that the physician enters an order, deals with a series of decision-support questions, and then passes the order to the pharmacist on line. Using an entirely different system, the pharmacist is confronted with a different series of decision-support questions, and presumably no history of how the physician acted on them. The pharmacist then releases the order to the nurse, who is confronted with yet a third set of decision-support questions.

This concern has been raised by, among others, David C. Classen, M.D., who discussed it in a presentation at the June, 2002 Healthcare Information and Management Systems Society (HIMSS) meeting in Las Vegas. Although orders can be integrated among disparate systems, Dr. Classen said he has not found any examples of integrated alerts, saying, "Technically, it is much more difficult."

Dr. Classen, a vice president with First Consulting Group, is a key architect of the CPOE testing protocol of the Leapfrog Group, and is an associate professor of medicine at the University of Utah, giving him both credentials and clout on CPOE. Dr. Classen implied in his HIMSS presentation, that vendors are putting significant pressure on First Consulting Group to remain silent on the issue of the difficulty of integrating clinical alerts in a best-of-breed environment. "Despite many pleas to the contrary," FCG is discussing it, he said.

We raised the question with Alberto Kywi, CIO for Santa Barbara Cottage Health System. Cottage uses IDX radiology and McKesson pharmacy, Misys laboratory, and will launch a pilot for Eclipsys Sunrise CPOE in December. His answer: Eclipsys Sunrise will become Cottage Hospital's definitive decision support system.

Mr. Kywi said that pharmacy decision support is being built into Eclipsys Sunrise 5.3, and at this writing, it was due out at the end of 2002. He believes that eventually, the functionality in Sunrise will allow Cottage to use it in place of the McKesson pharmacy system.

Cottage will also implement the McKesson robotics system, which includes the Robot-Rx distribution system, the AcuDose-Rx cabinets, and the AcuScan-Rx Dose medication administration record. The plan is for orders to flow from Sunrise to pharmacy to the robot to

AcuScan, which feeds back to Sunrise Clinical Manager.

Implementation to start in post-surgical unit

Santa Barbara Cottage Health System expects to begin piloting its Sunrise Clinical Manager with CPOE in a post-surgical unit by the end of this year.

Why post-surgery? CIO Kywi explains: SBCH surgeons like to try new things. Post-surgical patients usually don't go anywhere from the unit except home, so a patient's record will not be as fragmented between electronic and non-electronic systems as it might otherwise be. Finally, surgeons use a significant number of standing orders. From a physician's point of view, the workload tends to be lighter if he/she can reuse orders.

For Cottage, CPOE represents the next logical step in a long-term information technology plan approved by the Board of Directors in 1996. The plan, which includes 16 initiatives, was developed by Mr. Kywi the year after he became CIO. He avoided using consultants in order to build credibility with management and the board. In earlier phases, Cottage upgraded its network, replaced an outdated McKesson Series patient financial management system with Eclipsys Financial Management (formerly SDK), and installed a successful picture archiving and communications system (PACS.)

The Cottage Board is driven by a need to both improve care and cut costs. (Because it's in a California earthquake zone, the health system is faced with seismic retrofitting requirements so large that it expects to entirely rebuild its flagship hospital, Santa Barbara Cottage). The board is buoyed by the success of its other IT projects, particularly its DR Systems PACS. It has committed to fully funding the project, he said. Cottage is a teaching hospital, but most physicians are not employed by the health system.

Following the pilot, all three hospitals will go up on Sunrise results, nursing documentation, and CPOE for laboratory, medications, and radiology, he said.

Additional reasons for moving to CPOE:

- The HIPAA Data Security and Privacy rules. An order is more secure if it flows from the physician directly to the ancillary department than if it is handwritten and passes through other hands before reaching its destination.
- California law. A new law requires hospitals to adopt error reduction plans which make use of technology. CPOE is one component of the SBCH plan.
- Convenience. If the MD writes an order, he or she must turn it in to the nursing station and hope it gets entered. With Sunrise, physicians will be able to enter orders and monitor results from anywhere.
- Speed. When a handwritten order is turned in, there can be a significant delay before it is relayed to its destination. All physicians round at about the same time, and unit clerks are sometimes inundated. This can increase length of stay, and is a sore spot with physicians. If they can enter their own orders on their own timetables, the delay can be eliminated.
- Chart availability. With Sunrise, multiple users can look at the chart at the same time.

Mr. Kywi characterized Eclipsys Corp. as a firm that is "struggling" with issues of integration, of both its products and its business units. On the whole, they are succeeding, he said. "They are a very good company to work with," he said.

Additional observations by the authors: after obtaining the above information, we and our families happen to have had significant experiences with two of the CPOE hospitals in this study, Santa Barbara Cottage and Cedars-Sinai in Los Angeles, Calif., and a third hospital, Ventura County Medical Center, which, like many others, considering CPOE. (These were, obviously,

chance events; one doesn't plan injuries or illnesses.)

The Cottage PACS extends off the hospital campus. One of our Cottage-affiliated physicians, with an office a bit over a block away, expresses delight with the system; he took opportunities to show off what it can do for him. Another, with an office right in the hospital, seemed to use it less – perhaps due to a preference for film, or perhaps because the imaging department and the physicians who read them are conveniently just down the hall, affording him a greater opportunity for face-to-face consultations.

However, the PACS does seem to have helped create or enlarge the constituency of physicians who are favorably disposed to clinical information systems generally.

This decision to first provide clinical information systems with demonstrable benefits and no significant negative impact appears to be an important precursor –and may be a critical precursor – to acceptance of the burdens which physicians associate with CPOE. As this study and widespread news reports have demonstrated, the initial implementation of CPOE at Cedars-Sinai was not handled in the same manner, with less satisfactory results.

Case Study 5: IKnowMed Cancer Treatment Support CPOE System Being Piloted

University of Texas-M.D. Anderson Cancer Center
1515 Holcombe Boulevard
Houston TX 77030
(713) 792-2121

Size: 518 total beds

CEO or Administrator: John Mendelsohn, M.D.

Chief MIS Executive: Richard Pollock, CIO

Medical Director: David Calendar, M.D.

CPOE System: IKnowMed and Per-Se

Sources of information: Richard Pollock, CIO

M.D. Anderson Cancer Center, Houston, Tex., went live in the fall of 2002 on a pilot of IKnowMed EMR, a new product designed to support cancer treatment. A month into it, Anderson had a five-physician IKnowMed CPOE project at a breast clinic; nurses also use the product to document chemotherapy administration at an outpatient center.

"We're very pleased," said Richard Pollack, CIO. "It's been well-received." Anderson plans to roll IKnowMed out across its other outpatient clinics and to integrate it with its Per-Se Patient1 inpatient data repository. IKnowMed will be used for inpatient chemotherapy orders and for structured physician documentation; all other ordering will be through Per-Se, he said.

What's particularly interesting here:

In a world of tight budgets and cutthroat competition, Per-Se and IKnowMed are stepping up to the plate with a level of systems integration that many vendors cannot achieve even within their own organizations. Both vendors are rewriting code so their systems will parse each other. Instead of interfacing the EMR components on select data elements, Anderson expects to end up with a system that allows any data element to be pulled into either system, he said. The effort will be commercialized and available to other sites, he said.

M.D. Anderson was a very early Cerner Millennium site at a time when Cerner was having a hard time meeting its vision. That project failed three or four years ago (IHC, 10/12/98; 5/15/00). The staff has bounced back and is "more than ready" to get back into the EMR implementation business, Mr. Pollack said. The experience defies popular wisdom that it takes many years for organizations to recover from a failed implementation. Mr. Pollack noted that the project predates his arrival, so possibly new blood at the top was part of the solution.

Working with Per-Se, Anderson has embarked on a project to unlock some 25 years of data in generations of legacy laboratory information system databases. The project involves exporting the original data in flat files, building screens in Per-Se to reflect the original presentation, and having Per-Se map the legacy repository. Anderson will eventually replace the legacy repository with Per-Se's Patient1, an M-based (MUMPS) clinical data repository, and its Decision1 Oracle-based research database. Anderson started work in the spring of 2002 and expects to finish by late 2002 or early 2003. The pace depends on the speed of the conversion of the legacy data repository and on Anderson's decision to clean data as it goes.

Why choose Per-Se? Mr. Pollack offered three reasons. First, it runs on MUMPS, allowing it to handle large volumes of data with an efficiency and reliability other database

management systems can't match. Second, the Per-Se system is extremely flexible, which meant M.D. Anderson could replicate its legacy data presentations by creating hundreds, even thousands, of different screens in Per-Se. A less flexible system would have meant "tremendous compromises." Finally, Anderson happened to have several people who were extremely experienced in Per-Se systems on its staff.

Mr. Pollack: (713) 745-7960.

Case Study 6: Community Hospital Acclimates Physicians to CPOE With Gentle Persuasion, One-On-One Training, Customization of System Capabilities

Lehigh Valley Hospital and Health Network
c/o Lehigh Valley Hospital
Cedar Crest & I-78
Allentown PA 18102
(610) 402-8000

Size: 3 hospitals, 3 health centers; Lehigh Valley Hospital, 644 beds

CEO or Administrator: Elliott J. Sussman, M.D.

Chief MIS Executive: Harry Lukens

Medical Director: John Longenhagen, M.D.

CPOE System: IDX LastWord

Sources of information: Don Levick, M.D., Pediatrician and physician liaison

How do you persuade community-based, attending physicians to enter their own orders?

Lehigh Valley Hospital and Health Network, Allentown, Pa., set an expectation that all physicians would be trained on the new system, with the understanding that no one would be forced to use it. Unit clerks continue to be available for physicians who are unwilling to enter their own orders. However, physicians are under constant, gentle pressure to get with the program. When they do, they can count on a lot of support.

Pediatrician Don Levick, MD, physician liaison to the Lehigh Valley CPOE project, explains how this works:

Suppose you have a physician who just completed training, and it's 7 p.m., and he's writing orders. A trainer approaches him and says, "Wouldn't you like to enter them electronically?" He says, "No. I want to go home." So the trainer says, "OK – we'll do it in the morning."

So far, it is working at this 644-bed community hospital. A trauma step-down unit went live on IDX LastWord in late 2001; three medical surgical units have gone live beginning in February, 2002. As of this report, about half the physicians were entering their own orders. Of those, about 60% were entered by community-based attending physicians, 40% by residents.

Other factors that help:

- Lehigh Valley has been a LastWord site since 1993. Physicians are already accustomed to looking up results in the system. Labs and transcriptions are printed out and placed on the chart, but it is often easier to use the ubiquitous on-line record. Also, electronic results are available first. Medication administration records and vital signs are also available on line.

- Perhaps partly because of its extensive experience with LastWord, Lehigh Valley's IT department is able to respond rapidly and effectively to physician requests. For example: a physician wanted an order change for supplemental oxygen to include a titration order and the ability to choose a target level to wean the patient to. The department had the change ready within a few days. (Implementation took longer because the change had to be cleared with affected ancillary departments, and support staff and educators had to be notified, so they could communicate the change to the medical staff.)

- Medical staff leadership paved the way for the CPOE project with multiple meetings, presentations, and demonstrations. Physicians on the design team met twice per month, from 6:30-8 a.m. Coffee, muffins and bagels were always available. Free bagels and donuts were also available to nurses and physicians in the kitchen area of the unit as units went live. Project supporters received recognition at meetings.

- The project is well-staffed. Since the inception of the CPOE system in October, 2000, Dr. Levick has devoted about half of his time to it. A senior information systems manager spends most of his time on it, as do four analysts and three educators. The team provided support 24 hours/7 days for several weeks after each unit went live, as well as ongoing support.

- All training is one-on-one. It takes about two hours.

- The system itself, IDX LastWord, seems to work well. The word in "hallway conversations" is that **proficient physicians can enter orders in LastWord in slightly less time than it takes to hand-write orders.**

- Data entry is by desktop computers, wireless laptops on carts, or wireless sub-notebook computers that are carried by some physicians. Lehigh has also made LastWord available on Citrix, meaning that it can be used with a thin-client terminal.

Case Study 7: Hospitals Lacking Competitors May Find Installing CPOE Easier

Great Plains Regional Medical Center

601 West Leota Street

North Platte NB 69101

(308) 534-9310

Size: 116 beds

CEO or Administrator: Lucinda Bradley

Chief MIS Executive: Kevin Olson

Medical Director: Janet Bernard, M.D.

CPOE System: QuadraMed Affinity (CPOE development site)

Sources of information: Robert Buckland, M.D., (308) 534-5370; Kim Dyer, COO

There's "no question" that Great Plains Regional Medical Center will get good cooperation from physicians on its computerized physician order entry project, said Robert Buckland, MD. How can the physician chair of the information system committee for a 116-bed hospital in the middle of nowhere make an assertion like that?

"Middle of nowhere" may be precisely the point. Big-city physicians may feel no ties to the hospitals they practice at, and be less willing to extend themselves for the good of the organization. But the 60 or so physicians who practice in the North Platte area understand that their fates are wrapped up with the future of Great Plains Regional.

Some 20 physicians turned out for a meeting at which QuadraMed Corp., the vendor, showed a prototype of the system. Half a dozen have agreed to essentially donate the time it will take to get the prototype ready for a beta test; 12-15 are likely to participate in the six-month test.

Geography is facilitating the project in another way as well. With such a small medical community, the overwhelming majority of physicians' offices are a stone's throw from the hospital, and are already tied to it by fiber optic cables. Adding order entry and results retrieval from offices should be relatively straightforward. Viewing is through QuadraMed's browser-based results viewer, Clinician Access.

H expects the project to succeed in part because he believes that QuadraMed is poised to do things right functionally. "If you've got a good system, getting cooperation is easy," he said.

A longtime Affinity client, Great Plains is the development site for QuadraMed Affinity physician order entry. Applications are being built on the Affinity Cache database; a change to Oracle at a later date is likely, he said.

Great Plains is installing medication order entry, laboratory, and radiology, and it won't roll out until the entire system is built, said Kim Dyer, VP, operations. The reason: part of the problem with offering computers to physicians is that they are often also compelled to consult paper medical records as well. "Until we have it all electronic, they are not going to be all that interested in using it."

Great Plains is also installing Antibiotic Assistant, a decision support system from Theradoc, Salt Lake City, Utah. The system recommends appropriate antibiotics on the basis of lab values and gives underlying literature to support its recommendation. QuadraMed could be set up to provide the same decision support, but the purchase saves Great Plains the work of setting it up. Ms. Dyer said she was "leery" of licensing software "telling physicians how to do clinical practice," but found that they see it as "a great tool."

Case Study 8: Early CPOE Sites Don't Necessarily Have Electronic Pharmacy, Medication Systems In Place

Organization: several, based on literature review and survey by a HIMSS committee.

CPOE System: various.

Sources of information: Joe Miller, chairman of a HIMSS Special Interest Group for the Computer-Based Patient Record and manager of IS for Christiana Care Health System.

Few organizations had pharmacy systems working when they started CPOE projects. Also, the most common decision support rules among early CPOE sites had more to do with efficiency and data compliance than they do with prevention of adverse drug events. For example, alerts on incomplete orders, or incomplete data are fairly common.

This information comes from an early 2002 review of 10 CPOE projects that have passed the pilot stage. The results are surprising because reduction in errors, particularly medication errors, is one of the most frequently cited reason for implementing physician order entry. However, most decision support to reduce medication errors can work only if the organization also has the patient's medication available electronically.

Organizations thinking they need a full electronic medical record in place prior to implementing CPOE "may be setting the bar to high," said Joe Miller, chairman of the HIMSS special Interest Group for the Computer-Based Patient Record and manager of information services for Christiana Care Health System.

The organizations he studied were: Sarasota Memorial Hospital, Sarasota Fla.; Montefiore Medical Center, Bronx, N.Y.; Trinity Health, Farmington Hills, Mich.; Maimonides Medical Center, Brooklyn, N.Y.; Ohio State University Medical Center, Columbus, Ohio; Boston Medical Center, Boston, Mass.; Abington Memorial Hospital, Abington, Pa.; Rush Presbyterian-St. Luke's Medical Center, Chicago, Ill.; University of Illinois at Chicago Medical Center; and Alfred I. Dupont Hospital, Wilmington, Del.

Four are academic medical centers, five are teaching hospitals, and one is a community hospital. In a world in which many CPOE projects never make it past the pilot stage, this list includes some roaring success stories. All are past the pilot stage and more than half claim 100% CPOE, he said. Sarasota, the community hospital, has about 25% physician order entry. He based his conclusions on literature about the projects, and on his own discussions and surveys. Not all of his questions were answered by all organizations, he said.

Organizations implemented CPOE for a variety of reasons. Some were worried about medical errors. Others were responding to competitive pressures. Still others saw it as part of a broader re-invention effort that accompanied a merger. All their projects pre-dated Leapfrog.

Successful organizations varied in their basic approach to CPOE. Some scrapped existing systems entirely in favor of implementing totally new, integrated system. Others upgraded what they had. Boston Medical Center went straight from 100% paper-based orders to CPOE without ever having electronic orders entered by nursing or unit clerks. Abington Memorial achieved 40% CPOE, waited a while, then made a strong push for 100% compliance.

Here are other details he learned:

- Several organizations warned that the physicians who are most attracted to a CPOE project sometimes lack clinical influence. It is crucial to involve physicians who are respected

clinical leaders among their peers, he said. Leaders of successful projects "selected very carefully who was involved," he said.

- Virtually all of these organizations offer physicians order sets, which are groups of orders that can reduce the amount of time it takes the physician to enter his or her own orders. Academic institutions tend to do departmental order sets, he said. Teaching hospitals and community hospitals often allow personal order sets as well.

- Classroom training was common among early adopters. (This flies in the face of advice that says "physicians won't show up for classroom instruction.") Only one institution used one-on-one training, and one used computer-based training. Most offered around-the-clock support for two to four weeks following go-live.

- Several organizations reported that additional training sessions were necessary weeks or months after go-live. The reason: nurses were back to entering orders because physicians were demanding it.

- User access to input devices was a big concern. Many started out with one PC for every three to four beds on medical surgical units, and ended up with two beds per PC.

- Few had wireless systems when they started their projects, but most have wireless today. Wireless is a great convenience in CPOE because it allows an organization to easily expand the number of data entry units in the early stage, when users tend to be slow with their orders, he said. Later, as people speed up, the devices can be transferred to the next new unit.

- Many did studies highlighting "early wins" to their organizations. Several focused on reductions in time elapsed between the time the order is written and the time the order is filled.

- Virtually all said that top-level commitment and strong clinical leadership were essential. They "did not locate the authority for the project in information technology."

- Many found it useful to create a simple, direct vision statement of 10-20 words which summarized the goals of their electronic medical records projects. Vision motivates people to behave in ways that are not necessarily in their own interest, and it helps coordinate the actions of hundreds of individuals who are involved in a project, he said. Mr. Miller, (302) 324-3523.

Case Study 9:

Mount Carmel St. Ann's Didn't Buy Its Emergency Department CPOE System To Save Money--But Is Saving A Bundle

Emergency Physician Acceptance Is High;

However, Some Design Aspects Annoy Other Hospital Physicians

Vendor is addressing that problem

Mount Carmel East, West Health & St. Ann's

739 West State Street

Columbus OH 43222

(614) 234-5000

Size: 989 total beds, including:

St. Ann's Hospital of Columbus

500 South Cleveland Avenue

Westerville OH 43081

(614) 898-4000

Size: 175 total beds

CEO or Administrator: Joseph Calvaruso, Mount Carmel CEO; Kirk Hummer, St. Ann's Administrator

Chief MIS Executive: Cindy Sheets

Chief of Staff: Gerald Girardi, M.D.

CPOE System: A4 HealthMatics Emergency Department System

Sources of information: Frank Orth, D.O., president of the physician group which staffs the emergency room.

Mount Carmel St. Ann's of Columbus, Ohio, anticipates that it will take less than two years to pay back the cost of its A4 HealthMatics emergency department system, said Frank Orth, D.O., president of the physician group which staffs the emergency room, in an interview with the Inside Healthcare Computing staff for this report. Here are the returns on the investment:

- **Reduced transcription costs.** It formerly cost \$450,000/year to transcribe reports that originated in emergency. Now, 95% of that cost is saved because physicians document on line using Fujitsu hand-held notebooks.

- **Reduced insurance denials.** Mount Carmel set its system up to force physicians to make coding choices that carry Medicare reimbursement. Test denials, which previously cost tens of thousands of dollars per month, have dropped to zero, he said. Dr. Orth said he guesses that the savings on denied tests will at least equal the savings in transcription costs.

- **Improved charge capture.** As with reduced insurance denials, dropped charges for nursing supplies have become less common.

Here's what's so interesting: St. Ann's implemented an emergency room system as a way to gather data to support performance improvement, not to save money, said Dr. Orth, who is also physician facilitator for performance improvement for the emergency department.

A4's HealthMatics ED went live at St. Ann's in mid-2001. St. Ann's chose the system first for its reporting capabilities and second for its flexibility. "We can customize it on site without spending a lot of money," he said.

St. Ann's deployment includes all major modules: nurse triage, nursing documentation, patient tracking, physician documentation, order entry, and results reporting.

Screen design/flow issues did cause some pain

Installation was "painful" because of unpredictable issues with interface design and workflow. The only real remedy would have been a full-blown test environment, with the ability to mock up all interfacing ahead of time. That would have been prohibitively expensive, he said.

The system will benefit by some tweaking, but all modules are in production and working well, and the vendor has been remarkably good at taking suggestions from the medical staff and incorporating them into upgrades, Dr. Orth said. Allergy checking, order screening for completeness and logic, and certain changes to the way the chart is presented will be available in the future. Overall, support has been "very good," he said.

Physician acceptance within St. Ann's busy (40 beds, 65,000 annual visits) emergency department has not been a huge obstacle, principally because of the group's culture. All 19 ED physicians enter their own orders, along with 8-10 physician assistants. Physicians groups of 3-4 were trained on order entry. Getting ER physicians to attend the sessions was not terribly difficult, he said, but "I'd hate to try" to persuade a general medical staff, he said.

Physicians place lab, x-ray and pharmacy orders electronically. A year after installation, physician order entry is the most popular component of the system with emergency physicians, nurses and secretaries. The reason: orders are no longer lost or delayed before being entered in the system, and secretaries no longer track down physicians with questions about handwriting ambiguities or disallowed orders.

When a physician places a lab order, it appears immediately on the ED tracking board, where it notifies nursing that a blood draw is needed, and a label prints out of the printer. Sometimes the nurse is there with the needle before the physician has left the patient's bedside, Dr. Orth said.

It is almost impossible for structured data templates to capture the nuances of every possible patient scenario. To overcome this limitation, St. Ann's allows dictation of parts of the history and physician if the case just won't lend itself to the system. Physicians use this feature in about five percent of cases. Over-use is discouraged by the six-hour or so delay before reports are transcribed and appear back in the system.

St. Ann's also uses HealthMatics to force selection of appropriate dosages. Amounts are set by the medical staff.

One argument which helps ease acceptance of order entry: when reluctant physicians complain about becoming "clerks," Dr. Orth reminds them that they are judged by the quality of the data going in to the system, and asks whether they wouldn't prefer to be in control of it themselves.

Also, St. Ann's was able to redesign order entry screens for the 12 most common diagnoses to "be at least as fast as dictation." The system administrator, a nurse who was trained by HealthMatics but has no IT background, did the work. St. Ann's emergency department uses departmental templates, but physicians are free to develop their own.

Problem: rest of the medical staff dislikes the long reports

HealthMatics is available system-wide through Mount Carmel's browser-based front end for dictated reports and certain other patient data.

If the system is so terrific and so cost-effective, then why isn't every hospital in the country rolling it out? One factor is the resistance of other hospital physicians. They complain that ED records, which formerly comprised a page and a half of dictation, now run eight pages or more. Their resistance has been "a little messy," Dr. Orth acknowledged. A4 has helped address the problem by re-organizing the data. A true fix, putting a summary report at the top of the chart, was to become available within a couple of months after the interview for this report.

Another hurdle for non-emergency physicians is that if an emergency patient is to be admitted, and an attending physician wants to order a medication or test for that patient, the order must be entered by an ED physician or other trained system user.

Case Study 10:

One of The First CPOE Hospitals Is Retiring Old TDS (Eclipsys) System For IDX CareCast And Is Developing Clinical Pathways

St. Francis Hospital Health Care System

114 Woodland Street

Hartford CT 06105

(860) 714-4000

Size: 617 beds

CEO or Administrator: David D'Eramo, Ph.D.

Chief MIS Executive: Catherine Szenczy

Chief of Staff: Fred M. Gabrielle, Jr., M.D.

CPOE System: IDX CareCast

Sources of information: Catherine Szenczy, senior vice president and CIO

An organization which is moving to its second generation of CPOE has chosen the relatively new IDX CareCast system to replace its old Eclipsys (formerly TDS) 7000. St. Francis Care, Hartford, Conn., talked to "a lot of vendors" and "a lot of clients" before settling on IDX.

One reason for the decision was that **CareCast offered a platform and an architecture which the hospital concluded would provide fast response times and high reliability**, said Catherine Szenczy, senior vice president and CIO. CareCast, introduced in February, 2002, runs on Tandem Nonstop Himalaya, just as its predecessor, IDX LastWord, does. The old Eclipsys 7000 runs on an IBM mainframe, which is also fast and highly reliable, she said. "Several-second response times" were simply out of the question, she said. Cerner. was the other finalist.

Another reason for choosing CareCast: integration was crucial, primarily because of the importance of integrating clinical decision support with order entry.

St. Francis is serving as the development site for Care Paths, a clinical pathways system, in CareCast. The system St. Francis envisions will allow physicians to change the patient's clinical pathway and adjust the underlying order without having to leave the care path to go back into order entry, she said.

St. Francis will use Cap Gemini Ernst & Young's Rapid Design Methodology to develop the Care Paths, she said. The development plan is for the entire 150-member end-user design team to meet in three 3-day sessions to plan the entire system. At each session, they're being asked to make a new set of decisions, she said. The system will be prototyped based on these suggestions to be sure it is really what the users had in mind, she said.

The meetings, held by IDX, are spaced about six weeks apart. Cap Gemini's approach was first used by St. Francis two years ago with great success to plan its e-health strategy, she said. While getting people to a meeting for three consecutive days requires enormous planning, it is more effective and less difficult than coping with the constant interruption of a long series of meetings, she said. IDX and CGEY were to attend all sessions and provide a transcriptionist to document all decisions.

Roll-out is to three facilities: St. Francis Hospital Healthcare System, St. Francis Hospital, and the Medical Center Mount Sinai Campus.

Bristol Hospital, a 108-bed affiliate in nearby Bristol, Conn., with no history of CPOE,

will also participate in the project, replacing its McKesson Series 2000 with IDX Carecast. Bristol will go up on order communications for nursing and unit clerks with electronic resulting. The idea, Ms. Szency said, is to ease physicians into CPOE through the availability of an electronic medical record. Bristol will participate side-by-side with St. Francis in the nine days of planning meetings, but there is no firm timetable for implementing CPOE at Bristol.

St. Francis is a teaching hospital, staffed by community physicians and 100 employed physicians, who train some 200 residents. It installed the original predecessor to the EC 7000 about 30 years ago. What made for a successful CPOE program 30 years ago:

- Extremely strong top-level support. The CEO and senior management made it clear that they were fully committed to physician order entry, and that if physicians intended to admit patients to St. Francis, they would have to go along with the program.

- The first thing senior administrative support did was make sure that senior medical management wholeheartedly endorsed the project. Whether they talked to administrative management, or medical management, physicians heard exactly the same message.

- System selection involved a very large group of physician who participated in the advisory committee, the selection process, and site visits. They willingly gave time to the project because they understood that if they did not participate, they might be stuck with a system they did not like.

- The caliber of St. Francis physicians made a big difference. They are highly motivated to partake in cutting-edge technology. "That is very relevant to our success."

Case Study 11: Step-By-Step 3.5-Year Rollout, 100% CPOE at Montefiore ...Clinical Systems Director Offers Many How-To Tips

Montefiore Medical Center

111 East 210th Street

Bronx, NY 10467

(718) 920-4321

Size: 1,060 total beds

CEO or Administrator: Spencer Foreman, M.D.

Chief MIS Executive: Jack Wolf

Medical Director: Brian Currie, M.D.

CPOE System: IDX LastWord

Sources of information: Dorrie Napoleone, Director of Clinical Systems, (718) 405-4092.

(This report is based on both an in-depth interview and Ms. Napoleone's responses to our survey; most other user reports in this study are based on one or the other.)

Teaching hospital Montefiore Medical Center just finished rolling out the IDX LastWord system with CPOE to the last of its nearly 1,100 beds in the fall of 2002. The implementation, which began in March, 1999, has cost \$25 million, including hardware, software, and out-of-pocket vendor implementation fees. That amount doesn't include the substantial amount of in-house effort. The first unit was a general medical unit, chosen because there was, and still is, good physician support on that unit. It "went up and stayed up," said Dorrie Napoleone, Director of Clinical Systems.

We asked what she would have done differently. Her answer: "It took three years to roll out the system to serve 1,100 beds. I would have liked to have hired more staff so that we could have done it in two years. [But] [o]ur [core] strategy we would repeat again: unit by unit--being successful as you go."

System selection approach

Montefiore's management assembled a committee of 25 people to select a system. About half were physicians. This committee also included nursing, ancillary department staff members, and administrators. The physicians were from a diverse variety of services--surgery, pediatrics, internal medicine--who were well-respected by colleagues, and even a new graduate from a residency program who had just joined the staff. Management wanted the decision to carry weight after it was made. The entire group went on "road trips" to learn about systems. They had marching orders to look for a system that would provide high quality, reduced cost, and high physician utilization of the system.

They saw five vendor systems in action: IDX LastWord at Michael Reese, TDS at New York University, and Cerner, HBOC (now McKesson), and the SMS (now Siemens) system at a time when these last three didn't really have much.

The eventual choice was LastWord. This may or may not have been the entire group's basis for making a selection, but Ms. Napoleone says, "For hospitals approaching this project, I recommend that you purchase and install a system that has 100% up time. This is critical when you're trying to go electronic. You can't afford down time at all." (One of the benefits which

IDX touts about LastWord and its successor, CareCast, is that they run on high-reliability Tandem mainframe hardware.)

After selection: talk it up to build support

After the selection of LastWord, two well-respected physicians were chosen to be champions to speak up for the system. They spoke at as many existing Montefiore staff and employee forums as possible--perhaps--25 times. They went on grand rounds and attended departmental meetings, giving updates.

Going live, getting physicians to do CPOE: remote access a plus

Montefiore forces physicians and nurses onto the system. "We take away the paper, so there's no choice for the physicians but to use and master the system. This rule went into effect: a physician could not use the system if he/she did not sign on for training, and couldn't place an order without training. A benefit was provided at the same time: the physician received remote access and the ability to place orders remotely -- a big plus for the physician. "They really like remote access." They now give very few verbal orders.

Another important success factor, Ms. Napoleone said, is this: start at a location where you will have the greatest chance of success. Once you get 1-2 units under your belt, it is hard for a nay-sayer to claim that the system "never would succeed."

Also, it's very important to pay attention to the details as you go live. For example, the first nursing unit had a lot of dialysis patients. The implementers had to be closely engaged to review orders. "People don't like to tell you what they have been doing wrong."

Building and implementing the system--more how-to details:

The in-house "build" and implementation team is about 13 FTEs. "We employ a couple of physicians for about 20% of their time..." "Because they're still practicing medicine, they have more clout within the physician community. We don't want them to become the "IS doctors" and lose their standing in the practice of medicine. We supplement their salaries for the time they put in with IT, but they can continue to practice. We have five nurses, one pharmacist, and the remainder of staff go in the programmer/analyst bucket... We found that it is easier to teach clinical people about technology than the other way around."

The group included 1-2 people from nursing whose principal tasks were to do workflow analysis for nursing units. They would identify the uniqueness of the department's or unit's needs, and send the screens back to a couple of analysts to do screen tailoring.

Then, at go-live, they would take away paper from nurses. They gave support 24 hours a day, 7 days, for at least two weeks after each go-live. In the ICU, typically that support was for 3 weeks; it varies by number of beds and census.

The clinical CPOE system was a bigger change for nursing than for physicians because of all the products that were brought up for nurses at once. Each nurse had a four-hour class; physicians had 1.5 hours.

After going live, you are still implementing

Montefiore goes back 3-4 months after each unit is live and asks what users need and want. "You need to solicit user feedback." LastWord has a powerful screen builder tool, so they can make 95% of needed modifications without going back to the vendor.

Integration with pharmacy, nursing helps build support

Another success factor: integration. Montefiore brought up the LastWord pharmacy system before implementing CPOE.

Your best chance for success, Ms. Napoleone said, is to have order entry completely integrated with pharmacy and with medication administration so that the physician, the pharmacist, and the nurse are always on the same page when looking at a medication order. "I feel very strongly" that integration there is a key. Montefiore currently has an older Community Health Computing (CHC) lab system, which it's replacing with a Triple-G system. The radiology system is IDXRad.

In failed implementations she has studied, they didn't provide the clinical data feedback to physicians. They'd have to place orders and drop to the paper world for results.

Ratio of data entry devices to patient beds

Montefiore has about one device for every 2.5 beds in all units except the ICU, where it's one-to-one. "It's adequate, but I would love to have more devices," she said. "Part of the issue is what else you use the devices for. If it's only for CPOE, then the ratio is OK. But if the staff is doing e-mail and research on these same devices, then the ratio needs to be higher."

Decision support: another big benefit

"We use a combination of out-of-the-box rules checking for allergies, drug interactions, and duplicate checking," Ms. Napoleone said. "We write some rules beyond these just mentioned using the rules engine that comes with the IDX product."

She said that Montefiore has found "tremendous benefits" in reducing prescribing errors through the system's allergy alerts, drug interactions, warnings on incorrect routes, and dosing alerts--along with the fact that orders were perfectly legible.

"With each unit we brought up, we've seen more than a 50% reduction in medication errors. That's immediate payoff. We've also seen considerable reduction in turnaround time (approx. two hours less) from order placement to the patient receiving the medication or procedure. This time savings translates into short LOS because we're treating patients faster, and they're getting better quicker."

"Nobody wants to go back to paper," Ms. Napoleone said.

Case Study 12: Stanford Missteps And Screen Design Issues Led To Early Dissatisfaction; Bumpy CPOE Start; Lehigh Valley Faced Some Of Same Problems Differently

Stanford Hospitals and Clinics

300 Pasteur Drive

Stanford CA 943045

(650) 723-4000

Size: 663 total beds

CEO or Administrator: Mike Petersen

Vice President of Information Systems: Russ Peckinpaugh

Medical Director: Michael Smith, M.D.

CPOE System: IDX LastWord Version 4

Sources of information: Russ Peckinpaugh, Stanford's VP of information systems; also, comparative results of a LastWord CPOE implementation from Don Levick, M.D., and physician liaison at **Lehigh Valley Hospital and Health Network**. (For more on Lehigh Valley, see Case Study 6 above).

Two things went right for Stanford in the implementation of computerized physician order entry in its IDX LastWord system, according to a 2002 conference presentation by Russ Peckinpaugh, Stanford's VP of information systems:

1. LastWord has an integrated pharmacy information systems which he said was "absolutely key" to the project.
2. Data entry was through a wireless network. Physicians' use of low-end laptops on carts during rounds has worked well, he said.

The list of things Stanford would do differently was longer.

The good news: a year after the go-live, most physicians have accepted its benefits and are entering their own orders. However, the beginning was bumpy. In a commendable act of bravery, aimed at helping other organizations avoid repeating Stanford's mistakes, Mr. Peckinpaugh has gone public with the "do this differently" list:

- Stanford did not mandate training. The result was "residents on units who did not have a clue" what to do with the system, which was not intuitive.

- Stanford didn't deal well with nursing expectations. Nursing believed that nursing entry of verbal orders would decline once physician order entry was live. In fact, physicians continued giving nurses verbal orders to enter at the usual rate. The problem was particularly acute in surgery, where physicians would announce their orders, then rush off to meet a surgery schedule.

- Stanford did not go live on nursing documentation prior to physician order entry. Without nursing documentation active, it is difficult to manage the nursing work list, and it limits the amount of feedback physicians receive about the orders they have placed.

- Stanford rolled out the entire organization in approximately six months, at times bringing one unit per week live. "We could have easily spent twice that long" building order sets and stabilizing the units, he said.

- Stanford had difficulty balancing the tension between ancillary departments, which

wanted as much order detail as possible and physicians who wanted to keep screens bare-bones. "We ended up with too much information on the screens and too many detail screens required."

There were also some IT-related bumps. For example, if an order is not added to the patient profile in the Pyxis drug dispensing software by the time the nurse needs to administer the medication, the nurse will perform what is called a manual override. The nurse then needs to go into Pyxis or IDX (the systems are interfaced) and manually assign the order to the physician. If the nurse chooses the wrong physician, the physician will rightfully refuse to sign the order. The order must then be researched and resolved to get it signed by the right physician. "This required a well thought-out plan," which was not in place initially.

LastWord screen flow was a big challenge for Stanford physicians. For example, Stanford's system did not include a screen a physician could consult to see all of the orders he had placed on a patient before finalizing them, he said. The problem has been addressed in CareCast, IDX's next-generation clinical system, he said, but Stanford runs on Version 4 of LastWord. "We are working with IDX to bring the functionality" to V4, he said.

Lehigh Valley Hospital and Health Network: Better Experience With CPOE on LastWord

Don Levick, M.D., physician liaison for the CPOE project at LastWord shop Lehigh Valley, had quite a different experience. The majority of Lehigh physicians find LastWord screen flow "intuitive and acceptable," he said. He described Lehigh's order entry process:

First the physician chooses orders from multiple lists. The lists depend on how a system is configured: Lehigh's are divided into medication, laboratory, imaging, and nursing. Once orders are selected, they appear in an "unprocessed orders list." The physician then goes back in and fills in order detail. For example, he or she would give the reason for an order for a radiology study. Then the physician enters the order. At that point in the process, the system issues any decision-support flags.

"There is no final window" for reviewing all orders, but if the physician wants to see what he or she just did, there is another route for it. All active orders on a patient appear in an "order profile screen," which, when chronologically sorted, gives a view of all ordering activity. Lehigh Valley Hospital and Health Network physicians find that the system gives them "adequate control" over order entry flow and display, he said.

Case Study 13: Canadian Hospital Takes A Careful, Consensus Approach; Sees Reduction in Medical Errors As Principal Benefit of CPOE

Organization: Cambridge Memorial Hospital

700 Coronation Blvd.

Cambridge, Ontario, Canada

Size: 227 beds

Phone: 519-621-2333

CEO or Administrator: Helen A.I. Wright

Chief MIS Executive: Rena Burkholder, Chief Information Officer

Chief of Staff: Jim Snider, M.D.

CPOE System: Meditech Magic Patient Order Management

Sources of information: Rena Burkholder, Chief Information Officer, (519) 621-2333, ext. 1395; Cheryl MacInnes, MLT, ART, MBA, Program Manager, Diagnostics and Therapeutics

CIO Rena Burkholder of Cambridge Memorial Hospital figures that she recently witnessed the end of an era: the last physician to refuse to use a computer to look up patient medical information has finally retired, five years after Cambridge began its electronic medical record project.

What worked best to encourage physicians to do computer lookups? "...bring them on when they are comfortable, and not fight," she said.

For Ms. Burkholder, the event held an important message that is relevant to Cambridge's CPOE project: left to their own devices, physicians will get there eventually. "What works best is bringing them on as they are comfortable, and not fighting them."

Cambridge plans to involve seven hospitalists in a two-year pilot project on Meditech Magic Patient Order Management (POM). The project is supported by an \$89,000 CDN grant from the Ontario Hospital Association's Change Foundation. As in the United States, CPOE is widely seen in Canada as a way to reduce medication errors. Medication errors are believed to kill 500-700 Canadians annually. Placing decision support at the physician's fingertips is the principal allure of the project, Ms. Burkholder said.

Capital costs are \$91,600, including \$89,000 for software. The two-year operating expenses are \$152,400, including the cost of evaluating the project. The system goes live in November. Initial rollout is pharmacy order entry only, with lab and radiology to follow.

Meditech Patient Order Management (POM) allows physicians to create their own custom order groups with no support from the information technology staff. Meditech has also added fuzzy logic to help speed order entry. Physicians have only to input a few letters of a patient's name, before the system will start guessing at whose record the MD wants to see. "I have been thrilled," she said. Her comments seem to challenge the view that Meditech has a very limited physician order entry capability.

Roll-out will be by speciality. Each speciality will be evaluated prior to rollout to address gaps between what physicians require and what the system can do. If a speciality is not satisfied, the project will not proceed to another specialty area until it is -- "period" -- she said.

Do lab and radiology order entry fit into the plans? Yes. "[w]e hope to move to lab and radiology once medication ordering is complete, said Ms. Burkholder.

These steps should also help ease physician acceptance:

- Cambridge will pay hospitalists at their regular rates of pay for the extra time they devote to developing the system.
- In support of the project, the pharmacy department has agreed to manually document the amount of time it spends on the telephone with physicians clarifying orders. Ms. Burkholder believes that these logs will help prove to physicians the utility of CPOE.
- Cambridge pulled together some 50 relevant articles on the benefits of CPOE and presented its medical staff with a summary and the original research so that they could see for themselves the risks and benefits. It was very well received.

Here are the areas in which the challenges lie:

- Working out a process for getting patient allergies entered into Meditech by someone who understand the difference between a sensitivity and a true allergy. Ideally, allergies will be noted by a nurse and affirmed if necessary by a physician or a pharmacist.
- Making sure that staff support is in place and that the system is not missing some critical component before it is rolled out to each specialty area. A researcher will conduct focus group sessions with physicians to ensure that they are satisfied with the results of development efforts.

Case Study 14: Overlake Starts Pilot Testing; Blending CPOE Orders With Paper Charts Is A Key Transition Workflow Issue

Organization: Overlake Hospital Medical Center

1035 116th Avenue NE

Bellevue WA 98004

Size: 337 beds

Phone: (425) 688-5000

CEO or Administrator: Ken Graham, President and CEO

Chief MIS Executive: Bruce Elkington, Chief Information Officer

Chief of Medical Staff: Tom Castle, M.D.

CPOE System: Meditech Magic Patient Order Management

Sources of information: Bruce Elkington, CIO, (425) 688-5000

Overlake Hospital Medical Center launched a pilot test of CPOE using Meditech Magic CPOE in October, 2002. The original July starting date was delayed while Meditech did some upgrades recommended by clients who were CPOE early adopters, said Bruce Elkington, CIO. The module will “snap on” over Overlake’s existing pharmacy and medication administration record systems.

Overlake is pilot-testing the system with hospitalists, who write a significant portion of Overlake's medication orders. The implementation staff will include a pharmacist, a nurse, a half-time IS person, and a physician, who will devote eight to ten hours per week to the project.

The nurse, who is still being recruited, will help with order set development and workflow issues, and participate in training, he said. One key workflow issue: blending CPOE with a paper chart. One knotty question raised by the dual system is this: if some physicians place electronic orders and others hand-write orders, how will the nurse, the respiratory therapist, and others on the care team know whether an order has been placed on a patient?

Training will be by the pharmacist and the nurse, who will provide some instruction and will also follow physicians around until they get the hang of the system.

Data entry will be by wireless device; Overlake has considered Pocket PCs, Microsoft Tablet devices, PCs on carts, and wall-mounted PCs he said. The hospital has no solid answer, and may end up using more than one type of device.

Overlake expects to implement medication decision support, including dose checking by patient size, drug interactions, therapeutic checking, allergy alerts, and flags for high-cost drugs.

Mr. Elkington firmly believes he is at a natural advantage in his CPOE project because Overlake years ago chose Meditech Magic, a closely integrated system. Other organizations are spending "many times" what Overlake is because they face the problem of integrating the underlying systems, he said. He believes that CPOE is more common among Meditech sites than it is among hospitals that are building on competing legacy systems “because (Meditech is) installable.”

Overlake's main motive is improvement of patient care, he said. Overlake is situated in Bellevue, Wash., where major employers are driving participation in Leapfrog Group reporting. “Leapfrog is there,” he said, but we’d be doing this anyway...My family comes here too.”

IV. Additional User Reports: Survey Results

As noted above: most of those interviewed for the Case Studies above were asked some identical basic questions. However, a core purpose was to let interviewees discuss what they, not we, deemed significant. As a result, the Case Studies are wide-ranging, do not offer a common data set or answers to all the same questions, and follow no specific presentation template.

However, for the section below, we asked system implementers to respond to one standard set of questions in e-mail and voice interviews (with some, but little, opportunity to move off-topic).

Researcher Rachel Ross obtained survey results from clinical implementers or information technology executives at 10 hospitals. The majority asked not to be identified; therefore, in this section, none is identified, with these exceptions:

1. Information from her interview with **Montefiore Medical Center** is combined with the information obtained by Editor Suzanne Corrales in the Montefiore Case Study above and is not included in the aggregated responses below.

2. **Vanderbilt University Medical Center** spent years developing its own unique and, judging from what we have heard about it, highly capable system, and then licensed the system to vendor McKesson for an ongoing commercial adaptation. Because no other user information is available yet about the system, we concluded that the Vanderbilt survey response may be of great interest to potential buyers of a CPOE system. Therefore, the survey response from Karen Hughart, Vanderbilt's director, systems support services, is not included in the aggregated responses, but is presented separately below them.

As some vendors have few CPOE clients, it was necessary to avoid associating the exact size and CPOE vendor with a particular institution's response in order to better preserve their anonymity. This does, unfortunately, make some responses a bit less useful than they might be (for example, in making judgments about the size of an implementation team). However, given the limitations of promised anonymity, this is the best we could do for this edition.

Survey Questions And Aggregated Responses:

Questions asked on the survey are in **boldface**. Responses are in regular type.

1. Types of organizations from which we received survey information:

One respondent is a community hospital with fewer than 300 beds, with no residency program. One is a community hospital with fewer than 200 beds, with a residency program. One is a community hospital with more than 400 beds, with a residency program. One is both a community hospital and an academic medical center with more than 500 beds. One is a military hospital with more than 400 beds, with a residency program. Three identify themselves as academic medical centers; of these, the smallest has more than 500 beds, and the other two have more than 800 beds.

2. Status of implementation:

The responding community hospital without a residency program is just planning its pilot test. One of the community hospitals with a residency program was just going live on its pilot

test at the time of the survey response. All of the others are live in all or most departments.

3. Which systems these respondents are using:

Two community hospitals are using the Meditech Provider Order Management System; two are using Per-Se Patient1. The military hospital has the CliniComp system, CIS. The academic medical centers are using Eclipsys Sunrise Clinical Manager, Per-Se Patient1, and two use Siemens Invision. As noted, Vanderbilt, for which responses are broken out separately, uses Whiz, an in-house-developed system first rolled out in 1994.

4. What department did you use for pilot testing? Was it the right choice? Why or why not? How did you chose it? How long did your pilot test last?

5. When did you go live on your first non-pilot unit?

Community hospital with no residency program, with fewer than 300 beds, planning pilot: "Proposing the Hospitalist Group - (provide care to patients who have no family physician)." Planned go-live of pilot is April, 2003.

Community hospital with residency program, fewer than 200 beds, currently live on its pilot program: "We selected one patient floor and one physician. The physician was selected due to the variety of patients, the close proximity of patients, and most importantly his willingness to participate in the pilot. Selecting one physician permitted us to focus in one area and correct problems as they occurred in a central area. We feel this worked well as the pilot uncovered some nursing procedure changes. These were easier to manage on one floor than if we had attempted numerous nursing areas. Our pilot is ongoing for the last week." Go-live on other units was two weeks away at the time of this survey.

Community hospital with residency program, over 400 beds: "We didn't have a pilot unit. We've had CPOE since 1996, and it was always "live." We started with resident order entry in 1996, and the resident population (medical and surgical) now average 95% direct order entry.

"For the attending population, we concentrated on physician direct order entry in September, 2000 for a specific unit in our Inpatient Behavioral Health Division...They were a smaller, more controlled group of physicians (mainly psychiatrists) whose order sets were standardized according to their specifications, and the medication order sets were not as complex as the medical or surgical attendings.

"...We (IS Department) provided a minimum of 3 weeks of 24x7 support for both the physicians and the nurses. We had an issues list, and we worked with those groups to correct their issues for at least the next 6 months."

Community hospital with residency program which is also an academic medical center, 500+ beds: "Pilot test with Lab system about 10 yrs. ago. Lab dept. was chosen because their contract with CHC (Community Health Computing, a lab system vendor at the time) was ending and it was a logical jump at the time. Test lasted for 6 months."

Go-live beyond the pilot: "Six months after lab dept. went live with CPOE, we went live with the order entry piece and then the pharmacy piece."

Military hospital with residency program (respondent had worked on a CPOE implementation at a prior military hospital): "At the previous facility, I used L&D (labor and delivery) & NICU (neonatal intensive care) for 6-weeks. However, the hospital stopped deploying CPOE after I left. Nurses are still, for the most part, transcribing from paper orders. The NICU & L&D are still the only units using CPOE. These units were chosen because the population is somewhat contained, and business processes don't filter to the other units with transfers, etc. Reasons are patient care continuity and SAFETY!

"...[M]y current employer (also a military hospital) initiated CIS with the providers entering orders from the very beginning. When CIS was implemented, so was CPOE."

Academic medical center with 500+ beds: "Piloted on a general medicine unit to ensure the largest breadth of goods/services ordered (particularly medication orders). It was the right choice. Pilot lasted about 3 weeks." This hospital went live on first non-pilot unit in February, 2001.

One of the academic medical centers with 800+ beds: "We did our pilot test in the transplant unit because it represents a good mix of all kinds of patients. It's like a mini-hospital that enabled us to address all ancillary areas, and iron out related medical issues. It was the right choice because of the variety of patients. Pilot lasted a good three months before rolling it out to rest of our departments...We went live in all units in May 2002.

"After our success with the pilot in the transplant department, we didn't want to go unit by unit in a piecemeal way. We went fully live in all units, all ancillary areas the same day. Sort of a big bang approach! Part of the reason people fail at implementation is because they do it unit by unit and the system has less adoption. If you go unit by unit, doctors have to order meds in two different kinds of systems. The frustration in the healthcare environment is stressful enough, but if you put two different processes in front of a physician, forget it, they won't use it. Once burned, twice shy, so to speak. They won't use it. We have to keep it simple."

The other academic medical center with 800+ beds: "We piloted using the inpatient General Medicine Unit. This unit represented a wide cross-section of ordering patterns that allowed us to identify and remediate the majority of issues quickly. Pilot testing lasted for approximately one month, followed by a phased implementation in other inpatient care areas.

"The project was initiated in Spring 1993 and went live on our first non-pilot unit in Summer 1996."

6. When you went live, did you have --

A--a pharmacy system that was integrated with your physician order entry system?

B--a medication administration record that was integrated with your CPOE system?

Community hospital with no residency program with fewer than 300 beds, planning pilot: does have integrated pharmacy, does not have integrated meds administration. it's "planned for future but not feasible now since we need hand-held devices for nursing."

Community/military hospitals with residency programs:

- Three did have integrated pharmacy, one did not.
- Three did have integrated meds administration, one did not (a slightly different subset than the three above).

Academic medical centers:

- Two did have integrated pharmacy, one did not.
- One did have integrated meds administration, one did not.

(Others didn't respond.)

7. Of the total number of physicians who practice at your hospital, what percentage currently enter their own orders through your CPOE system?

Community hospital with no residency program with fewer than 300 beds, planning pilot: "too early to tell."

Community hospitals with residency programs: the one which has fewer than 200 beds is "still piloting with one physician," and at the 400-bed hospital which has been live since 1996, "90-95% of docs do order entry online."

Community hospital with residency program/academic medical center, over 500 beds: "Residents are at 95% and the attendings are at 40%."

Military hospital with 400+ beds: "100% for inpatient. There are areas which have such complex order sets [that] they remain on paper (ex: Chemo, Dialysis). We are trying to upgrade to accomplish this also."

Academic medical centers:

- "99%"
- "100% mandatory. Everybody's doing it."
- "approximately 99% of residents."

8. What is your ratio of data entry devices to patient beds? Is it adequate?

Community hospital with no residency program, fewer than 300 beds, planning pilot: "We have almost one device for every patient bed and anticipate an increased demand once we move beyond the pilot group, which is a very small group of physicians."

Community hospital with a residency program, fewer than 200 beds, currently in pilot: this hospital is using the pilot project to test the appropriate number.

Another community hospital with a residency program: "1 PC for every 2 beds at our 600-bed hospital. But that is just in the hospital. There are more PCs in the clinics."

Community hospital with residency program, over 400 beds: "We have bedside, point of care devices in every patient room in addition to having several devices at every nursing station and substation. We can use more at the nursing stations and areas where the MDs congregate."

The military hospital with 400+ beds: "1 to 1 on all inpatient units, plus some! Providers want more. Not all physicians have access to CIS on their office PCs and/or in the outpatient clinic areas. However, they DO desire this. We are working on it."

Academic medical center with 500+ beds: its ratio is 1 to 2.5 beds. Its response did not comment on adequacy.

One academic medical center with 800+ beds: "Hard to say because our stationary PCs are used for so many different computerization systems. But at every nursing station there are a least a minimum of two PCs, that are used for CPOE, among other things."

The other academic medical center with 800+ beds: "The ratio of data entry devices to patient beds is approximately 1:4 on the inpatient units. However, a positive aspect of CPOE is off-unit access to orders which allows physicians to manage patient care from their office computers, or any network-connected computer."

9. What percentage of clinician order entry is on wireless devices?

The answers were all over the map:

One community hospital with a residency program: "100%--although they could use desktop if desired."

Another community hospital with a residency program: "Only 10%. Wireless devices used mostly in surgery dept."

Community hospital with residency program, over 400 beds: "We do not use PDAs for order entry, but we do have our home health RNs set up to do documentation and order entry on laptops that use CDPD wireless technology."

The military hospital with 400+ beds: currently, zero.

Among the academic medical centers:

- The 500+-bed medical center said zero.
- One of the two very large medical centers with 800+ beds said, "128 wireless laptops that roam around the hospital for physician order entry. We have 128 dedicated wireless devices to 650 staff beds."
 - The other: "On the inpatient units, approximately 40% of the devices are wireless-enabled laptops affixed to rolling carts. In our outpatient setting, only a small percentage of devices in use are wireless. At this time, we do not support wireless hand-held devices such as PDAs or tablet computers."

10. What kind of training did you use for physicians--Computer based? Classroom? One-on-one? Combination? And what worked best?

Community hospital with no residency program, with fewer than 300 beds, planning pilot: "A combination of classroom, one-to-one and printed manual is planned."

A community hospital with a residency program: "We did one-on-one training. This provides a better training method and works well trying to accommodate physician schedules."

Community hospital with residency program, over 400 beds: "A combination of classroom and one-on-one. Training is a hurdle. Docs seem to be embarrassed to be seen by peers as "not knowing" something in a classroom situation. They don't want to be seen as being behind in any area. It doesn't matter what schedule of classes we offered--morning, noon, night, the docs stopped coming after a while.

"We found we got the best results from private sessions with docs. Also, we make rounds once a day to try to catch docs actually doing their order entry at the computer. Then we approach them, make a friendly connection through conversation, and try to create a "teachable moment" when they are on the job, so to speak.

"We also provide a separate phone line, just for docs, to get help for non-urgent questions. They can leave voice mail if they are just wondering how something works. We e-mail them back (documentation of response) and/or call. Docs seem to like the conversation piece. For urgent needs, we have a 24-hour beeper help line. If they are stuck on the system and need to prescribe meds right away, they beep us and we help them on the spot."

The military hospital with 400+ beds: "A combination of classroom and a lot of e-mail infomercials--physicians are extremely reluctant to come to a classroom. At the last hospital, I had super-users (nurses), who understood the system due to the transcription of paper, teach the physicians for 6-8 weeks prior to going live."

The community hospital which identifies itself as also an academic medical center, 500+ beds: "We used a combination of all three formats. Sometimes we have no other choice due to the doctor's schedule. We usually need to do one-on-one with ER doctors, for example,

because they're working around the clock. We also provided Internet self-paced learning. But the classroom format proved to be the most popular, and worked best because it offered more hands-on training."

The academic medical center with 500+ beds: "a combination of classroom and 1:1."

One of the academic medical centers with 800+ beds: "There were mandatory computer classes for doctors to retain privileges at the hospital. We staggered the training throughout the implementation period. We used a combination of mandatory computer classes and we also trained "super users" from each department, and several were trained to roam the halls and find out if a physician was having trouble, and provide one-on-one help to physician. So we always had one super user per floor but within a month, the demand plummeted because the system is so easy to use, people got used to it right away. A lot of hospitals that provide only classroom training make a mistake. It's the real-life scenarios that require the most help, and that is the best place to apply the learning emphasis."

The other academic medical center with 800+ beds: "A combination of classroom and one-on-one. Medical students are taught CPOE in classroom sessions as part of their introduction to UTMB. We also arrange for one-on-one training at the convenience of the medical staff, either as full training sessions or "refresher" courses."

11. Did you go live with departmental order sets? Departmental and personal? Has this changed since you went live? Does it depend on the department? Which uses which?

Community hospital with no residency program, with fewer than 300 beds, planning pilot: "Both-- we will go live with personal (physician created) order sets, and some order sets that have been predetermined."

The community hospital with a residency program which was in its pilot test at the time of the August, 2002 survey: "We are using both departmental and physician order sets. It's too early in our process to tell if changes will be necessary."

Community hospital with residency program, over 400 beds: "We use a combination of departmental and personal order sets. Any order sets are kinetic and we make adjustments to personal order sets when requests come through. Revisions are very common requests from the physicians. As they use the system, they are finding what works easily for them versus what is too cumbersome. Overall, many of the changes made for departments are because of regulatory requirements, especially in the pharmacy area."

Community hospital with residency program which is also an academic medical center, 500+ beds: "Combination. It really does depend on the department. Changes are based on the coding books. If they change or add new codes, we've got to update the order sets. If

you're a doctor that's a specialist, you have your own personal order sets designed. We accommodate them based on policy and procedure. It's really very user friendly, that is the key. Otherwise doctors won't use it at all."

Military hospital with 400+ beds and one academic medical center: both replied that they did go live with departmental order sets, but didn't elaborate.

The academic medical center with 500+ beds: "yes" to departmental order sets.

One of the two very large academic medical centers with 800+ beds: "Order sets are organized to be service-specific and then they're ailment-specific. So there's specific order sets for cardiology, and another one for NICU. We have about 400+ different order sets for various ailments and conditions. We encourage practicing evidence-based medicine, best-practices medicine to contain costs and ensure the patient gets the best possible care. Physicians do have ability to modify, but that doesn't alter it permanently. We have accountability to our patients to ensure they get the best possible care so when a physician wants to change something, we go back to evidence-based medicine. If they really believe that their way of practicing medicine is better, they present it to the ongoing order set evaluation committee. So, if it makes sense, we change it for the baseline."

The other academic medical center with 800+ beds: "Yes, we utilize departmental order sets extensively. We do not support personal order sets. The use of departmental order sets and protocols was a key factor in acceptance and subsequent success of CPOE."

12. What use are you making of on-line decision support?

A--most rules are for efficiency and data compliance;

B--out of the box medication checking rules (vendor wrote the rules);

C--Adverse drug event checking (Organization had to write the rules);

D--Other?

Community hospital with no residency program with fewer than 300 beds, planning pilot: "Our organization will do some tweaking of the rules" (presumably a standard set of vendor-supplied decision-support rules).

The community hospital with a residency program which is still in its pilot: "We are using the vendor-supplied interactions and adverse drug checking."

The community hospital/academic medical center, 500+ beds: "Most rules are for efficiency and data compliance. (e.g., Is the order complete? Logical? For example, system might flag pregnancy test on a man because it is illogical.) "We use Medi-Span, which is integrated with Patient1 pharmacy module. It has, for example, IV interaction alerts. Also, if a patient is lactose-intolerant, it will signal if a drug has a lactose derivative. But you have to set

the different settings. If you want it at the most sensitive, then it will bleep at anything. But if you just want the most critical, then it will only bleep at the most critical reaction."

Community hospital with residency program, over 400 beds: it is using out-of-the-box medication checking rules provided by a vendor, its own adverse drug-event checking rules, and also something called "criteria engineers," which the respondent describes as "a kind of program logic that we build into the system as part of our HIS system."

The military hospital, 400+ beds: "First Data Bank (now Medi-Span) drug-to-drug, drug-to-allergen, duplications."

The academic medical center with 500+ beds: "Both vendor-supplied rules and custom-built."

One of the academic medical centers with 800+ beds: "We jointly developed rules with Micromedex. We were one of the development sites. Most of our rules were developed by us. Siemens didn't provide any rules in its software. We developed all of our checking rules internally, as a partner with Micromedex."

The other very large academic medical center: [the medical center] uses a combination of vendor and locally-written rules for medication interaction/allergy checking; ADE checking; medication dosage, timing and scales per unit validation."

13. How many FTEs were assigned to your project and for how long: Physician? Nurse? Pharmacist? Programmer/analyst?

Community hospital with no residency program, with fewer than 300 beds, planning pilot: it is planning on these figures:

- Physician: .48 FTE total, varies over 20 weeks;
- Nurse: "to be determined once roll-out begins, initial impact will be very minimal;"
- Pharmacists: .53 FTE total, varies over 20 weeks
- Programmer/analysts: .53 FTE total, varies over 20 weeks.

The community hospital with residency program which is in its pilot program: "We had a team for the implementation but primarily our clinical analysts worked on the project. To estimate, I would say 1.3 FTE. The project length is hard to estimate since we had to wait mid project for our vendor to make some necessary changes. Total would be about 8 months."

The community hospital/academic medical center with 500+ beds: "On a go-live basis, 4 to 5 of each of the above. We did what we call "train the trainer." We train key personnel intensively so that when we're not there, they can troubleshoot and support the others in their department using it. We're a team, in a sense, but we don't have to be there because these

users are the first line of defense. They can usually handle any IT or help a doctor when he gets stumped, but if they can't figure it out, then they're usually the ones to call us. It works well with these super-users because without them, the others would be calling us all the time and we wouldn't get anything done."

Community hospital with residency program, over 400 beds:

- Physicians: none;
- Nurses: 4 IS RNs;
- Pharmacist: one part time in IS
- Programmer/analyst: 1 lab analyst.

"There was no real time line - in 1996, when the residents began order entry, that project lasted about 9 months."

The military hospital with 400+ beds: "Initially, there were 5 assigned to deploy CIS, then reduced to 4. Now, we are hiring the database administrator (a 1st) to review order entry processes (overrides, etc.). We handle all our own training because there are so many ongoing changes to CIS, which have an impact on everyone."

One of the academic medical centers with 800+ beds: "During implementation, we had about 20 FTEs, ongoing super user groups, and about 10 consulting physicians who met with us about once every two weeks. Now that we're fully live, our support personnel is much less."

The other academic medical center with 800+ beds:

- Physicians "participated as members of Steering Committee."
- Nurses "participated as members of Steering Committee, varied as new areas were brought up on POE."
- Pharmacists "participated as members of Steering Committee."
- Programmer/analysts: "initially, a team of 12 programmer/analysts developed, implemented, and supported the system. Currently, a team of six provides enhancement and support."

14. If your project has been live long enough for you to see payoffs (benefits), what were the first you saw? How much time went by before you saw them?

Community hospital/academic medical center: "The payoffs are immediate in dollars saved. That shows within 6 months to a year. Everything is documented, [and so the] onus is on everyone who has access to the system. It documents and tracks what they do. The doctor can't say that the nurse didn't understand his writing. Even if the doctor can't spell, he selects from clear options, so there's no spelling errors. There's not a lot of room for major mistakes, so if one is made, it's clear who's responsible. The individual accountability is right there; each person in each department is held accountable. Some people are afraid of that, but it's good for the hospital, and especially for the patients."

Community hospital with residency program, over 400 beds: "The RNs like the fact that they do not have to deal with the bad handwriting or calling for clarification. Pharmacy likewise, but they are also more concerned with seeing fewer medication errors. They also like the fact that the docs see the drug interaction alerts and the duplicate check messages when they direct-order."

Military hospital with 400+ beds with residency program: "There is a more integrated operation with nursing, physicians, pharmacy, and even medical records and JAG--much more of a team effort in patient care and better understanding of how we all impact each other's processes."

The academic medical center with 500+ beds: "Immediately: legible orders, fewer phone calls to clarify order intent or order status, more complete orders, reduction in ADEs (adverse drug events). Later: increase in IV to PO (intravenous to patient oral) conversions."

[Editor's note: while this respondent didn't give an indication of the cost significance of conversion of intravenous medication to a patient taking a medication orally, we did find this piece of anecdotal information at the University of Kentucky Hospital's web site: "The conversion of each patient receiving IV famotidine to the oral form just one day earlier is projected to save the hospital approximately \$8,000." -- <http://www.mc.uky.edu/pharmacy/dic/interchange/famotidineIC.htm>.]

One of the academic medical centers with 800+ beds: "We saw payoffs in the pilot phase. They were better access to care and length-of-stay reduction (LOS). At 6 months post-live, we saw more benefits:

- Turnaround time from prescribing a medication to getting it into the patient improved by 66%, reducing it from about 7 hours to about 3 hours.
- Radiology exam turnaround improved by 45%. Finishing the tests, getting the results into the system improved 25%.
- In crucial areas, like cardiology, LOS reductions were favorably measured. There was a 25% reduction in medical errors administration.
- Transcription errors went to ZERO."

The other academic medical center with 800+ beds: "Initial payoffs seen almost immediately were:

- use of printed requisitions to ancillaries resulted in less confusion and time spent transporting requests;
- standardized data collection resulted in fewer call-backs to the floor for additional information;
- clinical practice guideline enforcement;
- standardized processes for medication dose, dose timing, and dose scales per unit;
- standardized prescription writing and prescribing (units written out, metric);

- rounds reporting, interdisciplinary rounds report, checkout listing for cross coverage;
- off-unit access to orders;
- legibility of physician orders; and
- increased compliance with required fields in requisitions and orders."

15. All things being equal, knowing what you know now, what would you have done differently?

Community hospital with residency program, over 400 beds: "We should have had a better rollout plan. The hospital administration mandated to the "captive" MDs that they would need to do direct order entry hospital-wide beginning in January, 2002, but we weren't prepared with all the doctors' order sets or education. Doctors resisted--there is a large cultural change that must be taken into consideration--and you need enough resources to be a presence on the units to support the docs."

Community hospital/academic medical center: "The initial idea was to copy and scan all charts on line, but because we're in NY, there are strong unions, and this would have eliminated lots of medical clerks' jobs. There was a big fight about that, so we decided to do it slowly. But eventually, it will be paperless--that's our goal. You won't need the paper chart. It will all be electronic. We have a back-up generator, we've got the necessary safety mechanisms in place."

Military hospital with 400+ beds, with residency program: "I would have, if empowered to do so, insisted that the first hospital I worked at with CIS implement the system the way [the second one] did, and direct the physicians to put the orders in."

One of the academic medical centers with 800+ beds: "We used a mainframe-based, non-Windows system, which took almost 3 years of planning because we wanted to go live in all departments at once. Today's systems are equipment are much more flexible. Adoption would have been easier. Selling the idea and regular use to doctors with today's technology, which is web-based, robust, user-friendly, would have been easier. Vendors have matured a little. They used to build clinical systems on business platforms but now they're building them from scratch and designing them clearly for clinical settings. That's an improvement."

The other academic medical center with 800+ beds: "We would probably do very little differently. I would recommend compressing the implementation schedule as much as possible, as it was difficult for medical staff during transition between "POE Units" and "non-POE Units."

The survey response of Vanderbilt University Medical Center follows.

CPOE Survey Response: Vanderbilt University Medical Center

Vanderbilt University Medical Center

1660 21st Avenue South

Nashville TN 37232

Phone: (615) 322-5000

Size: 631 total beds, 609 acute

CEO or Administrator: Mark Penkhus

Chief MIS Executive: William Stead, M.D.

Chief of Staff: C. Wright Pinson, M.D.

Medical Director: John Sergent, M.D.

CPOE System: In-house-built Whiz System

Sources of information: Karen Hughart, Director, Systems Support Services, 615-936-6779

1. Type of institution:

Academic medical center.

2. Status of CPOE implementation:

Live in all departments for several years. (Began project in 1994.)

3. What kind of system are you using?

"An in-house system called Whiz, which the medical center sold to McKesson. The medical center will be installing the McKesson Horizon version of the system within the year."

4. What department did you use for pilot testing? How did you choose it? Was it the right choice? Why or why not? How long did your pilot test last?

"Our pilot units for Whiz Order were the Cardiac ICU and Stepdown units. We had strong physician leadership, a homogenous group of patients, and strong nursing leadership on the units. The patients on the two units transferred between each other so we didn't have such a big problem with patients going from implemented to non-implemented units by starting there.

"We also got very early experience with both ICU and lower acuity patients. In hindsight, this was a good choice, because we had an excellent chance for success. We had assurances that the Nursing and Physician leadership would not fold at the first signs of adversity. They made a commitment to work with us till we got it right. We implemented the next unit (Adult Myelosuppression unit) approximately 2 months after the go-live date in Cardiology."

5. When did you go live on your first non-pilot unit?

March, 1994.

6. When you went live, did you have --

A--pharmacy system integrated with your CPOE system?

Yes.

B--medication administration record (MAR) integrated with your CPOE system?

"No. We had an MAR computer generated from the Pharmacy Computer system that was manually completed. (We still do.)"

7. Of the total number of physicians who practice at your hospital, what percentage (estimate) currently enter their own orders through your CPOE system?

"There are approximately 600 attending physicians and an additional 300 residents and fellows. Approximately 68-70% of all orders are entered by physicians. Because we are a teaching hospital, the overwhelming majority of all orders entered by physicians are entered by house staff.

"The 30% of orders entered by others are entered by nurse practitioners and staff nurses (as verbal, telephone, protocol, or nursing orders not requiring MD countersignature; by pharmacists, respiratory therapists, dieticians, and other professional disciplines who are permitted by policy to enter verbal, phone, and protocol order for their own disciplines; and by clerical personnel who may enter written orders."

8. What is your ratio of data entry devices to patient beds? Is it adequate?

"We have 1-2 patients per computer in our ICUs, approximately 3 patients per computer in Stepdown areas, and 4-5 patients per computer in general care areas. There are also computers in ancillary departments, the cafeteria, etc. We do use some wireless laptops on rolling carts to enter orders during rounds in a few units.

"Especially on medicine units, which tend to have physicians present more hours of the day, we do have some wait times for computers during busy times of the day. We would put more devices in these areas if we had sufficient space. Except for these few areas, the numbers are generally adequate.

9. What percentage of clinician order entry is on wireless devices?

"We do use some wireless laptops on rolling carts to enter orders during rounds in a few units."

10. What kind of training did you use for physicians? What worked best?

"A combination. Except during initial rollout, we've trained all house staff in classroom training sessions. They give us one day during house staff and fellow orientation and we train 50-150 people each day once per year. We like to train groups of attending physicians, too, but don't have much luck with this. Most of them get trained in one-on-one or very small groups of 2-3 physicians at a time."

11. Did you go live with departmental order sets? A combination of departmental and personal order sets?

"Yes, we started from the beginning with 'best practice order sets' that an entire group was encouraged to use. We also had 'Private Whiz,' which allowed each user to develop up to ten personal order sets for use when a 'best practice' order set was not available or to enter orders for

patients not yet registered that could be 'played back' once the patient was registered."

Has this changed since you went live?

"We are still doing the same."

Does it depend on the department?

"Some departments are more proactive in maintenance of best practice order sets than others, so in cases where the order sets are out of date, they are not used as often."

12. What use are you making of on-line decision support?

"We have access to commercial (AHFI and Moseby) Drug References and hospital-developed monographs from within the order entry system. We have dose range checks for certain classes of drugs for adults and most all pediatric medications. We also have more sophisticated drug dosing decision support for titratatable drips, antibiotics, and several other types of drugs used by children that consider weight, age, and creatinine clearance (if lab data is available). There are lots of other drug-specific decision support tools incorporated into Whiz to address specific issues (e.g., an empiric antibiotic advisor that shows cost adjusted rankings for therapeutically equivalent therapies, interventions to advise users away from drugs that are non-formulary, etc.)

"Our radiologists have worked out several decision support tools to help users order the best test to diagnose a problem to help steer users away from ordering both CAT scans and MRIs when only one or the other is warranted. We have decision support to help users order restraints in a compliant fashion, easily initiate appropriate Latex precautions orders, implement fall prevention orders appropriately, target skin prevention and skin care orders based on skin risk assessment, specify reasons for blood transfusion, and special preparation of blood bank products, etc. "There's a LOT of decision support built into Whiz."

13. How many full-time employees were assigned to your project? For how long?

A--Physician: "For most of the rollout, the physician-programmer who created Whiz was on the project full-time. For the past two years when we have not been actively implementing new users, we have had several part-time MDs involved in the project, but none focus on POE full-time."

B--Nurse: "There have been 5-6 nurses focusing on Whiz as their sole or primary project since the beginning. This group is responsible for implementation planning, training, implementation support, and on-going support for all Whiz users. They also develop order sets and do some simple systems maintenance."

C--Pharmacist: "Two pharmacist spend very significant percentages of their time helping maximize pharmacy impact from Whiz. A third, a chemotherapy pharmacist, maintains all chemotherapy order sets."

D--Programmer/analyst: "The numbers have varied, and there has been regular involvement from biomedical informatics students throughout the project, but there are an average of 2 programmers and 1 analyst that work full-time on POE. Part-time help that might

add up to another FTE develops modules and does other smaller pieces of work."

14. If your project has been live long enough, what were the first "payoffs" (benefits) you saw, and how much time passed before you saw them?

"We realized some benefits almost immediately. We are able to deliver first doses of medications 17% faster for ICU and 38% faster for general care patients if orders are entered directly by physicians. Orders are legible and we've been able to alter cumbersome work processes by taking advantage of the computer's ability to produce an accurate "snapshot" of active orders on demand. Nurses don't have to manually update Kardexes. We can review current orders when patients change service or level of care and make changes as needed instead of starting from scratch. Physicians, nurses, and other members of the team are all working from a common set of orders rather than from individual perceptions of what's active and what's not.

"Other benefits came along somewhat later after we had a solid user base. We generally think it's best to get people using the system, then give them data, and then work on interventions rather than start with new users with interventions to change practice dramatically from day #1.

"We have used data from Whiz to identify areas with over- or inappropriate utilization of services. We've then been able to target interventions to address these situations without adversely impacting quality of care. For example, our clinical experts have looked at patterns for ordering lab tests, portable chest x-rays, and other heavily-used services, and made changes in the system to curtail this. You can no longer order open-ended orders for these targeted services, but must instead review orders every 24 hours in most cases. This targeted way of cutting cost has been done with no identifiable impact on the quality of care, but has saved hundreds of thousands of dollars. We've been able to provide decision support to address quality and cost issues for a variety of services (some mentioned previously)."

15. All things being equal, knowing what you know now, what would you have done differently?

"We would have been more realistic about ongoing support needs. It takes a lot of time, expertise, and effort to support clinicians and to maintain up-to-date clinical systems. The more users and areas implemented, the heavier the ongoing support burden.

"We underestimated how different pediatrics was, and spent over 3 years trying to develop the medication ordering infrastructure to support their needs.

"We've been slow to respond to the increasing blur between inpatient and outpatient status and to develop the application to support both. Now that we are working with the ED, the Clinical Research Center, and other patient care areas that treat large numbers of outpatients, we are finally making system changes we've needed earlier to better support appropriate ordering for outpatients that are in inpatient beds for observation."

V. Additional Topics:

- 1. Six Approaches To Winning Physician Acceptance of CPOE**
- 2. Hand-Helds: Many Physicians Do Like Them--But Only for Limited Purposes**
- 3. A Cautionary Tale: Pharmacy Alerts Shut Off**

1. Six Approaches To Winning Physician Acceptance of CPOE:

Five of the six organizations discussed below use persuasions based largely on helping physicians to find and appreciate the benefits of CPOE. In the sixth--a prominent hospital loaded with "physicians to the stars," one of whom made the cover of Time Magazine--the approach is, surprisingly, "You WILL use it." These hospitals are:

Holland Community Hospital, Holland, Mich.

Fairview Health System, Minneapolis, Minn.

Overlake Hospital, Bellevue, Wash.

Great Plains Regional Medical Center, North Platte, Neb.

Cambridge Memorial Hospital, 277 beds, Cambridge, Ontario

Cedars-Sinai Medical Center, Los Angeles, Calif.

Holland Community Hospital; Fairview Health System; Overlake Hospital

In most situations, entering most orders into a computer will take a physician extra time, which physicians will be loath to give up. So, if winning physician acceptance of computerized physician order entry (CPOE) is tough in a teaching hospital, where many physicians are employees, what should a community hospital do, when most physicians aren't employees?

Bill Van Doornik, MIS director at 213-bed Holland, Mich., Community Hospital, plans to install the Per-Se Patient1 CPOE system. He agrees with estimates that CPOE will take physicians an additional 30 minutes per day. Gary Strong, CIO at nine-hospital Fairview Health System, Minneapolis, Minn., guesses that it will add one minute of physician time to an order that would normally take two minutes to write. He's installing Eclipsys Sunrise.

The solution, they and other project leaders agreed, is to make the technology so compelling, the order sets so easy to set up, and the decision support so useful, that physicians begin to demand it. "You have to make the benefits visible," said Bruce Elkington, CIO, Overlake Hospital, Bellevue, Wash., who is installing Meditech Magic.

In some cases, circumstances will help. Overlake has a staff of hospital-based intensivists and hospitalists who are responsible for writing a significant portion of Overlake's orders. For some reason, it also has a disproportionate number of technically-oriented physicians on its OB/Gyn staff. It will beta-test physician pharmacy order entry in the ICU, and probably roll out first to Ob/Gyn, Mr. Elkington said.

Fairview Health System operates a large ambulatory care practice, which is rolling out Epic Systems EMR. Physicians who are already familiar with the Epic system come to the community hospital more willing and eager to computerize than they otherwise might be, because they are familiar with the benefits, Mr. Strong said. But he is also out there doing old-fashioned sales pitches. He estimates that he has participated in at least 100 meetings with

physicians and physician groups about CPOE.

Mr. Elkington figures that he has a natural advantage because Overlake chose Meditech Magic, a closely integrated and relatively inexpensive platform, years ago. Other organizations are spending "many times" what Overlake is because they face the problem of integrating the underlying systems, he said. If you look at the First Consulting Group Leapfrog report, you notice that a lot of Meditech sites have CPOE, he said. "That's because it's installable."

Great Plains Regional Medical Center, North Platte, Neb.

Great Plains Regional Medical Center, 116 beds, North Platte, Neb., has a physician project champion who just happens to be married to the woman who was, until recently, the Great Plains CIO, Bonnie Buckland.

Not surprisingly, Robert Buckland, MD, sees plenty of advantages for physicians in CPOE. One obvious one: they'll be spared the annoyance of puzzling over each other's handwriting. As a surgeon, Dr. Buckland often walks into a patient room cold and picks up the threads of what another physician has started. Being able to consult a legible, well-organized medical record and tell at a glance what is going on will be a big improvement, he said.

Not being interrupted during the day for order clarifications, and not having to repeat orders or prolong patient stays because someone didn't understand what the MD meant in the first place are other major benefits for physicians, he said.

Cambridge Memorial Hospital, Cambridge, Ontario

277-bed Cambridge Memorial will try to document that benefit for its pharmacy and medical staffs. Cambridge pharmacists will manually log the amount of time they spend on the phone with physicians, both before and after installation of Meditech Magic CPOE, said Rena Burkholder, CIO.

Cheryl MacInnis, Cambridge director of clinical pharmacy, also conducted an extensive literature search on the benefits of CPOE. Ms. MacInnis summarized some 50 CPOE research articles and presented them, along with the original articles, to the medical staff. It was well-received, she said.

Cambridge will also try to boost physician acceptance by paying physicians at their regular rates of pay, for time they spend on the hospital's Meditech Magic CPOE project. Cambridge received an \$89,000 grant from the Ontario Hospital Association's Change Foundation. The technical quality of underlying systems is the one success factor that is heavily within the control of the IT department, so project leaders are focusing on it. For example, Holland Community beta tested an earlier version of the Per-Se order entry system and found the screen flow cumbersome, Mr. Van Doornik said. Per-Se has rewritten the module using Java, and Holland plans a second beta test. "We are building them the very best system we can."

Integration of the underlying system is also key. Dr. Buckland, who is installing QuadraMed Affinity, and Mr. Van Doornik said having a unified, underlying system architecture is a crucial first step. "Without that, you just couldn't do this," Mr. Van Doornik said.

Mr. Van Doornik, (616) 394-3449; Mr. Elkington, (425) 688-5000; Mr. Strong, (612) 627-6339; Ms. Burkholder (519) 621-2333, ext. 1395; Dr. Buckland, (308) 534-5370.

Cedars Sinai Policy: Suspend Physicians Who Didn't Train For CPOE

In a bold (and ultimately, we think, unwise) move, Cedars Sinai Medical Center implemented a policy to suspend physicians if they didn't finish either a 2-hour classroom training course or a self-paced computer assisted learning module on the hospital's new computerized physician order entry (CPOE) system before their units went live. Physicians did receive a benefit--CME credits--for the training, which was set into stone as a requirement in Cedars Sinai's medical staff bylaws.

The strategy seemed at first to be working. Virtually all physicians had completed the course by the time a pilot test went live in the fall of 2002. Of two who had not, one was retiring and the other had moved away, said Michael Shabot, M.D., medical director of enterprise information systems. (However, see the Updates section of this report for the eventual reaction.)

The new system, Patient Care Expert (PCX), is a home-grown patient management, patient accounting, and clinician order entry system. Physician use of the system was to be mandatory. Paper orders were not accepted once the system went live. Physicians who had not taken the training were to be unable to give telephone orders, because their names weren't in the system. At the start, Cedars officials said that medical staff cooperation on the training requirement was fairly high because the system was built largely to their specifications.

Later, however, the entire approach fell apart. See the **Updates** section.

2. Hand-Helds: Many Physicians Do Like Them, But Only for Limited Purposes Most Are Using Devices To Consult EPocrates

Just because many members of your medical staff carry Palm Pilots doesn't mean that they are necessarily ready to accept hand-held applications or would vote for hand-helds as the device of choice for CPOE. Those are our conclusions after listening to a presentation by Neil Smithline, M.D., and conversing with him briefly.

Dr. Smithline consults on hand-held deployments. He says the overwhelming majority of physicians who use hand-held computers use the simplest of all applications, EPocrates, the Physician Desk Reference, with automated drug interaction checking and regular on-line updates via the Internet. EPocrates is simple, convenient, and free to physicians. Some 170,000 physicians, or one out of five in the U.S., use it. Patient Keeper, another vendor, offers a \$35 application that allows physicians to manually enter and store patient demographics, histories and physicals, lab data, and other clinical data on a Palm. Patient Keeper claims 45,000 users of that application.

Now take all other major vendors of wireless applications: Allscripts, MDeverywhere, e-Physician, and OnCallData--applications which do more and cost more. They may have 10,000-15,000 users combined, Dr. Smithline said.

His bottom line: physician adoption of hand-helds has been slow because physicians are not yet convinced that the benefits they offer are worth the money and the trouble. The more

features hand-helds have, the more complex they are, and with complexity come costs and technical challenges.

Some physicians do use hand-helds for CPOE in a few hospitals. However, given Dr. Smithline's observations, and the relative difficulty of performing complex decision-tree tasks on a small device, we believe that at present, synchronized wireless devices of notebook size or smaller are more likely to end up being popular as data retrieval, limited prescription-writing, and transcription devices for physicians on the move than as full-blown order entry units. (There are, of course, exceptions, as noted below.)

In case you're considering providing wireless devices for your physicians, Dr. Smithline offers three basic considerations when looking at hand-held applications:

1. Operating system: The leaders are Palm and Windows CE. At present, Palm is by far the most popular with physicians.

2. Wireless vs. cradle synchronization: at the time of his presentation, Allscripts, MDeverywhere, and OnCallData offered wireless synchronization; Allscripts, MDeverywhere, e-Physician, MedAptus, and I-Scribe offered cradle synchronization. The advantages of wireless are that it is real-time, and that it reduces the load on devices with limited data storage. Wireless costs are coming down and response times are good, but security is often only so-so, he said.

3. Integration: if the hand-held is not integrated with the system that stores patient demographic data, it will not be used, he said.

Here's his rundown on the major hand-held applications, what they do, and what their limitations may be:

Prescribing: major vendors of hand-held prescribing applications include Allscripts, Touch Works, OnCallData, and e-Physician. While having physicians enter their own orders directly into a hand-held can theoretically help reduce medical errors, the system is only as good as the data that has been entered into it. Hand-held applications can, for example, provide drug allergy checking, but only if the patient's allergies have been entered into the system in the first place. Similarly, drug interaction checking works only insofar as patient medications are in the system.

Transcription: major vendors of hand-held transcription applications include Allscripts, Touch Works, MDeverywhere, and MedAptus. Early dictation systems were clumsy because the hardware did not support four-button functionality (fast-forward, rewind, etc.); more recently vendors have built this capabilities into the software.

Charge capture: major vendors of hand-held charge capture applications as of June, 2002, included Allscripts Touch Works, e-Physician, MDeverywhere, and MedAptus. Charges are less likely to be lost with such a system. Also, to the extent that the system builds in insurance company rules, charges are less likely to be rejected by the insurance company.

Six to one return on investment claimed

Studies publicized by MDeverywhere on its own system claim returns on investment of 6 to 1 and sometimes higher, but they have involved academic medical centers and may not hold true for small practices, Dr. Smithline said. His reasoning: while salaried physicians can afford

to be casual about billing, physicians whose livelihoods depend on accurate billing are probably already doing a better job, and therefore may have less room for improvement from solely using a more convenient charge-capture device.

He predicts that hand-held applications will evolve from today's stand-alone systems to a more integrated approach. The evolution is already occurring. Examples include:

Patient Keeper has developed a common platform that includes modules for charge capture, lab data review, and problem lists, and it supports legacy applications. Cerner Corp. recently announced plans to build on the Patient Keeper platform.

Epic: arguably the leader in electronic medical record systems, Epic is developing a hand-held interface to its EMR. It will use either cradle or wireless synchronization. Charge capture is the first functionality it will offer.

Dr. Smithline, (415) 331-7407.

Microsoft Believes It Sees A Future For Tablet Devices

We do note, however, that just as we completed the first edition of this study, Microsoft held a press conference in which it announced the Tablet PC, a Microsoft name for its Windows XP Tablet PC Edition software running on a variety of third-party wireless devices. Two hospital software vendors, Allscripts and Eclipsys, announced physician order entry applications on this operating system and hardware. Here's more information, from a Microsoft announcement (see--
<http://www.microsoft.com/presspass/press/2002/nov02/11-07Tablet2002LaunchPR.asp>):

"Tablet PCs are available in two primary designs: One features an attached keyboard and can be configured in the traditional laptop "clamshell" mode, and the other uses a variety of detachable keyboard designs in a so-called " slate" form factor. All Tablet PCs are designed to be a user's primary business PC, recognizing input from a keyboard, mouse or pen. Tablet PCs are powered by chips optimized for low power consumption and longer life from Intel Corp., Transmeta Corp. and Via Technologies Inc. Tablet PCs are available at retailers throughout the United States. Final retail prices are being announced by each manufacturer."

Whether the Tablet PC or something like it becomes a new CPOE device of choice, or turns into the latest clinical computing device to find its use as a paperweight like the AT&T PNut or a coat-rack like the IBM Clinical Workstation, only time and use will tell.

3. A Cautionary Tale:

Many Hospital Pharmacies Shut Off Patient Safety Software Alerts Why? The Software Interferes With Getting The Job Done

In a test which may offer an implied warning for organizations implementing any clinical decision-support system, it was found that most pharmacists had turned off alerting systems and safety checks in their software because it interfered with getting their work done.

Perhaps it is arguable whether the response of a pharmacist to annoyances in his/her computer system necessarily imply that a physician, or a nurse, would behave similarly. However, it is not unknown for physicians to loudly object--and even to sabotage -- information systems which they perceive as a serious interference with their ability to effectively treat patients. (One of the co-authors of this report wrote about a case in which military physicians began unplugging terminals and reporting them down when superiors tried to force a faulty order entry system on them in the early 1990s.)

Here is what the test found:

Only four of 307 pharmacists found that their software issued alerts on all 10 dangerous errors run through the software as medication orders in the test.

"It was a real eye-opener," said David Classen, M.D., the First Consulting Group medical errors expert who shared the results at a recent meeting of the Association of Medical Directors of Information Systems. Dr. Classen is also helping to shape the Leapfrog decision support system test, which is expected to be available early next spring.

In addition, Dr. Classen said that Leapfrog Group evaluations of decision-support capabilities so far had turned up these observations:

- Most medication errors that harm patients are caused by errors in IV solutions, rather than errors in pill distribution. Therefore, it is possible that bar-code-driven systems at the bedside will reduce errors without actually reducing adverse drug events.

- It is possible for automation to increase medication errors. Dr. Classen said a new pharmacy robot at LDS Hospital somehow misfired, and 273 patients received the wrong medication.

- A study under way at Stanford and several other California hospitals is helping define traits of what he called "high reliability organizations" (basically, safe hospitals).

The most commonly observed characteristic of less safe hospitals: a relentless pressure to produce. "Nothing had a greater impact," he said.

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VI. Our Observations:

Summary: Is Your Principal Goal To Reduce Errors Or To Reduce Costs And Control Resource Use?

CPOE can be principally a tool to reduce errors. Or, it can be principally a tool to reduce physicians' consumption of resources. Or, it can be a bit of both. However, control over physician use of resources can also be a political battleground -- an "HMO through the physician entrance"-- to the hospital. The authors argue below that the principal reason that the large industrial entities are expressing interest in CPOE via the Leapfrog Group is not to improve care, but to seek to standardize physician actions for the purpose of reducing resource use and costs. This is not necessarily an undesirable purpose. However, you, as a caregiver implementing software, should approach it eyes wide open.

Discussion: Two Groups With Divergent Agendas Promote CPOE

Two divergent core reasons exist for implementing CPOE. You -- that is, the medical and bean-counting managements of your care-providing entity--must decide which is/are yours.

As stated in our introduction above, the Institute of Medicine report, "To Err is Human," and the Leapfrog Group's push for CPOE are widely cited as mutually consistent, dovetailing pressures to implement CPOE. It's our view that this is seriously faulty logic. Let us explain.

First, IOM and "To Err Is Human"...

The stated mission of IOM is to "advance and disseminate scientific knowledge to improve human health." That is, to use science to improve medical care. "To Err Is Human" seeks to do so by reducing medical errors.

We would observe, however, that if goal is to improve care, then error reduction is only a part of the appropriate strategy. Vastly more care fails the sick and injured because it is not given than fails because it is given improperly. Most of us understand intuitively that this is so. In fact, the IOM more recently seems to be trying to refocus the debate away from CPOE as a panacea in a new publication, "The Future of the Public's Health in the 21st Century," announced Nov. 11, 2002. "The report calls for the federal government to lead a national effort to examine options and develop plans for making comprehensive and affordable health insurance available to everyone," according to a National Academy of Sciences announcement about it.

It also intuitively seems likely that more adverse treatment outcomes arise in ways unlikely to be prevented by CPOE with decision support than occur in ways which are headed off by CPOE. For example, a patient the authors know had a tiny tumor which went undiscovered, apparently because the reading physician was just too busy to notice or to explore an anomalous spot on an MRI. In that same patient, different physicians failed to spot a cancer metastasis--in part because diagnostic activity for cancer is fragmented, and no one compared a tiny anomalous glow-spot on a PET scan image with the position of a lymph node on a CAT scan. These are two sets of real-life examples with which the authors of this report are closely familiar, and which would not be headed off by a CPOE system.

In another example, the final writing of this report was interrupted in October, 2002--first

for a week by an injury to one of the authors, and then for another week by a series of treatment bungles. These adverse outcomes (“medical mistakes,” to the mere layman) do not appear anywhere in the medical records of the treating institution from where they arose. However, they posed a larger danger to this author’s life than did the serious injury (a pneumothorax and multiple broken ribs) for which he was being treated. Their repair cost more than another full week for a series of outpatient visits at a second institution (where, obviously, a medical record was created, but with no cause-and-effect link to the errors which made them necessary).

If there is one core activity needed to reduce medical errors, it is that of judiciously spending more money on health care on an ongoing basis. To reduce adverse outcomes, that money would likely best be spent on improved access to care, better diagnostic equipment, more intensive training of residents, more peer review and internal quality-assurance watchdogs, and above all, more time for clinicians to do their jobs well without being rushed. CPOE, while certainly useful, logically falls lower on the list as a strategy if the objective is to improve care.

We believe that the main reasons CPOE enjoys its high status as a strategy are twofold: (1) “errors” made the political limelight because medical errors attract and hold public attention, and therefore resonate in the political and media arenas in ways that such larger issues and inaccessibility of care do not; and (2) CPOE itself shows a likelihood of producing measurable results. Measurability has public-relations value: one can say, and prove, that one did something.

Second, Leapfrog...

The sponsors of Leapfrog are industrial organizations which who have a lengthy, unbroken, and sometimes far too effective track record of seeking to reduce their health insurance costs.

The larger and longer-term goal of the industrialists behind Leapfrog is to reduce consumption of health care resources, not increase their use, which would be needed to turn around the decade-plus-long decline into "sicker and quicker" discharges of hospital patients.

We do not mean to suggest that there is anything inherently unethical about these cost-cutting motives. Rather, we think that as one implements CPOE, it is extremely important to understand them for what they are. Caregiver organizations probably should use CPOE to adopt some resource-saving strategies.

However, we think it takes a tremendous stretch of wishful imagination to conclude that the people who fund Leapfrog – and therefore, Leapfrog itself, have improving care as a guiding motivation. The very core arguments that Leapfrog makes for CPOE contradict with the actions of its masters. It is widely reported that industrial companies are cutting back on employee health benefits and shifting health care costs to employees. Some employees thus lose access to health care, and others, hit with a higher proportion of costs, opt out of health plans or fail to obtain treatment.

As this goes on, we hear Leapfrog putting forth the argument that medical error reduction reduces lost employee time and thus improves industrial productivity. If that is true, then the same is true of providing better health care benefits.

We concluded that the real rationale behind Leapfrog’s endorsement of CPOE lies elsewhere, and that it is as simple as this: it is viewed as a way to reduce physicians’ ability to

consume medical resources. That is, it's a software HMO.

CPOE, in the hands of an overly money-focused management, can take treatment decisions too far down that path. The worst bottom-feeders among HMOs (and other managed-care entities) are those which cut expenditures and maximize net income as the principal goal. A hospital management which uses CPOE principally to put a throttle on physician consumption of resources can be characterized as having sneaked its own HMO in through the physician's entrance.

In other words, a clinical system with CPOE can either focus on improving care, or on limiting resources, or on a balance between the two goals.

Whose hand will be on the steering wheel? Yours? Washington? Leapfrog? The HMO?

If a clinical system with CPOE and decision support can be used to limit resources, a second question is: whose hand is on the steering wheel?

We think the sponsors of Leapfrog view CPOE as a version of industrial Enterprise Resource Planning (ERP) software. Reducing errors does reduce costs--but reducing consumption of resources in the course of production--that is, requiring a hospital staff to behave like the production line of an industrial organization -- has the larger cost-reduction potential.

CPOE, when coupled with decision support, offers the possibility of exactly the kind of programmed, cost-driven channeling of decisions that the sponsors of Leapfrog have always had as their principal health care agenda.

This use of software to guide, pressure, or force physicians into resource-conscious decision paths is, as stated, already happening in CPOE systems. It is prominent in Vanderbilt University Medical Center's Whiz system. Other academic medical centers and community hospitals with residency programs have also cited resource consumption decisions being among the core functions of their CPOE systems. Two of the respondent medical centers in the survey section of this report allude to greater control over physician-ordered resource consumption, one citing "clinical practice guideline enforcement" as a benefit, the other referring to an "increase in IV to PO (intravenous to patient oral medication) conversions," which can save significant amounts of money and reduce the risks of IV-caused infections.

In addition, we reported last year on presentations by John Halamka, M.D., CIO of CareGroup Healthcare System, a large Boston, Mass.-area physician group practice, who said that a software system which physicians use in a manner similar to a CPOE (and which could likely be integrated with CPOE) saves CareGroup \$10 million a year by heading off referrals to physicians outside the group practice.

That system, which CareGroup calls Service Tracking and Referral System (STARS), is a CareGroup add-on to the New England Health EDI Network (NEHEN), a network which allows its members to send HIPAA-compliant electronic eligibility verifications, claim status inquiries, referrals, authorizations, and specialty referrals. The way it works is that all 535 of CareGroup's primary care physicians use NEHEN to obtain payer approvals to refer patients. If the caregiver seeks a payer approval to refer a patient to a specialist who is not a CareGroup provider, a STARS screen pops up, warning the primary-care physician that this out-of-network referral must be justified, that it will be reviewed, and that it may be delayed. The system invites the

physician to refer to a CareGroup specialist. STARS issues a similar challenge if the primary care physician requests too many specialist referrals.

A referral, while not strictly speaking a medical "order," is, in effect, another kind of physician order. Thus STARS is a "decision support" tool, interjected into the process of arranging for further clinical care for purposes including maximizing revenues.

It is our view that as CPOE systems evolve, the error-reduction functions (misunderstood handwriting, drug interactions, wrong prescriptions, etc.) and the time-saving functions (faster movement of prescriptions, tests, and faster resulting treatment) will be seen as lower-level functions of CPOE. They'll always be quite important--but they will be the small stuff. The emerging principal function of CPOE systems will be as a software system to get more bang for the health care buck by heading off uses of expensive medical resources which health care management deems to be "unnecessary" or "cost-inefficient" or "wasteful," or whatever term management applies to its decision-making.

And as that happens, the core questions are: "Where do you draw the line?" and "Just who are you--clinical management the financial management, or an outside financial or regulatory influence?" That is, a CPOE system with decision support can readily be devised as a way to manage (and justify) a lower-quality, denial-of-expensive-procedures, faster-discharge version of hospital care. A clinical system with CPOE can be a system which not only turns the hospital into an industrial production line, but builds a bullet-proof record to medically justify it.

This emerging capability of clinical information systems with CPO to make resource-use decisions will require decisions by the implementing caregiver's money and medical managers:

What do you want your clinical information system to do?

Who is the "customer" of CPOE -- the patient, the physician, or the payer, or (we hope) some careful balance of all three?

--Bill Donovan, Publisher, Inside Healthcare Computing

Also See The Supplement and Index Beginning In Next Section

Supplement and Update to:

Computerized Physician Order Entry: How to Make It Work

A study by the staff of Inside Healthcare Computing

This supplement is provided to you because fast-moving events are occurring which affect your study of how to do CPOE successfully. It includes information excerpted from 2003 issues of the biweekly newsletter, **Inside Healthcare Computing**.

This supplement is an extra report, provided to you as a purchaser of the CPOE study. Its purpose is to provide you with updates, news, and additional "how-to" information on CPOE since this study was published in November, 2002.

We believe that our enclosed January, February, March, and October, 2003 reports on the difficulties with a CPOE system, and the successes, at Cedars-Sinai Medical Center in Los Angeles, Calif., may be especially of interest.

If your organization is embarking on or considering CPOE, we highly recommend that you subscribe to our biweekly newsletter, Inside Healthcare Computing. We will continue to provide new information on CPOE throughout the year 2003 and beyond. For example, an upcoming issue of the newsletter will carry information on typical costs of CPOE. To subscribe to Inside Healthcare Computing, see:

<http://www.insidehealth.com/about.html>.

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Inside Information Group, Ltd.

3600 S. Harbor Blvd., Suite 220, Oxnard CA 93035

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Excerpted from Inside Healthcare Computing, Vol. 13 No. 6. Jan. 27, 2003:

Physicians Force Cedars To Suspend CPOE

In a tense staff meeting, 400 physicians confronted Cedars Sinai Medical Center management Jan. 18 and voted nearly unanimously to halt use of the four-month-old home-grown computerized physician order entry system, Patient Care Expert, local news sources say. MDs complained that the system as built is dangerous to patients and impedes medical practice.

Management said the system didn't pose a safety threat, but conceded it's tough to learn and takes too long to enter orders. MDs complained of delays of hours to days in execution of orders for meds, supplies, and lab tests. Supporters of the system said problems are fixable with more user-friendly design. Cedars had required all MDs to use it under pain of not being allowed to practice (See "Cedars Sinai Policy Suspends MDs Who Don't Train For CPOE," IHC, 8/5/02). The system is a thin-client application with browser-based interface built on a platform from Tenfold with help from Perot Systems.

Excerpted from Inside Healthcare Computing, Vol. 13 No. 7. Feb. 10, 2003:

Object Lessons:

Why MDs Told Cedars Sinai To Suspend CPOE

Physicians at Cedars-Sinai Medical Center, Los Angeles, receive an abundance of useful computer tools. Results are available in their offices in a browser-based display. All lab results, all PACS images, all charts from the emergency department, ICU, and labor and delivery, are available at their fingertips, as are dictations and transcribed reports.

In addition, over 50, and perhaps as many as 100, physicians had input into the process of designing computerized physician order entry screens. So why, then, did physicians show up at a mass meeting and demand that the computerized physician order entry (CPOE) system be taken down?

Background: we reported Jan. 27 that in the face of a physician rebellion, 877-bed Cedars-Sinai took down its CPOE system less than three months after its Oct. 24 go-live. The CPOE system is a feature of PCX, an in-house-developed clinical information system the hospital hopes to sell to others. The decision to suspend CPOE came after an angry Jan 17 meeting, attended by more than 400 MDs who were nearly unanimous in their demand that it be taken down.

A great deal is at stake, and not just intangibles like reputations. As we'd reported Jan. 27, PCX had been expected to cost \$16 million. Rumor has it that overruns and 10 extra months of development have raised the total cost of the largely successful PCX system to \$34 million. PCX also includes patient billing, ADT and coding, and abstraction modules.

Michael Shabot, MD, director of enterprise information services, told IHC he believes the CPOE start failed because not enough MDs became deeply involved in the development process.

That 50-100 MDs who had some input into screen flow and screen design come from among a staff of about 2,000.

It is also possible that Cedars' physician input unintentionally violated either of two key rules of CPOE design: one, physicians who want to work on CPOE probably like computers, and are therefore the wrong ones to ask whether they like the resulting screen designs; and two, different specialties do things differently.

For example, the system was piloted in July in the big Cedars Ob/Gyn department, where it was fairly well received, Dr. Shabot said. A difference was that Ob/Gyn care is heavily driven by order sets, and Cedars Ob/Gyn MDs did participate heavily in a rewrite of departmental order sets. The order sets are evidence-based and optimized for the best possible outcomes, he said. "I believe that part of the project was successful."

In the rollout, physicians objected that they had difficulty using the system, and to the amount of time it took to enter orders, Dr. Shabot said. The arrangement of items on screens, the content of drop-down menus, and system response times were issues raised by MDs. The implementation also uncovered unexpected problems related to how well the system supports the Medical Center's workflow, such as problems transferring data, along with patients, from department to department within the hospital, and back again, he said.

The false start created no patient safety problems, he said. For all the turmoil, patients may have been safer when it was running because no orders were lost in the system, he said.

Cedars Sinai plans to work on making the CPOE system acceptable to physicians, but there's no timetable for going live with it again. Dr. Shabot predicted that it will be "a matter of months--not weeks and not years." He vowed that it will go up only after physician concerns have been addressed and "not one minute before."

We couldn't reach Cedars Sinai CIO Doug Jones with our questions about the complaints concerning system response times and their causes. Two years ago, he said PCX was being built on Oracle and UNIX, which should be able to accommodate any amount of traffic with sufficient hardware. The system is browser-based, on a thin client, built on a technology from a Salt Lake City, Utah, firm called Tenfold.

There were complications from taking the system down. Physicians updated or created 160+ departmental order sets in preparation for the new system. However, these new orders never existed on paper, and old order sets were not reprinted. The new orders will have to be transcribed to paper and printed in triplicate, said Dr. Shabot. He called that "the most difficult part about going back to paper." It wasn't clear how Cedars is getting by until that can be done.

PCX is a very slick tool in other respects. That may be part of the problem, Dr. Shabot said. Physicians may have expected CPOE to be relatively easy, as results reporting had been. Possibly due to that expectation, they didn't jump in enough to participate in the decision-making on screen designs.

This time, he said they will realize what CPOE is, and what it is supposed to do, he said. "Our outlook is excellent, assuming we have really good participation in the process."

Other aspects of PCX are less controversial. Coding and abstracting, which went live in October, is working and is expected to stay up, he said. ADT and patient financials will go up on schedule in February, Dr. Shabot said.

Nurses, who also document in PCX, seem to be more satisfied with the system, possibly because nurses in some parts of Cedars have been documenting in the Carevue ICU system and Emstat ER system for years. Some medical and Ob-Gyn units, as well as the Neonatal Intensive Care, have sent e-mails asking that nursing documentation stay up in their parts of the hospital, Dr. Shabot said.

Cedars started work on PCX about three years ago, after shopping and finding nothing suitable. Cedar Sinai's longtime associate, Perot Systems, assisted in development work. Perot is also in line to provide support for the commercial product, according to public documents. The underlying technology platform came from vendor Tenfold.

Tenfold has recently been struggling out of a financial pit, brought on by shareholder lawsuits and disputes with customers, including Cedars. Despite Tenfold's money-back warranty that the system will be delivered on time, Cedars go-live was at least 10-months late. Cedars restructured its deal with Tenfold in midstream, taking back responsibility for completing the system build and implementation in exchange for changes in the financial deal.

Excerpted from Inside Healthcare Computing, Vol. 13, No. 8. Feb. 24, 2003:

MDs Heeded Alerts; Rock-Solid Up Time
Cedars-Sinai CPOE: What Went Right

In our Jan. 27 and Feb. 10, 2003 issues, we reported on the physician protest that caused 877-bed Cedars-Sinai Medical Center, Los Angeles, Calif., to take down the computerized physician order entry (CPOE) component of its in-house-developed PCX patient care system. (To find those issues on our web site, input the keywords "Cedars Sinai" and "CPOE" into the subscriber search engine at www.insidehealth.com.)

However, some things also went quite right with the system, Michael Shabot, M.D., Medical Director, Information Services, told fellow physicians in a meeting of the Association of Medical Directors of Information Systems (AMDIS) on Feb. 9:

- There were no system crashes or unscheduled down time in three months for the Unix-based system, built on a Tenfold Corp. platform with extensive tech work from Perot Systems Corp. Scheduled down times were few and brief -- 15 minutes or so in the wee hours of the morning every couple of weeks, he said.

- The embedded First Databank drug allergy alerts and dose range checking worked and seemed to have a profound impression on physician behavior. In all, 39,000 medication alerts fired. MDs responded by changing 54% of orders warning of drug interaction alerts, 31% of orders setting off drug allergy alerts, 24% with duplicate-drug alerts, and 13% when dose-range alerts fired -- 35% overall.

- No patient orders were lost, and in contrast to comments by some MDs to an L.A. newspaper, patient safety was never put at risk.

- A "Guess the Order" contest ended. (Cedars had actually run a "Guess the Order"

contest, in which the prize was a free dinner for two for guessing what the worst-handwritten medication orders, he said.)

- The system also replaced a manual meds administration record which poor handwriting and crossouts made sometimes even worse than the least legible written prescriptions.
- As we'd previously reported, the system was well-liked in departments with a lot of cookbook order sets (principally Ob/Gyn and the neonatal ICU).

Lessons learned and your decisions

So what were the fundamental reasons the first attempt was such a public failure?

Despite attempts, Cedars couldn't get the right MDs to evaluate and give feedback on the system before going live.

Excerpted from Inside Healthcare Computing, Vol. 13, #25. Oct. 20, 2003:

Delay Lengthens, But Cedars Foresees Completion Of Patient Care System

Cedars-Sinai Medical Center, Los Angeles, Calif., continues its slow march toward implementation of its in-house-developed clinical information system applications. As you probably recall, Cedars pulled out the CPOE part of the system nearly a year ago in the face of a rebellion by physicians (IHC, 1/27, 2/10, 2/24/03). We also reported that Cedars at one point was considering all options, including licensing a commercially available system (IHC, 5/19/03).

This report was prompted by sources who told us that Cedars directors will consider approving the in-house application in January, 2004, with a proposed target date for go-live of July, 2004. But one source also indicated that there was concern on the Cedars board about the "platform" it runs on.

This source said that due to that concern, the Cedars board has asked an in-house tech group, the "product team," for additional testing. Another source said the hospital might upgrade either the operating system or database.

However, Richard Jacobs, Cedars Sinai's Senior VP for System Development (a senior corporate planning position, not an information systems position), who is one of those in charge of the project, said there is no current unease over any aspect of the underlying platform. He acknowledged that the system is being tested, but said it's just thorough testing of a "pre-flight" nature. "There is no one particular area we're worried about."

The tentative go-live date of July, 2004 is for patient management and a nursing-to-ancillary order communications system that goes under the acronym "PMOC," he said. Cedars "fully expects" to go live with physician order entry after that, but is being "guarded" about when.

The project is far behind its original schedule. In late January, 2003, after use of the CPOE system was suspended, Michael Shabot, M.D., told us to expect PCX patient management to go up the next month. Some parts of the system have remained running; to the best of our knowledge, PCX coding and abstracting went live about a year ago.

If there is anything to the expressed concerns about the "platform"--a broad term--it was

not clear which aspects might be involved. Tenfold CEO Nancy Harvey referred most questions to Mr. Jacobs, but said Enterprise Tenfold (formerly the Universal Application Platform), the middleware being used in the system, is "exceptionally robust" and its performance is "vigorous" at Cedars. The system also reportedly runs on Unix and an Oracle database. Tenfold's software runs on any operating system and with any database, Ms. Harvey said.

Excerpted from Inside Healthcare Computing, Vol. 13 No. 6. Jan. 27, 2003:

Dr. Bria: Disjointed, Non-Integrated CPOE Can Foment Medical Errors

In a CPOE system without pharmacy integration, orders are entered by the physician, printed, and then typed into another system by the pharmacy department.

That can be irritating to the pharmacy staff, and worse: a disjointed CPOE system can interfere with patient safety. "Errors are encouraged when care processes are changed to take away the existing beneficial interplay between clinicians," said William Bria, M.D., medical director of clinical information systems at the University of Michigan Medical Center, in a recent presentation and followup [Inside Healthcare Computing](#) interview.

In the absence of CPOE, a physician writes a pharmacy order, a nurse checks it, and a pharmacist checks it again -- that is, "They back each other up," he said. But CPOE can put everyone on his or her own. Some information systems in which CPOE has been implemented are "Rube Goldberg" contraptions, so customized for different groups that they can't possibly work in each other's modules, he said.

Dr. Bria said several of the most ballyhooed physician order entry installations in America are not integrated with their hospital's or health system's pharmacy systems.

"These are the famous ones, the ones everybody talks about." Dr. Bria is also president of the Association of Medical Directors of Information Systems (AMDIS). He said he became aware of these problems during an information system evaluation and search by the University of Michigan. Drawing on literature searches and his own experience, he listed some of the strange thing that can happen when care processes becomes disjointed:

- A recent article in the Journal of the American Medical Informatics Association recounted the situation of a hospital that added barcoding on top of CPOE. A physician would go into the system and discontinue an order. From the perspective of the nurse, who just used a barcode-driven system to give that medication to that patient, the order would have disappeared from the system entirely, and the dose would be impossible to chart. "The net was a whole new way of having errors," he said.

- He personally witnessed a situation in which a resident wrote a STAT order, but the patient did not get the medication for an hour. The reason? The nurse was accustomed to being alerted verbally to STAT orders, but the resident never mentioned it, thinking it was "unnecessary" because the organization had just installed physician order entry.

- In a third case, a nursing executive decreed that if the hospital was to have physician order entry, it would be used exclusively by physicians and no nurse would be trained on it. Nurses were unable to back up physicians, and the system stayed up for only one week.

Excerpted from Inside Healthcare Computing, Vol. 13 No. 6. Jan. 27, 2003:

This Reference Lab Can Set MDs Up With Direct-To-Lab CPOE

A reference lab, Cognoscenti Health Institute, is in the early stages of building a vital piece of the healthcare IT infrastructure -- CPOE from the office-based physician direct to the reference lab using Internet-based connectivity.

Despite an early IT setback (IHC, 12/09/02), the business appears to be going like gangbusters. Physician offices are signing up for the service almost as fast as they find out about it, claims founder Philip Chen, MD. "Among physician offices, our business closure rate is almost 100%," he said. The business opened in March, 2002; by October, about 100 offices had signed up. He said at the time, "We are headed for break-even by the end of the year (2002)."

Given the popularity of the model, it also strikes us as a wonderful opportunity for the right hospital to offer physicians in its area. Cognoscenti did have an advantage: it's the only independent lab in an area of 2.4 million people.

After the demise of the first technology attempt, Dr. Chen seemed satisfied with the replacement system. It uses an order entry results/reporting system by Qextron Inc., Raleigh, N.C. Orders and results travel via phone line. Cognoscenti lends physician offices a touchscreen monitor, which Dr. Chen likens to the ordering systems used by some restaurants. An MD can place an order in as little as 15 seconds, he said. Physician office encounter form information is automatically screen-scraped into the Qextron system, saving time and potential errors. Medical necessity requirements are automatically calculated and advance beneficiary notifications printed.

The lab can test blood for more than 250 diagnoses. A Web portal is provided separately by LabDat, Glendale, Calif. Physicians can already tap into results; Cognoscenti expects to eventually extend the privilege to patients.

Dr. Chen said Cognoscenti avoids running afoul of Medicare Fraud and Abuse laws by lending the hardware and software, and charging MDs a small, one-time placement fee. Information: Dr. Chen at Cognoscenti, (407) 882-0212.

Excerpted from Inside Healthcare Computing, Vol. 13 No. 7. Feb. 10, 2003:

This Book Tells Which Vendors Are Making CPOE Work, and How Well

For a quick fix on how tough it will be to install a given vendor's computerized physician order entry system, try asking the number of full-time personnel it will take to install the system, on the part of the site and on the part of the vendor. A product that is "ready to roll" with less implementation effort should be "cheaper, quicker to install and more reliable."

The advice comes from Medication Safety Tools 2003 a newly updated report on CPOE and medication administration systems by Richard Kremsdorf, M.D. Some of his suggestions:

- Pay close attention to your own initial response to a 15 minute vendor demo. "Focus on clicks and keystrokes." "If you can't grasp the metaphor in that interval, and like it, consider whether your nurses and physicians on the front lines will do any better."

- Avoid concluding that if a very complex function is available, then simpler ones must be there, too. "Assume that if you don't see it, it doesn't exist."

- “Keep track of specific examples used to demonstrate functionality and insist the code for the examples be included” in the product you are shipped.
- Learn whether the screens you are being shown represent “the product to be delivered” or the one you might choose to build “using their tools and a few starter screens.”
- If clinical decision support (CDS) and alerting are driving your selection process make sure you know exactly what CDS will ship with the product. “Often vendors ship tools to create advice and rules but not the rules themselves.”

Here’s more of Dr. Kremsdorf’s advice:

If it’s relative ease in creating your own clinical alerts you want, choose Epic Systems. If it’s vendor-supplied clinical content you are after, take a look at McKesson or Pyxis VisualMed. If it’s the ability to selectively control drug-drug interactions (so that, for example, your students receive more alerts than your attending docs) choose Eclipsys or Pyxis VisualMed. They handle those particular jobs particularly well. But don’t look to Meditech for dose parameter checking, or to Siemens Invision for strong alerting capabilities.

The 90-page report provides vendor-by-vendor feature/functionality ratings of CPOE and medication admission record (MAR) systems. Vendors are scored based on 74 CPOE criteria, 21 of them vital, and 42 medication administration criteria, 13 of them vital.

In Dr. Kremsdorf’s view, when it comes to vital functionality, Pyxis VisualMed has the best feature/functionality of any CPOE system on the market today.

Functionalities are also scored according to availability. You can, for example, look at Epic Systems scores on CPOE and MAR and see that the systems are not yet in pervasive use, although a company like Epic would probably tell you that anyway.

You can also see vendor progress. For example, Cerner Millennium stacks up much better on vital CPOE functionality than it did in 2001 or even 2002. Dosage parameter checking is also more complete.

Participating vendors are Cerner, Eclipsys, Epic, IDX, McKesson (Horizon), Meditech Client Server, Meditech Magic, Per-Se, Pyxis VisualMed, and Siemens Invision.

Some examples of the sorts of information that are available in Dr. Kremsdorf’s report:

- Pyxis VisualMed, Epic, Cerner, Eclipsys and McKesson lead the pack when it comes to 21 vital CPOE feature functions; Meditech (both C/S and Magic) and Per-Se trail. Siemens Invision is somewhere in between.

- Per-Se scores highest on vital MAR functionality. Per-Se MAR system is well integrated with the rest of Per-Se, and in use at “multiple sites.”

To Dr. Kremsdorf’s way of thinking, there’s lots of room for improvement in MAR systems. For example, most systems lack the ability to correlate treatments with clinical observations and labs. McKesson, Per-Se and, to a lesser extent Cerner are the exceptions. Most also lack the ability to display germane labs or clinical observations appropriate to the medication. Cerner and Per-Se are the exceptions. Eclipsys and Siemens Invision also provide the capability, but less satisfactorily.

- For all the newness of Horizon Expert Orders, the system stacks up well when it comes to providing high-priority functionality.

The report is available to hospitals at HIMSS.org for \$299. It would be useful to anyone

who is shopping for the systems in question. However, it is based entirely on vendor assertions, vendor demonstrations, and Dr. Kremsdorf's opinions. He encourages readers to re-score functionalities based on their own perceptions.

Excerpted from Inside Healthcare Computing, Vol. 13, No. 8. Feb. 24, 2003:

Tablet PCs: Hype or Help?

The Microsoft Tablet PC is impressive. The question is whether it's right for the uses Microsoft has identified for it -- as a carry-around for physicians, nurses, and other caregivers.

Physically, it's the size of a thin laptop. It runs on what Microsoft calls a "superset" of Windows XP. Weight is about 2.5 to 3 lbs, depending on options, one of which is a keyboard. The screen is on the outside of a lid that opens like that of any laptop. It swivels 180 degrees to allow its use with an optional, typical-laptop-sized keyboard. The device comes with wireless LAN capability built in. Prices vary with the configuration, from \$1,700 to \$2,500.

In tablet mode, depending on the software displayed, one can either check boxes or write on the screen with the stylus; it comes with handwriting recognition software.

In a test, I started to write, "Now is the time...", and it quickly read my prescription-quality scrawl as, "Now is the tusk..." -- not bad. Microsoft's Ahmed Hashem, M.D., said it "learns" the user's handwriting over time.

Eclipsys, Stentor, Allscripts, Greenway Medical, and possibly other health care IT vendors are developing applications for it. They expect that physicians will do rounds with the device. Abington, Pa., Memorial Hospital, 500 beds, and big home health care provider Gentiva Health, Melville, N.Y., are piloting its use. Abington plans to try it with Eclipsys's Sunrise XA.

But the design does raise questions:

1. It's vulnerable to fluids. I mentioned to Microsoft's Ahmed Hashem, M.D., that during my last ER visit in October, a young woman was wheeled in on a gurney nearby and suddenly hurled her dinner, some of which landed in the pocket of a staff member about five feet from her. (This girl's projectile performance was the talk of the ER staff into the wee hours, so maybe that's an unusual event.) The Microsoft response: an ER might not be the first place one would want to use a Tablet PC, but it can be ruggedized. That would add both weight and cost.

2. It takes two hands to use, and doesn't fit into a pocket. Physicians would need to put it down to do anything with a patient. I spent several days in one of our three local hospitals here recently; in both the ICU and general med-surg rooms I occupied, there would have been no safe place to set down a fluid-susceptible \$2,500 device that size--in fact, I was constantly knocking things onto the floor--but that's an older, low-budget facility. In another, newer local hospital, there seemed to be numerous safe spots. (I haven't been in a med-surg room in the third.) So where to set it down that it won't be knocked to the floor, spilled upon, or electronically interfered with will be an issue in every room the caregiver visits.

3. Reboots, etc. A friend just converted his office from Windows 98 to XP, and says he traded in Win98 freezes/crashes for sudden, automatic reboots with XP. Also, I ran into a CIO friend at the CHIME meeting who saw freezing problems with the version of XP running on the Tablet PC, which he's testing against other devices. This CIO said he called a Microsoft tech

staffer, who responded, “Just reboot it.”

4. The price. Ouch. It’s about \$1,000 more than a laptop (more for a ruggedized unit).

Gartner Group VP and Research Director Kenneth Kleinberg asked a Gartner gathering of 300+ CIOs and industry execs on Feb. 10 how many of those present had Microsoft Tablet PCs. I saw two hands go up, and probably missed 2-3 others. A longtime healthcare IT analyst, Kleinberg said that in his view, as the bugs are worked out, and if, as likely, the price comes down, “then it’s a reasonable device.”

5. Weight and bulk. One can imagine that if design and feature/function advantages end up making it the right device, it could become the doctor’s black bag of a new era.

Microsoft isn’t, of course, the only company with a Tablet PC. In a commercial for her company than keynote at the 2003 CHIME meeting, Hewlett-Packard’s Carly Fiorina plugged CPOE (she called CPOE “computer” physician order entry) and asked, “How do I get physicians who have been walking around with clipboards for decades to use simple Tablet PCs?”

Summary: Microsoft has an answer while other big vendors are still asking that kind of question: work with HIS vendors to develop applications. So, if I were to bet on any tablet device bigger than pocket-sized for hospital rounds, it would likely be a future iteration of Microsoft’s. However, a key issue is whether portability and complex order entry screens of today and tomorrow can accommodate to each other. --Bill Donovan, Publisher

Excerpted from *Inside Healthcare Computing*, Vol. 13, No. 9. March 10, 2003:

Hospital CEOs Are All For CPOE--Or Are They?

The results of the recent HIMSS survey ([IHC](#), 2/24/03) saying most CIOs plan to implement computerized physician order entry in the next two years prompted us to ask: “Are hospital CEOs as gung-ho for computerized physician order entry (CPOE) as IT executives are?”

The answer seems to be a truly mixed message: definitely yes--but no, not really.

In Deloitte & Touche’s biennial survey of hospitals CEOs, issued in November, 2002, 61% said they plan to implement CPOE in the next two years--a close correlation with the 64% of CIOs and other hospital IT execs in the HIMSS-Superior Consultant Co. Leadership survey that they will buy CPOE in the next two years.

However, when asked what’s the most important concern on their minds, neither quality of care nor its CPOE-related subset, medical errors, is #1 with hospital leaderships.

Financial survival is. Not only is it the top priority by a good margin, but it has leapfrogged all other issues as a top concern of most hospital boards of directors since the prior Deloitte survey two years ago.

Two years ago, “financial viability” was a top concern of only 8% of hospital boards, and “quality of care” was tied with “physician relationships” as most-mentioned board concern (43% each). In the new survey, while quality is still a big concern of 47%, financial viability has leaped eight-fold to #1 at 65%.

The Deloitte authors express deep skepticism over CEOs’ reasons for interest in CPOE.

The chapter on IT in Deloitte’s November 2002 survey report opens with, “Interest in expensive computerized physician order entry (CPOE) systems...suggests that hospitals are

responding to outside pressure to invest in IT as a way to improve the quality of care. But this reactive approach may nor may not be appropriate for a given institution. Relatively few hospitals have the support systems in place that are needed to realize the full potential of CPOE...Many CEOs might be better served by taking a more proactive, systematic approach to IT planning and spending.”

The final chapter of Deloitte’s survey report, “A Call To Action,” puts it even more bluntly: “Invest in IT in the right order.... Hospitals that fail to think systematically about this issue may end up wasting millions of dollars on a single technology, e.g., CPOE, that does not yet fit...” The Deloitte survey said that over the next 2 years:

- 58% of CEOs plan to implement or upgrade clinical information systems;
- 55% will implement or upgrade electronic medical records systems;
- 48% will implement or upgrade voice or imaging systems;
- 38% named PDAs, 35% named disease management systems, and 22% clinical messaging as systems they’ll implement or upgrade over the same period.

CPOE needs some of these other clinical systems as a foundation. And both CPOE and these other systems are expensive. In the Deloitte survey, many CEOs are saying they’ll be spending on both these foundations and CPOE over the next two years. That seems to suggest that most of the “CPOE-yes” CEOs don’t know either the time frames or the costs involved.

And in another survey (Modern Healthcare, December, 2002), when asked, “Compared with 2002, how much spending do you foresee at your healthcare organization on information technology in the new year,” only 18% said “much more.” In other words, “CPOE, yes...but actually spend big money for it--Uhh, get in line.”

This data suggests good news and bad news for health care IT execs. The good news: CEOs feel the pressure to improve quality, and the time may be ripe for investments in core clinical information systems (and if you’re ready, in CPOE). The bad news is twofold:

- First, Deloitte seems to agree with the view expressed by our publisher last issue that CPOE has been vastly oversold as a quick fix.
- Second, a multimillion-dollar system that doesn’t promise a hard-dollar return isn’t on the top of hospital boards’ priority lists. Deloitte says that the median profit margin of hospitals surveyed -- 2.1% -- is too thin to support CEOs’ clinical and IT technology shopping lists.

The report on the survey, titled, “The Future of Health Care: An Outlook From the Perspective of Hospital CEOs, Ninth Edition 2002,” has a lot more details on what hospital CEOs are thinking. To obtain a free copy, go to http://healthcareceosurvey.com/ceo_info/default.asp

Excerpted from Inside Healthcare Computing, Vol. 13, No. 10. March 24, 2003:

Unit Costs Higher For Smaller Hospitals

CPOE Costs In 5-Hospital Study: \$28,800 Per Bed

CPOE systems cost \$6.3 million to \$27 million at 5 provider entities ranging in size from 547 beds to a 717-bed two-hospital, 15-clinic entity, and took 18 to 36 months from the start of selection to end of rollout. A sixth provider did a pilot, then backed off, but said it’ll try again.

Using these figures from actual sites, First Consulting Group estimated that in a 500-bed hospital with 25,000 admissions/year, CPOE would cost:

- \$7.9 million to implement and
- \$1.3 million/year to run.

Assuming a system life of five years (our assumption, not FCG’s), that’s \$28,800 per bed, or \$115 per admission.

The study is called “Computerized Physician Order Entry: Costs Benefits and Challenges.” First Consulting, which has staked out a position of CPOE expertise as a consulting firm, did the work for the AHA and the Federation of American Hospitals.

(Some highlights were given by David Classen, M.D., an FCG vice president and CPOE guru, at the 2003 HIMSS meeting, but the 50-page report has more details.)

The six entities studied:

- **Lehigh Valley Hospital and Health Network**, an **IDX LastWord** site, which was still implementing at its biggest (600-bed) hospital in Allentown, Pa.;
- **Boston, Mass., Medical Center**, 547 beds, an **Eclipsys** site;
- **Ohio State University Medical Center**, **Siemens Invision**, 3 sites totaling 684 beds;
- **Queens, N.Y., Health Network**, a **Per Se** client, 2 hospitals, 717 beds plus 15 clinics;
- **Hospital of St. Raphael**, New Haven, Conn., **Per Se**, 511 beds.
- and the entity that pulled back, **Main Line Health** (Bryn Mawr, Lankenau, and Paoli Hospitals in the Philadelphia, Pa., area).

Reasons given for the Main Line pullback: failure to “assign sufficient resources,” project wasn’t designated as a top priority, and “inadequate communication between leadership, designers, and end users.”

Cost details: FCG predictive model

FCG used data from the five hospitals to predict what you’d be likely to spend on CPOE. The report goes on for a few pages on this, but here’s its summary for a 500-bed, 25,000-admission/year hospital (a number of additional assumptions are detailed in the FCG report):

Table: CPOE Costs For 500-Bed, 25,000-Admissions/Year Hospital

Capital costs:

Hardware/server	\$ 750,000
Software license	\$ 900,000
Network	\$1,100,000
User devices ¹	\$ 800,000
Implementation ²	\$ 800,000
Other	\$ 200,000
Subtotal, capital	\$4,850,000

One-time operating costs:

IT department ³	\$2,300,000
Non-IT resources ⁴	\$ 650,000

Other	\$ 100,000
Subtotal	\$3,050,000
Total, one-time:	\$7,900,000
Annual ongoing costs:	
System support ⁵	\$ 400,000
CPOE IT staffing	\$ 800,000
Non-IT resources	\$ 150,000
Total annual costs	\$1,350,000

¹Workstations, printers, wireless devices

²Vendor, consultant, contractor staff

³Project team and leadership resources

⁴Management, MDs, other clinical resources

⁵Hardware, software, workstation, network, and interface management

Unit costs seen higher for smaller hospitals

FCG estimates that for a 250-bed community hospital, costs would be:

- \$3 million in startup capital costs;
- \$2 million to over \$3.1 million in startup executive and physician costs;
- \$700,000 in annual ongoing costs.

The higher rate of non-capital startup costs is likely because higher levels of physician and training resources would be needed to work with community physicians, FCG concluded. On a per-bed and per-admission basis (assuming 12,500 annual admissions, half as many as in the 500-bed example), this works out to a five-year cost of \$34,000 to \$38,400 per bed and \$136 - \$153 per admission.

Factors likely to cause variations:

The FCG study says your costs will vary from the model, but not necessarily in a linear way. These factors will affect price: size, number of sites, the status of your network before starting, whether you will need to implement wireless, which clinical applications you have to start, whether those applications and CPOE are parts of a single integrated system with multiple applications or best-of-breed (the latter is likely to add to CPOE costs), and whether yours is an academic or community hospital.

FCG theorizes that in a community hospital, IT and non-IT overhead expenses are likely to be significantly higher than average. At Lehigh Valley, the only community hospital in the study, the investments in executive leadership and physician resources were \$2.8 million, 2x to 4x the amounts in the other two single-site implementations, and double the average for the model. “Presumably this relates to the need to work closely with the community physicians over time...” FCG concludes. By comparison, Queens Health System, with a rollout to two hospitals and 15 clinics, required just \$3.9 million in this cost category over five years.

What drove these organizations to CPOE

FCG said none of the five organizations implemented CPOE with any expectation of an equivalent savings or other financial return. At some, error problems may have been unusually high. Buried deep in the study, for example (page 43), is the startling news that before CPOE, physician handwriting was collectively so bad at Lehigh Valley that there was a “25% error rate in radiology orders” and constant communication from pharmacists and others having to clarify orders. The FCG study notes that Lehigh already had the IDX LastWord system installed -- which, obviously, paved the way for implementation of the LastWord CPOE.

Not mentioned in the FCG study was that in June, 1999, the year that Lehigh Valley’s Performance Council began considering CPOE, Lehigh and two physicians were hit with a \$1.1 million jury award for malpractice in a case in which caregivers on a team simply failed to communicate. In that case, a patient was admitted by an outside consulting MD for a spinal contusion. A physical therapist and nurse then entered notes into the chart indicating that the injury was more serious than diagnosed. They never verbally told physicians on the team. A hospital-based MD then failed to review the updated chart and ordered the patient to start physical therapy, according to a report. A spinal injury and paralysis ensued.

Would CPOE have prevented that harm? Possibly, if CPOE were implemented with these particular clinical alerts. However, the complexity and number of alerts are a big issue in CPOE; pharmacists are already complaining that alerts are bogging them down, and in some cases are turning them off (See CPOE–How To Make It Work; www.insidehealth.com).

A few cost savings listed

Cost savings weren’t a core topic of the study. It does list these anecdotally:

- Transcription costs: Queens Health Network saved about \$270,000.
- Better documentation hiked radiology revenues over \$300,000 at Queens Health Network. Similarly, Lehigh Valley has begun tracking radiology costs and reimbursements and is seeing an increase in revenues.
- Earlier conversion of patients from intravenous to oral medications has brought documented cost savings of \$50,000/year at Boston Medical Center.

You can obtain the report from the FCG web site, <http://www.fcg.com>.

Excerpted from Inside Healthcare Computing, Vol. 13, No. 10. March 24, 2003:

Free CPOE System --With Advertising

ScriptRx, West Palm Beach, Fla., claims to have free order entry software installed in 170 emergency rooms around the country. Costs are supported with on-screen advertisements from pharmaceutical companies.

The three physicians we contacted liked the system, although all were using it only for patient information and prescriptions--much less functionality than the vendor claims to support.

“It’s a quantum leap for us in patient care,” says Dr. Robert Van Gallera, MD, medical director in the emergency department at Walton Medical Center in Monroe, Ga. Before ScriptRx, physicians at Walton hand-wrote discharge instructions, which nurses rewrote into

“patient-friendly language,” says Dr. Van Gallera, an employee of EmCare, Dallas, Tex.

David Soria, MD, regional director for Inphynet, an emergency-medicine practice based in Fort Lauderdale, says his staff no longer gets calls from pharmacists “trying to decipher the handwriting.” Soria is medical director at St Mary’s Medical Center and Good Samaritan Medical Center, both in West Palm Beach, Fla.

Both said the ads don’t bother them. Dr. Soria says he’s noticed primarily big names, such as Pfizer Inc. in New York and Merck & Co., Inc. in Whitehouse Station, N.J.

The system is usually integrated with the emergency-room registration systems, says Doug Wheeler, CEO of ScriptRx (although none of the three physicians we talked to had systems with that capability). Although ScriptRx doesn’t charge hospitals for integration with emergency-room admissions systems, it will charge \$10,000 to integrate with a medical records system, once the interfaces are available in version 2.1, which goes into beta this month. Mr. Wheeler acknowledges that the lack of integration with other systems has limited the system’s use in many hospitals to patients’ discharge instructions and take-home prescriptions, but said ScriptRx is working on additional interfacing.

How the workstation operates: MDs’ identities are verified through a touchscreen thumbprint. Once in the system, physicians select a patient and a medical condition. A new screen then pops up with buttons for prescriptions, patient-discharge instructions, and physician referrals, as well as orders for nursing, laboratory, radiology and pharmacy. In the middle of the screen is a pharmaceutical advertisement. Physicians’ selections are printed out.

ScriptRx, which employs 18 people, relies on a mix of employees and outside contractors to provide customer support. The firm plans big leaps: from a paper-based system to a truly electronic order-entry system and then from an emergency-department system to a hospital-wide system. When asked how ScriptRx plans to compete with established vendors that offer CPOE modules as part of integrated systems, Wheeler said, “It is hard to compete with free.”

ScriptRX: 809 North Dixie Hwy, West Palm Beach, Fla. 33401, 866-727-4789, www.scriptrx.com.

Excerpted from Inside Healthcare Computing, Vol. 13, No. 17. June 30, 2003:

First Two Client Hospitals Give Rave Reviews Of OB/Gyn CPOE System

A new obstetrics and gynecology information system is getting terrific reviews from its first two U.S. clients, Baystate Medical Center, Springfield, Mass., and Maimonides Medical Center, Brooklyn, N.Y. The vendor, E&C Medical Intelligence, an Israeli start-up, didn’t respond to our inquiries, but users did plenty of talking for it. Baystate spokeswoman Molly Gray predicts “hyperbolic growth” for E&C. “There is really nothing else quite like it on the market,” said Ms. Gray, manager of inpatient obstetrics.

Baystate executives were initially leery of being a beta site for a start-up with home offices halfway around the world. A multi-million dollar settlement on an OB case, where the care was good, but the hospital folded because of missing documentation, became “a card to

play,” Ms. Gray said.

So far, geography has not been a problem. E&C has opened an office in New York. Turnaround on changes is “very fast,” she said.

Baystate chose E&C only after reviewing products of five major companies. Competitors offer systems that cover labor, delivery and recovery (LDR), but E&C’s Intelligent Patient Record for Obstetrics can be set up to take a patient from prenatal through postpartum, she said. E&C’s system has “medical intelligence we didn’t see anywhere else,” she said. The system interacts with the clinical scenario and provides the MD with suggestions as the case unfolds. Competing systems present the MD with an index of information.

The intelligence has “really helped us,” agreed John Patrick O’Grady, MD, chief of maternal-fetal medicine at Baystate. He described the Intelligent Patient Record as a longitudinal patient record with order entry and sophisticated decision support. Data entry is mostly structured and template-driven, so much that dictated notes are almost a thing of the past, he said. “That’s one of the biggest boons.”

A spokeswoman for Maimonides described a similar experience. MDs stopped dictating their notes three months after implementation, and OB transcription costs declined \$20,000 per year, said Nancy Daurio, associate VP of management information systems.

Maimonides’ system came with a library of about 5,000 rules from the American College of Obstetrics and Gynecology; Maimonides added another 1,000. Some had to do with the Maimonides patient population, which tends to produce large families, and is subject to its own set of complications. Others are rules and features related to nursing documentation and workflow, she said.

Users say the system may help protect against costly litigation losses, a particular threat in OB/Gyn departments. Intelligent Patient Record “reduces errors” by “clarifying material” the MD can’t read or material that is incomplete, Ms. Gray said. The net: “It knocks the corners off idiosyncracies” and “regularizes care.”

But hey, isn’t that “cookbook medicine?”

“Things are changing in western medicine,” from an “opinion-based” model to a “knowledge-based” model, Ms. Gray says. If the standards and procedures exist, and they aren’t followed, you could find yourself in court, having them read to you.

The system also eliminates problems with missing records or unavailable charts, Dr. O’Grady said. (While this can be said of almost any clinical information system, we find that having a physician actually say it is a hallmark of a successful implementation.) It supports multiple users on simultaneous data entry.

Baystate went live in December, 1999, and has not yet tested Intelligent Patient Record in court on a malpractice case. But it has had “a couple of OB disasters” since the system went live; management feels that “documentation on those charts is impeccable,” Ms Gray said.

Maimonides has experienced fewer pre-litigation cases and an overall reduction in insurance since Intelligent Patient Record went live in late 2001. It is too soon to tell whether that’s due to the new system, Ms. Daurio said.

The insurer, Federation of Jewish Philanthropies (FOJP), offered Maimonides and several other New York area hospitals a \$300,000 reduction on their insurance premiums if they installed

Intelligent Patient Record with certain standards. Maimonides received its first payment and recently qualified for its second, Ms. Daurio said. A year after go-live, Maimonides passed JCAHO “with flying colors.”

No system is perfect, but this one is so good (and the vendor so small) that hospitals are unusually willing to discuss its shortcomings:

- It is not yet well-interfaced to other vendors’ systems. Baystate and Maimonides, both Eclipsys sites, are waiting for important interfaces. “It is not that easy to develop them,” says Baystate’s Molly Gray, and “it will take more time than you expect.”

- The system is not Web-enabled.

- Baystate’s system does not keep track of reasons for overrides on decision support, but it probably should. “What the doctor or nurse was thinking” is usually a factor in a medical malpractice case, Ms. Gray said.

- The system is the product of an Israeli start-up company which, according to its web site, has “more than” 30 employees -- not the warm, cozy feeling you get if you deal with a Siemens or a McKesson.

Implementation tips from Nancy Daurio at Maimonides:

1. Prior to going live, Maimonides took the system to its legal department and its malpractice insurance company to make sure it was building a system that “didn’t add risk.”

2. Maintaining and updating rules and adding protocols is an “ongoing process.” The MD task force meets monthly “just to review what we have and where we can improve.”

Implementation tip from Molly Gray at Baystate: have enough hardware to support the system. Baystate put the PCs on carts with fetal monitors, so every laboring patient gets a system, but post-partum patients don’t. It would have been better to have a PC at every patient’s bedside. “E&C counseled us about this at the beginning, but we really didn’t get it.”

Dr. O’Grady also mentioned these concerns: Baystate’s OB PCs lack sufficient memory. Also, at busy times, it can take longer to load data or get on the application, also a hardware issue, he said.

E&C 1-877-700-4755; Ms. Daurio, (718) 283-1835; Dr. O’Grady, (413) 794-3470; Ms. Gray, (413) 794-5359.

Excerpted from Inside Healthcare Computing, Vol. 13, No. 19. July 28, 2003:

Cerner Impresses Skeptic With Big Changes To PowerChart, But Cerner CPOE Implementation: More Object Lessons

If you are on the verge of installing Cerner PowerChart for physician order entry, you might consider waiting for Version 8.0, due out in the first quarter of 2004.

That view is based on an interview with a hospitalist from 246-bed Mayo Clinic, Jacksonville, Fla. Mayo de-installed Cerner Millennium Matrix orders in Dec. 2001 after a 5-month pilot test in internal medicine. Problems included inadequate early-stage participation by physician users; “many” system outages; a “poorly designed” graphical user interface (GUI); and

the “huge” burden of setting up PharmNet order entry, said Jason Persoff, M.D.

However, Dr. Persoff is impressed by the rapid progress Cerner is making on the version 8 (Cerner calls it Rev. 8) user interface. Mayo is also working with the vendor on improvement to PharmNet.

Dr. Persoff is a committed student of the literature that shows that a successful computerized physician order entry (CPOE) system can improve patient care and decrease costs. But he has become a skeptical consumer. His view: no matter how well a vendor says its product functions, it will have to be tweaked to accommodate your organization.

Mayo Jacksonville’s troubles are almost certainly not unique to Cerner, and “So far, there’s no magic bullet out there,” so be forewarned, he said. Installing any CPOE system is likely to “age you terribly before its all over.”

More vendor-independent lessons on what to do and not to do...

1. Involve the right physicians from the start.

If that lesson seems so obvious, why is it that so many make this mistake? Mayo failed to involve enough of the right physicians in early design stages, he said. For example, surgeons have very different needs from internists. Had the right MDs been at the table, they probably would not have accepted the product for testing, he said. His advice to others: “Don’t release a rough product” to your physicians.

2. Repeat: systems must be up all the time.

Dr. Persoff is chagrined by persistent system outages. “We had lots,” he said. His opinion: vendors should build “backups for the backups” into their architectures and cost estimates, making medical records as complete and foolproof as banking records. Of course, no one likes the idea of spending the extra money, but “all it takes is one lawsuit” to eat up whatever savings the organization thought it achieved by doing without. (Our view: It's not hard to tell is more at fault here, vendor or client. Our view: clients. Example: IDX users have told us the LastWord/Carecast system, running on Tandem hardware, is highly reliable. Field reports say it's highly difficult for IDX to close a deal. Why? Because of the expense of the hardware.)

3. Make it user-friendly and fast...or else.

Dr. Persoff said the “biggest problem, in our case,” was the GUI. Physicians spent too much time “surfing screen real estate” and “scrolling back and forth.” He notes that most MDs are less tolerant of screen changes than they are of being required to make multiple clicks on a single screen. He compares PowerChart with Microsoft Word: both offer a lot of functionality nobody ever needs, while hiding some of the everyday stuff deep in the system where nobody would think to look for it.

Some Powerchart changes he'd like to see

- Powerchart screen flow is “counter-intuitive” to current medical practice, he said. For example, functionality to provide a historical view of test results at set intervals is not where MDs would

intuitively expect to find it.

- MDs also found Cerner's database of synonyms inadequate, he said. To order a test, the MD goes to a menu and types in a test name. The system uses fuzzy logic and attempts to match the term entered by the MD with a term in its database.

But in some cases, Cerner's terminology is nothing a physician or a lab tech would ever think of. Dr. Persoff remembers once spending an hour searching for a test for antibodies that prevent normal blood clotting, something commonly called a "PTT Mixing Study." He tried PTT study, he tried PTT mix, and he tried mixing study, but nothing worked. He finally found it under "inhibitor screen." "That's not a name that would dawn on me in a million years," he said. What's needed here is obviously "a more comprehensive database," he said

- Little aggravations can turn killer apps into apps killers: another problem: lengths of test names sometimes exceeds the length of the window, and there is no horizontal scroll bar. For example: There might be seven different tests that begin with "Hepatitis B," but in order to identify the right one, the MD must click on the test and create the order. If it turns out to be the wrong one, the physician must then cancel it and try another that begins with "Hepatitis B," he said.

Physicians coped by devising multiple work-arounds. But those were a problem too, because every work-around requires training and updates. It was also irritating to MDs. Use the term work-around with Mayo Jacksonville docs these days, and you risk "bodily harm," he said. His standards are high: a CPOE GUI should be "as intuitive as the Web."

PharmNet CPOE implementation challenges

Installing PharmNet CPOE was also a challenge. The problem involved something Cerner calls "order sentences." The theory is good. Common doses of common medications should be readily accessible to the physician. But implementation meant creating custom order sentences for each MD on a 3,000-drug formulary. That one detail turned out to be "the most time-intensive" aspect of the project, he said.

Rev. 8 will make it easier for the MD to customize his or her profile, he said. (Dr. Persoff made his remarks during an audioconference sponsored by the Healthcare Information and Management Systems Society and in a follow-up interview with us.)

Excerpted from Inside Healthcare Computing, Vol. 13, No. . 11. April 7, 2003:

Leapfrog: Creating CPOE Reimbursement System

You spend on CPOE. Payers save. Not fair, is it?

The Leapfrog Group, the nation's premier force behind expensive approaches to improving medical care, is on the verge of announcing a program it says is aimed at fixing those misaligned incentives, and to give back some of your investment in CPOE. Leapfrog is the employer-led consortium that is attempting to reduce medical errors by encouraging patients to use hospitals that have round-the-clock staffing by an intensivist, meet certain numeric or

outcomes standards on high-risk procedures, and implement computerized physician order entry (CPOE) systems.

The to-be-regulated are skeptical.

The plan will be published in a month or so on Leapfrog's web site, <http://www.leapfroggroup.org>. Meanwhile, here's our understanding of what Leapfrog is planning, based on a HIMSS presentation and a followup interview with Leapfrog's executive director, Suzanne DelBanco, PhD.

Assume that the CPOE gods smile on your particular project, and it really does succeed in reducing medical errors and saving money. Then, if you are paid principally on the basis of DRGs or managed care contracts, you might win financially, too. But if you are paid principally on a per diem basis, your CPOE system will likely reduce your revenues. The insurance companies and self-insured employers will grow richer from your investment.

"We are going to give back the money," declared Leapfrogger Francois deBrantes in a presentation at the 2003 HIMSS Conference and Exhibition. "We don't want it for ourselves. What we want to do is create a business case for quality, period. End of story." Mr. DeBrantes is GE's program leader for Healthcare Initiatives and E-Health, and the man in charge of working out the reimbursement schedule.

That sounds like a "great idea," particularly in an era that has most healthcare IT executives scratching their heads over "where all of the money (for CPOE and other technologies) is going to come from," said Cynthia Spurr, director of clinical systems for Partners Healthcare, whose antecedent organization, Brigham and Women's Hospital, pioneered a CPOE system 10 years ago. But for it to be effective, the tool for determining the reimbursement will have to be very carefully thought out, she said.

Leapfrog plans to create carefully weighted, publicly available formulae for calculating how many deaths are prevented by implementing its standards, Mr. DeBrantes said. The mechanism he outlined is based on something he called a "defect rate." He declined a request for a followup interview. As far as we can tell the defect rate takes into account an organization's inpatient admissions, the number of Leapfrog standards the organization meets, and the number of lives Leapfrog believes will be saved by implementing a particular standard.

Ms. Spurr noted that it would also make sense for Leapfrog to take into account the effectiveness of the CPOE installation. Steven Chernow, MD, medical director for Preferred Care, a Rochester, N.Y., health plan, agreed. In the absence of CPOE outcomes data, "Leapfrog is just checking off yes or no," he said.

Leapfrog has said all along that it intends to test the decision support tools in CPOE systems, and First Consulting Group has completed design work, Dr. DelBanco said. Deployment is stalled around identification of a neutral third party to administer it, and funds for help desk type support. Cost would be around \$250,000 per year, Dr. DelBanco said.

"How exactly will the money travel from the insurance companies, who aren't necessarily associated with Leapfrog, to the hospitals and health systems?" Dr. Chernow wondered.

The Leapfrog employers who are self-insured would pay directly, Mr. DeBrantes said.

Excerpted from Inside Healthcare Computing, Vol. 13, #21. Aug. 25, 2003:

AC Group, CITL Both Say Low-End CPOE Systems Tough To Cost-Justify

In most situations, low-end ambulatory care physician order entry systems are impossible to cost-justify, two recent reports claim.

In one report, Mark Anderson of the AC Group says, "Systems that cost more usually have better ROI" because they offer the functionality that can boost practice revenues. Mr. Anderson focused on the EMR and emphasized the ability to code visits for maximum reimbursement; more on his study appears below.

Another study, focusing on the value of ambulatory CPOE, emphasizing the ROI of order entry decision support, came to similar conclusions.

In that report, a 100-page paper touting benefits of ambulatory care computerized physician order entry (ACPOE) information systems, the Center for Information Technology Leadership (CITL) said that, while more expensive systems can be a good choice for physicians, the cheapest and most basic systems are not a particularly good buy for anyone.

[CITL employs impressively credentialed analysts, and its board of advisors includes some leading lights of clinical informatics from academic medical centers. However, its financial backers include vendors of major high-ticket CPOE systems, including Eclipsys, Siemens, and IDX, and CPOE consulting firms First Consulting and Cap Gemini Ernst & Young, which also stand to benefit from provider adherence to its recommendations.]

The CITL study is available through the HIMSS bookstore at <http://www.himss.org>. Mr. Anderson's 120-page report, including detailed ratings of individual vendors systems, is available through the AC Group, (281) 374-0394.

Excerpted from Inside Healthcare Computing, Vol. 13, #20. Aug. 11, 2003:

Siemens Physician On CPOE: Order Sets A Key To Success

Do you remember that 1999 aspirin and beta-blocker study? It found that heart-disease patients admitted to America's top teaching hospitals survived better -- not because they had better surgeons or more advanced equipment, but because they were given aspirin and beta-blockers.

Siemens Chief Medical Officer Donald Rucker MD and others see a message in there for buyers of order entry systems: lives would be saved if MDs were presented with aspirin and beta blockers as routine parts of order sets in therapy for heart attack patients. In fact, order sets on the whole are "a tremendous opportunity for decision support," Dr. Rucker said.

Howard Landa, MD, a physician with Kaiser Permanente in Hawaii, agrees. "Order sets are probably the most powerful decision support tool available." And their real beauty is that "they don't interrupt workflow" the way that after-the-fact alerts do.

Alerts can be enormously unpopular with MDs. "Nobody can stand more than two per

order," said Lyle Berkowitz MD, director of information technology for Northwestern Memorial Physicians' Group. Also, they can also be difficult to write. And, while order sets are no piece of cake, they are easier to take as an earlier step in a computerized physician order entry (CPOE) process, and are more widely installed.

If you are just embarking on order sets, here are some of the decisions Dr. Rucker wants you to think over ahead of time, so you won't be making them on the fly:

- Will you allow for customized changes or will you require uniformity within specialties? From what he sees "most are going for standardization."
- Will you present MDs with blank order forms and have them check off what they want?
- Or will you show a complete or nearly complete order form and make them un-check what they don't want? If the former approach seems to force more thinking, you may want to think again. "The 50th time through, they may just motor right down" the form, he said.
- Do you want to organize orders by disease or by procedures? Ohio State University Medical Center, for example, started by organizing medical ICU CPOE by disease, but later changed to organizing around procedures involving ventilators.
- Just how many order sets do you want to end up with? Regenstrief Institute, for example, built "thousands," he said. Ohio State University, on the other hand, has about 700.
- In medicine, details drive the clock. By some counts, there are more than 60 specialties and sub-specialties. Order sets for a trauma surgeon and a general surgeon will be entirely different, and will differ from orders for a neurosurgeon. A neurosurgeon's orders will differ from those for a neurologist.
- How will you handle orders for multiple co-morbidities? Force choices though a dialog box? Create order sets for each possibility?

Finally a few pieces of advice:

- Buy starter sets. Then expect to edit every line of every order.
- Order sets require a big time investment by MDs. "If you want doctors to take this seriously, I think you have to pay them for it."
- Build in a feedback loop so you can tell how orders are being used. Who is deviating? Is there a good reason?

Excerpted from Inside Healthcare Computing, Vol. 13, #20. Aug. 11, 2003:

The Actual Process of CPOE Doesn't Take As Long As MDs Think

Physicians are right when they complain that computerized physician order entry eats up more MD time than handwritten orders. However, they may not be as right as they think they are.

In timed tests at Mayo Clinic Jacksonville, MDs were asked to handwrite a dummy order for a fairly complex patient, then enter the same order in a Cerner Millennium CPOE system,

then estimate how long they spent on each process. Actual times were recorded with a stopwatch, said Jason Persoff, MD, who presented the result at a recent meeting. Here are the results:

- MDs thought it took them about 5 minutes to hand-write the order. It actually took 9.5 minutes.

- They thought it took 38 minutes to generate a computerized version. It actually took 22 minutes.

In other words, they thought it took them nine times as long to enter the order electronically than on paper when, in fact, it took only about 2-1/2 times as long.

Excerpted from Inside Healthcare Computing, Vol. Vol. 14, #1. Nov. 3, 2003:

Response Time Troubles Hit Eclipsys SunriseXA

CIO: Several users told, 'You're the only one'

Eclipsys Corp. acknowledged that it has significant response time problems with its SunriseXA workflow engine, a core part of its newest-generation clinical information system with computerized physician order entry as a component.

Eclipsys said it had just learned of the problem, but sources say Eclipsys had been promising a fix since January. Eclipsys said that response times of 3-4 seconds were desirable, but times were as slow as 6-8 seconds. However, some users said they were seeing 30- to 45-second response times.

The engine, which moves data to and from the data repository and among applications, is a key component of Eclipsys's latest-generation system, and was central to its plan to adopt the Microsoft .NET architecture.

For more details: see the full report and followups in the Nov. 3, 2003 and subsequent issues of Inside Healthcare Computing..

**Computerized Physician Order Entry:
How to Make It Work
Is published by:**

Inside Information Group, Ltd.

3600 S. Harbor Blvd., Suite 220, Oxnard CA 93035
(800) 294-6032, (805) 984-8500, Fax (805) 984-8504.

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