

Saving Lives, Saving Money *In Practice:*

Strategies for Computerized
Physician Order Entry
in Massachusetts Hospitals



MASSACHUSETTS
TECHNOLOGY
COLLABORATIVE



*New England
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January 2009



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Prepared by:

Computer Sciences Corporation (CSC)

Acknowledgements

Authors: Erica Drazen, CSC (formerly First Consulting Group)
Bethany Gilboard, MPA, Massachusetts Technology Collaborative
Jane Metzger, CSC
Emily Welebob, CSC

Editors: Emily Dahl, Massachusetts Technology Collaborative
Alison Lauter

Graphic Design: Christine Raisig, Massachusetts Technology Collaborative

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Introduction

Computerized physician order entry (CPOE) allows physicians to enter patient orders into a computer system that has the capacity to check the order for safety and effectiveness. This capability, called clinical decision support (CDS), can alert the physician if the patient has an allergy to what has been prescribed, if the order is incorrect or a duplicate, and if there are any other contraindications. Because CPOE systems also can store sets of appropriate orders for common conditions, CPOE helps ensure that the patient's treatment complies with standards for best practice. And, because orders for common conditions can be modified for each unique patient's needs, CPOE can increase physician efficiency by allowing doctors and other providers to select a standard order set and individualize it for a given patient's requirements.

In 2003, in research sponsored by the Massachusetts Technology Collaborative (MTC), CPOE was identified as having the potential to improve patient safety and reduce costs (Advanced Technologies to Lower Health Care Costs and Improve Quality). A second report published in 2003 by MTC and The New England Healthcare Institute (NEHI) quantified the potential costs and benefits for Massachusetts if all hospitals adopted CPOE (High Tech Transfusion: Case Statement for Implementation of CPOE in all Massachusetts Hospitals). At that time, CPOE was in limited use in the state, primarily in academic medical center hospitals. To encourage the adoption of CPOE, MTC and NEHI launched the Massachusetts Hospital CPOE Initiative with the goal that all hospitals in Massachusetts have CPOE systems in use by 2011.

A recent study found that one in ten patients hospitalized in Massachusetts experienced a medication error that could have been prevented

(Saving Lives, Saving Money: The Imperative for Computerized Physician Order Entry in Massachusetts Hospitals). CPOE can help prevent these errors by monitoring the medications given to patients and alerting doctors to potentially dangerous contraindications. Implementing CPOE, however, is challenging. It requires not only new technology, but it changes the work of physicians, nurses, pharmacists, and administrative staff. It requires major efforts to create new clinical protocols and to design and manage clinical decision support systems.

The Massachusetts Hospital CPOE Initiative is helping hospitals to establish and optimize the use of CPOE. In an initial survey of the status of CPOE adoption, conducted in August 2006, all Massachusetts hospitals were provided with a roadmap outlining the steps that were needed to prepare for implementation of CPOE. An Advisory Group was formed to advise MTC and NEHI on what type of help would be most valuable. The group was comprised of Chief Information Officers (CIOs), physicians advocating for CPOE adoption (physician CPOE advocates) and project managers from hospitals that had recently introduced CPOE or were planning to begin introduction. Since most of the published reports of CPOE implementation came from academic medical centers, the Advisory Group requested a survey of community hospitals' CPOE adoption, focusing on six areas: the use of physician incentives, protocol redesign, evaluation, physician training, organization and governance of clinical decision support, and leadership involvement.¹

Many of the community hospitals in Massachusetts that were among the early adopters of CPOE are now past the planning stage and have introduced CPOE as a project

¹ MTC engaged First Consulting Group (now CSC) to interview project teams in community hospitals using CPOE and to gather information on the approaches that contributed to their success. The results of this research were published by MTC and NEHI in a report: (Saving Lives, Reducing Costs: Computerized Physician Order Entry: Lessons Learned in Community Hospitals.)

in selected areas of the hospital. Others have adopted the system throughout the hospital. These institutions are facing new challenges as they operate CPOE. From those challenges the Advisory Group identified five areas that merited additional research on questions raised during the operational phase of CPOE:

- Ongoing user support
- Optimization of CPOE
- Ongoing management of CDS
- Medication reconciliation
- Management of information technology downtime

This study reports the findings in those areas in six community hospitals. It is designed as a practical tool for use by CPOE project managers, CIOs, Chief Medical Information Officers (CMIOs) and others responsible for the CPOE effort in their hospitals.

MTC and NEHI engaged CSC (formerly First Consulting Group) to conduct the research on the operational challenges of implementing CPOE in community hospitals. CSC surveyed community hospitals in the United States where:

1. CPOE had been in routine use for at least one year.
2. At least 75 percent of the orders were directly entered by physicians.
3. The staff members using the CPOE system were typical of a community hospital (rather than residents or other house staff).

Six hospitals (listed in Appendix A) participated in this study. One hospital completed its rollout of CPOE in 2006, the other five completed CPOE programs between 2000 and 2004. In the study hospitals, 80 to 100 percent of orders were entered by physicians with an overall average of 92 percent. The hospitals ranged in size from 74 to 410 beds and were using four different vendors' CPOE programs.

Telephone interviews were conducted in 2007 to gather information from four of the hospitals, typically from the project manager, CMIO or both. Sometimes another participant such as the chief pharmacist or clinical support specialist was interviewed as well. Site visits to two hospitals allowed researchers to meet with more hospital staff members and to review approaches and crucial issues in greater detail.

All of the hospital staff interviewed provided practical information of interest to any community hospital undertaking the transition to computerized physician order entry as its standard practice. The study team is extremely grateful to all of these very busy individuals for sharing their time and accumulated wisdom.

I. Ongoing User Support

Making CPOE support readily available to physicians is crucial. Doctors, already busy with patient care and other responsibilities, view learning how to use CPOE as an additional burden until they are comfortable using the system. The study hospitals have come up with a mix of useful support systems and a variety of individuals assuming different roles and titles to back up physicians as they continue to learn CPOE after the initial implementation period. At the time of this review, CPOE had been in use at the study hospitals for between one and seven years. All of the study hospitals use multiple

clinical computer applications: some use e-MAR and a number also use a Picture Archiving and Communication System (PACS) and online nursing documentation. Staff acknowledged that physician needs for user assistance with these programs had dropped considerably over time. Support, as needed, was being provided by physician CPOE advocates, CMIOs and clinical support staff.

The job descriptions and number of dedicated staff supporting CPOE users in each of the study hospitals is presented below. The first three hospitals are part of larger health systems; the others are independent community hospitals.

Key points:

- Staff members responsible for ongoing user support not only cover CPOE but also other inpatient clinical applications such as Electronic Medication Administration Record (e-MAR).
- As part of the ongoing support team, all of the hospitals have nurses and a CMIO or designated lead physician(s) for CPOE.
- Study hospitals continue to provide physicians with around the clock access to a special support line, typically managed by nurses, or to a Help Desk.
- In addition to responding to specific requests for help, the CPOE support team is involved in training new physicians, optimizing ease of use and fit with workflow, and rollout of major upgrades and new software versions.
- Rather than in a formal refresher training program, ongoing training for physicians is offered as coaching during hospital rounds or in dedicated locations such as a physician lounge.

| STAFF SUPPORT FOR CPOE | | |
|--|---|---|
| | Staff Providing Ongoing User Support | Means of Support |
| Newport Hospital (LifeSpan System) (129 beds) | <ul style="list-style-type: none"> • 0.5 FTE lead CPOE Physician • 1 nurse informaticist • 1 analyst • Chief of Hospitalist Program, as needed | Physicians call nurse informaticist during daytime hours; help desk also available. |
| Baystate Franklin (Baystate System) (130 beds) | <ul style="list-style-type: none"> • 0.5 FTE lead CPOE physician • 3.8 FTE nurses • Hospitalists as needed (at night) | Physicians call local support line staffed by nurses during daytime; hospitalists backed up by nurses during off hours. |
| St. Mary's Health Care (Trinity System) (230 beds) | <ul style="list-style-type: none"> • 1 FTE medical director of informatics • 1 FTE nursing educator • 1 FTE clinical liaison to health system | Physicians call help desk. |
| Glens Falls Hospital (410 beds) | <ul style="list-style-type: none"> • CMIO • 1 FTE nurse CPOE specialist • 1 system analyst • 5 highly competent CPOE users • 1 Hospitalist as needed | Physicians call local support link staffed by nurse CPOE specialist during daytime and highly competent CPOE user during off hours. |
| Citizens Memorial Hospital (74 beds) | <ul style="list-style-type: none"> • 0.5 FTE lead CPOE physician (two physicians share the role) • 1 CPOE manager/physician liaison • 1 system analyst assisting with user support | Physicians call help desk staffed by analyst during daytime hours and CPOE manager or analyst during off hours. |
| Alamance Regional Medical Center (238 beds) | <ul style="list-style-type: none"> • 0.4 FTE CMIO • 1 FTE nurse clinical systems manager • 3 system analysts assisting with user support | Physicians call help desk; calls referred to systems analysts. |

Despite the different titles given to members of the user support team, the similarities of staffing among the study hospitals are striking. There is no direct correlation between the staffing levels and bed size because a core staff needs to be available to provide around the clock coverage without regard to hospital size. The scope of the job is different in different settings: generally, in smaller facilities the roles are broader.

- Each hospital has a small CPOE support team comprised mostly of physicians and nurses.
- The team in each hospital includes a lead physician with time dedicated to CPOE.
- The role of CMIO or Medical Director of Informatics is a broader one than that of a lead CPOE physician.
- Most of the other support staff members are nurses with a long history of clinical practice in their hospitals and involvement in CPOE implementation.
- Many of the hospitals have highly competent CPOE users, commonly referred to as “Super Users”. This person is familiar with all aspects of CPOE and is a designated resource for any staff member.

- In five of the six hospitals, local nurses, with a variety of staff titles, respond to physician calls for user assistance either by direct call or by referral from the Help Desk. Physicians in the sixth hospital call their health system Help Desk.
- During off hours (evening and night shifts), other staff such as hospitalists, system analysts from the Information Systems (IS) Department, and highly competent CPOE users assist with support.

Hospitals have also continued to rely on super users as added support resources on the units. One hospital aims to have one such super user for every 20 physicians. Team members from two hospitals, however, commented that some physicians are more likely to ask for help from the nurse with whom they have worked for years than to call a Help Desk. The growing number of hospitalists in every study hospital provides an additional resource of highly experienced CPOE users. Most study hospitals began the introduction of CPOE with few if any hospitalists on their staff; this, however, has changed and now hospitalists play an important role in supporting CPOE implementation and helping new users with the system.

Doctors are best served when support staff is nearby and can interact with physicians directly. Three hospitals regularly provide back up staff in designated rooms near areas where physicians work and write inpatient orders. One hospital has a Physician Resource Room, conveniently located on a patient care unit, where a CPOE support person is available four hours a day. According to one of the support staff, one advantage to being present on the nursing units is that it “keeps my finger on the pulse of what is going on.” Another hospital has, on a regular basis, a CPOE support individual in the physician lounge during the lunch hour and on the patient care units when physicians are making rounds. And one hospital has a “DOCing Station” where physicians can go for training and make appointments to meet with

analysts or educators for additional training. Only one of the study hospitals offers any incentives—gift cards—for physicians spending time with a member of the support team for additional coaching.

Although back-up staff cannot always be physically available, CPOE help is within reach around the clock to physicians and other clinical users. Assistants can always be reached either by calls to a Help Desk or to a mobile telephone support line staffed by a designated support person either on rotation in the hospital or on call outside the hospital. In one hospital, support staff can help by observing remotely what the user is doing on the computer. Often, however, once contacted by phone, staff members go directly to the floor to assist.

In addition to providing direct advice, the user support teams are involved in efforts to optimize CPOE by planning and training for the rollout of major upgrades and new clinical applications, and by training new staff. In two of the study hospitals, the CMIO or physician CPOE advocate personally trains all new physicians.

During the initial rollout of CPOE, the hospitals found it critical to provide physicians with help “at the elbow” and to offer one-on-one coaching rather than classroom training. This same hands-on approach is applied now when major changes are made to CPOE and when physicians unfamiliar with CPOE are brought on board.

The study hospitals use ongoing coaching rather than a program of refresher training. This allows them to address the unique needs of each physician user and to spend a few minutes increasing user skills whenever the opportunity arises. Training needed for a major software version upgrade at one hospital was accomplished in 30-minute, one-on-one sessions. One study hospital offers individual CPOE training at the user physician’s office. None of the study hospitals has had success with Web-based training for physicians because, even when it was available, few of their doctors would use it.

II. Optimizing CPOE

In order to optimize the value of CPOE, physicians have to achieve a comfort level with the system and feel the system enhances how they do their work. Given the complexity for physicians of understanding, managing, and incorporating the use of CPOE into their routines, it is not surprising that work on CPOE and related applications continues long after its implementation. All of the study hospitals have a defined process in place to manage CPOE program changes: set the agenda, set priorities, develop and test enhancements, and inform users. Except for major system upgrades, the ongoing work of optimization is a continual stream of enhancements, small and large, to improve the interface between CPOE and physicians. One CMIO referred to the gradual improvement of orders, order sets, alerts, and other decision support systems as “the period of little tweaks.”

Information on the need for ongoing enhancements comes from multiple sources:

- Logged calls from physicians to the Help Desk combined with clinical support staff assessment of the nature of the problem.
- Suggestions made by physicians and other staff (one hospital posts a telephone number for the suggestion line and two provide a tab on the physician desktop as a quick way to report a problem or make a suggestion).
- Observations of the CMIO, highly competent CPOE users, and clinical support team made while attending rounds with physicians on the units.
- Requests from Nursing, Quality Management, Pharmacy, and other departments.
- Suggestions made by representatives of all clinical departments to the CMIO.
- Advice procured from an external clinical information systems (CIS) consultant.

Key points:

- Even years after the initial rollout, all the study hospitals reported that work continues on optimizing the CPOE system.
- Optimization involves fine tuning the system to make order entry quicker and easier for physicians, to improve order management workflows, and to enhance support for patient safety and quality.
- Except during major application upgrades, optimization occurs as an ongoing series of small projects.
- Each hospital uses a defined process to set priorities and ensure that users are informed of changes.

A number of important suggestions have emerged from the on-going evaluation and improvement of CPOE once it has been implemented. These recommendations focus on making CPOE easier for physicians to use (improving the efficiency of ordering) and improving the actual content of the clinical decision support order sets and rules. Some of the recommendations include:

- Improve the user interface (e.g. color changes to facilitate interpretation).
- Improve the order content (e.g. add dropdown box to enter the reason for the order).
- Improve or expand the order sets themselves.
- Add order categories not included in the original program (e.g. TPN, chemotherapy).

CPOE also needs to be optimized beyond the entry of physician orders to the actual execution of the orders. For example, changes may need to be made to the label printing process for laboratory tests. And, as one study hospital pointed out,

there needs to be a credible substitute for the sort of human oversight available when there was a unit secretary making sure that orders went to the right places and triggered the correct responses by nurses and others. Despite all of the attention paid to workflow optimization during initial rollout, hospital staff report that there are always additional details to be addressed to ensure that order management is a smooth, reliable process throughout the hospital.

Teams from several hospitals noted that CPOE does not yet work smoothly in clinical areas such as Ambulatory Surgery or Obstetrics because the workflow differs significantly from that of medical and surgical inpatient units. One of the study hospitals planned to contract with the CIS vendor for a care optimization assessment that would produce recommendations for fine tuning both care plans and workflows.

The process for setting priorities for changes to CPOE differed among the study hospitals, and especially in hospitals that are part of a larger system. One or more groups (for example, an advisory committee, the pharmacy and therapeutics (P&T) committee, and/or the quality committee) in each study hospital approves and prioritizes actual software changes; then working out the details of the change may require input from other departments such as Pharmacy or

Nursing Informatics. For study hospitals within a larger health system, a decision has to be made as to whether a change is applicable to all hospitals in the system or just the one where the need was raised. One of the health systems has an interdisciplinary process management group that evaluates and is involved in the design of any changes to CPOE that affect the process of care delivery.

Because of the difficulty of ensuring that community physicians are informed of upcoming changes, multiple methods of notification are used: announcement screens at user sign-on, monthly Physician Bulletin, and email. One hospital uses email to send a link to walk through examples of new CPOE screens. Highly competent CPOE users are kept informed so that they can anticipate questions and explain new features to practicing physicians.

III. Ongoing Management of Order Sets and Clinical Decision Support

The capabilities in decision support must be effectively used in order to realize the patient safety and quality of care benefits. That requires an ongoing process of feedback, discussion, and change by those managing the decision support tools in CPOE.

CPOE requires a systematic, hospital-wide process to manage decision support. In a world with CPOE, there needs to be consensus on the actual content and rules of the orders for a given condition. Those jointly made decisions then need to be translated into order sets, decision alerts, and reminders that can easily be used by all physicians.

Overall Approach to Managing Clinical Decision Support

At initial rollout, every hospital in the study had implemented a number of order sets and some type of medication checking. Since the inception of CPOE, both the number of order sets and the types of medication checking have increased at every hospital. The individuals responsible for both order sets and medication-related CDS all report that these CPOE processes are evolving into a more tightly managed process for clinical care overall. According to one CMIO, “We are doing better, but still nowhere near what we should be doing.” He hopes to have a clinical knowledge tracking system in place next year for all order sets, clinical alerts, standard medication orders (drug-dose-route), and other standardized templates. The goal is to ensure that there is an individual or group responsible for the clinical content of every item and that each protocol undergoes at least an annual review.

Order Sets

There are five types of order sets that can be part of a CPOE program. Sometimes more than one may be used for the same patient diagnosis.

Key points:

- The study hospitals were moving to more formalized management of order sets and other clinical decision support than were in place during the initial CPOE rollout.
 - In most study hospitals the staff members responsible for management of order sets felt they had seriously underestimated the complexity of the tasks and the resources required.
 - Only one hospital is using order set content from a third-party vendor.
 - Only three of the study hospitals permit physicians to create “personal” order sets and in each case the hospital was discouraging their use or eliminating them altogether.
 - As study hospitals became familiar with medication checking, they introduced additional types of decision support.
-
- Personal order sets – reflecting the practice preferences of an individual physician rather than recommended practices of the clinical department or hospital.
 - Institutional order sets – approved by designated committees or departments and representing recommended practice for the hospital or the hospital system.
 - Medication order sets – for complex medication regimens requiring some combination of multiple orders, complex dosing or instructions (e.g., order set for pain management).
 - Convenience order groups – orders stored logically as a group to make ordering more efficient for physicians (e.g., common labs or nursing protocols for a specific condition).

- Favorites – a quick way for physicians to locate their most frequently used orders.

Only three study hospitals permitted personal order sets during initial CPOE implementation and in each case the hospital was discouraging their use or eliminating them altogether.

According to one CMIO, “We don’t train physicians to build their own or encourage them to do so. We also tell them they will be responsible for the maintenance on their own.”

Development of Order Sets

Three study hospitals only permitted institutional order sets and medication order sets. In two of the hospitals that are part of health systems, clinical content of order sets, other than medication orders, is designed locally, but order sets are built and maintained by staff in system-wide information services. System-wide standards in place for one of these hospitals require that there be only one order set per condition or procedure, that types of orders be in the same sequence in which most physicians were trained to think about orders, and that deep-vein thrombosis prophylaxis be included in every admission order set. In the third health system hospital, standard orders sets are in place under the management of committees with cross-campus representation.

Management of Order Sets

In each hospital, a number of different individuals and groups are involved in managing order sets.

- A CMIO or physician advocating for CPOE plays a key role, either at the hospital or the health system level, to develop and maintain order sets. In smaller hospitals with local order sets, this can be a very large, time-consuming role.
- Recommendations for new or changed order sets come from various sources: the

Quality Department, the Chiefs of Clinical Departments, Pharmacy and Therapeutics (P&T) Committee, individual physicians, and clinical support staff in recognition of physician requests for help. (see also, Optimizing CPOE above.)

- Analysts in Information Services typically build and maintain actual order sets. Some analysts are specialists in orders and order sets; they bring to bear a level of understanding of all of the software capabilities and how best to use them. One study hospital has a multi-disciplinary orders team to do detail designs and build orders and order sets.
- The physician requesting new or modified order sets is joined by one or more committees in reviewing an order set before it is released. Typically, Pharmacy or the P&T Committee reviews medications in all order sets. One health system has found that the work of maintaining medication-related clinical decision support is a full time job. In 2007, it intended to hire a pharmacy informaticist to focus on medication orders, order sets, and medication-related clinical decision support.

Only one of the study hospitals was using order sets from a commercial vendor, Zynx Health, which provides an order set management tool. The CMIO from another hospital regretted not having worked with an external content provider and said: “We vastly underestimated the effort that would be required.”

Review of Order Sets

To monitor the effectiveness of the order sets, every hospital in the study produces reports on how often the order sets are used and modified. In some cases, the reports are reviewed only by a physician advocating for CPOE or CMIO; in other cases they are also sent to clinical departments, quality committees, and Pharmacy. These reports provide insight into not only which

order sets might need revision or retirement but which physicians may need further encouragement to use order sets.

Staff members in each of the study hospitals believe that order sets should be reviewed on a regular basis, usually once a year, and an effort is made to accomplish this. One health system CIO sends all order sets out to department chiefs and unit heads every two years. If he has not heard back from the department within 30 days, the order set is removed from the system.

Medication Orders

All hospitals in the study took a cautious approach to the use of medication checking when they implemented CPOE. They wanted to start with the simplest, most widely accepted types of checking and then add the more complex rules later. There were concerns that turning on all the available types of checking might cause “alert fatigue”. In some cases certain types of checking were not available when CPOE was implemented. As study hospitals gained experience with medication checking, additional types of decision support were added. One hospital decided to send a set of the alerts to physicians when they placed an order and have more alerts provided to pharmacists when they filled the order. This reduced the chance that physicians would be overloaded with alerts but ensured that all types of contraindications were checked before the order was completed.

All three of the health systems in the study chose to use the same clinical decision support for medication checking in each of its hospitals.

| Types and Frequency of Medication Checking | |
|--|--|
| Drug Allergy | <ul style="list-style-type: none"> Used at every hospital |
| Drug Interaction | <ul style="list-style-type: none"> Used at five hospitals: <ul style="list-style-type: none"> ✓ In one hospital, physicians see messages for only about 50 incompatible drug combinations; others are displayed during pharmacist review. ✓ In another hospital, there are plans to add approximately 2000 incompatible combinations. |
| Dose Range | <ul style="list-style-type: none"> Used at three hospitals to indicate minimum and maximum recommended. Used at a fourth hospital to check for maximum dose only. |
| Therapeutic Duplication | <ul style="list-style-type: none"> Limited use at two hospitals for only two drug classes. Used at one hospital to check for prescribing identical drugs only. |
| Weight-based Dose Checking | <ul style="list-style-type: none"> Limited use at four hospitals: <ul style="list-style-type: none"> ✓ Used at one hospital to calculate IV drips. ✓ Used at one hospital to assist with calculations for dose and frequency. ✓ Used at one hospital for pediatrics dose checking with plans to add more as needed. ✓ Limited use in one hospital where most checking is done by pharmacy. |
| Drug/Lab Checking | <ul style="list-style-type: none"> Used at three hospitals: <ul style="list-style-type: none"> ✓ Two hospitals display relevant lab values and a related message to check dosing. ✓ Two hospitals display renal dosing based on creatinine levels. ✓ One hospital checks potassium level. |
| Drug/Food Advisory | <ul style="list-style-type: none"> Used at one hospital |

Suggestions for new clinical decision support for medications come from a variety of sources in every study hospital: Pharmacy and Therapeutics Committee, Pharmacy Department, Quality Department, Risk Management, and the medical staff. The lead physician or CMIO was always involved in managing the use of medication checking, often as chair of an IT Physician Advisory Committee (PAC.) Typical of the process of refining a medication-related CDS is the following protocol used at one of the study hospitals:

The PAC develops an agenda with input from the P&T Committee and the Quality Department. The pharmacy, working with a lead physician or CMIO, designs the changes to be implemented to the CDS. The PAC reviews and approves the design including the wording of any message to be displayed. The PAC, integrating user feedback,

monitors (both immediately and long term), the effectiveness of the newly designed medication-related CDS.

Each study hospital monitored the effectiveness of the alerts using system generated reports. This feedback is essential for ongoing management. To be effective, the reports need to indicate how often a particular alert appeared and the frequency with which the physician or pharmacist responded by canceling or changing the order after an alert. This type of information is invaluable for refining decision report rules and for measuring the broad benefit of CPOE. A sophisticated and highly functional set of rules is critical, as too many “nuisance” or excessive alerts will frustrate physicians and prevent them from using the system productively.

IV. CPOE and Medication Reconciliation

Medication reconciliation ensures that the medications a patient is taking are reviewed and considered in decisions about new medication orders whenever a patient is transferred from one level of care to another (e.g. from the Emergency Department to inpatient care, from the Intensive Care Unit to a medical-surgical unit, or from inpatient care to home or another facility).

recognized as a good practice, the attention paid to it has significantly increased since the Joint Commission on Accreditation of Health Care Organizations (Joint Commission) incorporated this process in requirements for hospital accreditation:

| Joint Commission 2007 National Patient Safety Goal | |
|--|---|
| Goal 8 | Accurately and completely reconcile medications across the continuum of care |
| Requirement 8a | There is a process for comparing the patient's current medications with those ordered for the patient while under the care of the organization. |
| Requirement 8b | A complete list of the patient's medications is communicated to the next provider of service when a patient is referred or transferred to another setting, service, practitioner, or level of care within or outside the organization. The complete list of medications is also provided to the patient on discharge from the organization. |
| Other Recommendations | <ul style="list-style-type: none"> Place medication list in a highly visible location and include dosage, drug schedule, immunizations, and allergies or drug intolerances on the list. Reconcile medications at all interfaces of care within a reasonable time. Involve patients, responsible physicians, nurses, and pharmacists. On discharge provide a complete list of medications and instructions to the patient. |
| Source: 2007 National Patient Safety Goals Hospital Version Manual Chapter, including Implementation Expectations. | |

Key points:

- Medication reconciliation is coupled with inpatient order writing and, therefore, CPOE.
- The challenges of medication reconciliation vary with the setting in which it is applied: admission, transfer, and/or discharge.
- All study hospitals enter a patient's home medications electronically upon admission, document completion of medication reconciliation and produce medication instructions for patients upon discharge.
- Medication reconciliation will be improved when the task of reviewing past medications is electronically linked to writing orders for new or continuing medications.
- Several hospitals in the study were awaiting significant upgrades and/or software modules from their clinical information system vendor to support medication reconciliation.

CPOE, and other related CIS applications, were not designed to support medication reconciliation as it is defined today or the Joint Commission requirement. In the study hospitals, design of support for the medication reconciliation process has created significant CPOE optimization projects.

All of the study hospitals integrate new medication reconciliation features into CPOE when they become available from CIS vendors. One hospital has worked with its CIS vendor to enhance CPOE to include electronic documentation of medication reconciliation, and several have added local customizations to the standard software as interim measures.

Medication reconciliation is a somewhat different process in each of its settings: patient admission, transfer within the hospital, and discharge. What follows is an analysis of the unique challenges posed by each of these settings.

Reconciliation upon Admission

When a patient is admitted to the hospital, one of the biggest challenges is assembling information on medications the patient was taking at home (home medications list.) This is typically done by a nurse in the Emergency Department or unit to which the patient is admitted.*

Rather than rely solely on patient reporting, nurses in two of the study hospitals view patient medication profiles from their ambulatory Electronic Health Record (EHR.) These profiles, used by physicians affiliated with the hospital, are regarded as a reliable starting point for a patient's medication list. In one hospital, staff can also view discharge medications from prior admissions. At one study hospital, the patient's pharmacy is also listed, providing a useful contact point for additional information about home medications and also for faxing prescriptions upon discharge.

*Source: Adapted from Jane Metzger et al; Taking the Measure of Inpatient EHRs; Journal of AHIMA, June 2007.

The home medication list is entered into the CIS in every study hospital. Ideally, this information is entered in coded form rather than free text. This makes the information transferable to the inpatient clinical system and usable for supporting inpatient care decisions. In one hospital, the nurse assembling the list of home medications uses a prescription writing feature to select the appropriate medication; another hospital was expecting a similar feature in the next system upgrade. Staff from one hospital wisely cautioned that the admitting staff must always be able to enter "little blue pill" because that may be the best available information at the time.

Once the home medication list has been created, the patient's physician is responsible for deciding which medications will be continued and which ones eliminated. The resulting list is then reconciled by the physician or, at one study hospital it is reviewed by the physician and then the final reconciliation is done by a pharmacist.

Physicians must document that they have completed reconciling medications. In the study hospitals this can be accomplished by an electronic signature attached to the reviewed list or by attestation: "I have reviewed and reconciled the patient's medications." One hospital allows a paper option for reconciliation but requires electronic attestation indicating whether the documentation is electronic or on paper.**

The team from one hospital pointed out that whether the task of reviewing medications is electronic or on paper, it is challenging to get physicians to indicate the decisions about every home medication; the tendency is to focus on the medications that are to be continued in the hospital rather than the full list. To ensure reconciliation is completed, one hospital sends the physician a message that reconciliation needs to be done on admission; if the physician fails to complete the task, a reminder is sent within 18 hours.

**Source: Adapted from Jane Metzger et al; Taking the Measure of Inpatient EHRs; Journal of AHIMA, June 2007.

Because the physician's role in medication reconciliation is linked to writing admission orders, the ideal design would automatically change all continuing home medications into an inpatient order. This would require that entries on the home medications list be coded rather than entered in free text. Turning the home medications list into an inpatient order would trigger medical reconciliation and would avoid requiring that the admitting physician enter each medication individually. Three of the study hospitals are anticipating system upgrades that would make it possible to electronically transfer medications that are being continued so that the home medications list does not have to be retyped.

Reconciliation upon Intra-hospital Transfer

Medication reconciliation for an intra-hospital transfer is less challenging. Because the current orders for the patient have already been entered into the clinical information system, staff members do not have to search for or document the information. One study hospital requires that all orders be discontinued and re-entered at transfer; more commonly the receiving physician is required to attest to having reviewed all medications.

Reconciliation upon Discharge

When a patient leaves the hospital to go home, the home medication list may need to be adjusted to reflect the patient's status at time of discharge. The physician has access to the home medication list entered electronically at admission and any modifications made during the hospital stay. The medications that the patients will take home can be reconciled, a process triggered in one study hospital by the placing of a discharge order.***

Information from discharge medication reconciliation is also incorporated into discharge instructions for the patient: it can list which of the medications have been discontinued, which ones will continue, and which ones are new. One hospital incorporates this, along with other information about the patient's hospital stay, into a Continuity of Care Form. Another hospital faxes the discharge instructions to the patient's community physician, faxes new medications to a community pharmacy, or provides access to the discharge medication through the patient's EHR.

***Source: Adapted from Jane Metzger et al; Taking the Measure of Inpatient EHRs; Journal of AHIMA, June 2007.

V. Management of Information Technology Downtime

Hospitals must plan for how they will handle lack of access to information during periods when CPOE is unavailable either because of anticipated maintenance and systems upgrades or because of a failure of some type. The study hospitals have identified a variety of ways to manage this downtime.

Each of the study hospitals has experienced both planned and unplanned downtime. Two had sufficient redundancy built in to recover on-line access to patient data entered before the downtime within one hour; they were, however, unable to enter data into the system. Another hospital plans, within a few months, to have a back up system outside of the hospital so that, in the event of a

power failure, access to all clinical applications will very quickly be restored. One CMIO commented that community hospitals using CPOE and other advanced clinical applications really need a site outside of the hospital that allows instantaneous access to all applications in the event that the hospital's system is down. The capability to retrieve "view only" data (contrasted with the capacity to enter new data) is relatively inexpensive. Another alternative is to continually queue the more recent patient data to print; then if the system goes down, staff can get printed copies of the patient's information.

Planned downtime to accomplish a major upgrade or install a new version of a system can be as long as 8-10 hours. In this case, back-up patient information can be produced immediately before the downtime is scheduled to begin. It is always scheduled when it will cause the least possible disruption to CPOE and other applications. Typically, clinical leaders in multiple areas are consulted before the scheduling decision is made. One of the challenges is that when the inpatient units are quiet, the Emergency Department is often at its busiest. Nevertheless, the study hospitals reported that nights and weekends are usually selected.

Alerting staff to an anticipated downtime is extremely important. One staff member commented that there is no such thing as "over communication" when it comes to downtime. The study hospitals used the many different methods listed below to inform users, designated managers and support staff.

Key points:

- All of the study hospitals have had both planned and unplanned downtime. Methods for dealing with downtime have evolved to minimize the impact on clinical care.
- Multiple communication methods are used to make staff aware of both planned and unanticipated downtime. The types of communication and the staff targeted to receive them are tailored to the circumstances of the downtime.
- Each of the study hospitals has formal procedures for clinical operations during downtime and for provision of ready access to needed forms and patient data. Whenever possible, highly competent CPOE users and clinical support staff on the units are available to assist the physicians.
- Once clinical staff members are relying on CPOE and e-MAR, the ability to view patient data is crucial even during periods when it is impossible to enter new patient information. The study hospitals have different approaches to meeting this need.

Forms of Downtime Notification to Staff

| Planned | Unplanned |
|---|---|
| <ul style="list-style-type: none"> • Electronic system notices via the CIS at user sign-on: countdown one week prior to, days prior to, and hours prior to disrupted service • E-mail (especially to managers who do not use the CIS daily) • Posted notices on patient care units and in staff lounges • Staff meeting announcements and staff newsletters • Overhead announcements beginning 30 minutes prior to and at the start of scheduled downtime • Electronic pop-up notices to all users starting 15 minutes prior to downtime and repeated every 5 minutes | <ul style="list-style-type: none"> • E-mail to all users • Text page to key management, nursing managers, and clinical support staff • Nursing managers and clinical support staff circulating on the units • Overhead announcements in the hospital • E-mail notification where available |

Procedures for a “return to paper system” during downtime need to be established. This will become increasingly important the longer CPOE and e-MAR have been in use because fewer and fewer staff will recall the old paper-based processes. Orders need to be handwritten, requisition sheets, medication administration records and handwritten orders need to be delivered or faxed to the pharmacy, laboratory or other departments. Many other tasks and processes are affected as well: a representative from one of the study hospitals emphasized the importance of working out downtime procedures for typical patient scenarios, such as admitting or transferring a patient, rather than just for isolated tasks.

cart on each unit with all of the necessary forms and procedures. During an actual downtime, the IS department staff print patient information summaries and deliver them to a specific cart on the patient unit. The staff can then retrieve the information from that central cart.

All of the study hospitals have implemented e-MAR in addition to CPOE. In order not to disrupt patient care, each hospital has taken measures to provide backup access to every patient’s recent e-MAR record and other critical information. The specific methods vary, as shown below.

Downtime Kit

- Contact numbers for key personnel
- Copies of policies and procedures – downtime and recovery
- Order sheets and high-volume order sets
- Downtime requisitions (lab, X-ray etc.)

Ready access to forms and to information about downtime procedures on each patient care unit are critical. Two of the hospitals have organized necessary materials into a “Downtime Kit”; after every downtime, a designated staff member is responsible for determining what needs to be replenished. Having both forms and procedures on the computer system within the hospital serves as a backup. One hospital has a downtime crash

Clinical Data Access During Downtime

- At set intervals, automatically print patient summary on the unit
- At set intervals, automatically deliver electronic patient summary (orders, e-MAR, and current lab results) to a designated electronic mailbox
- At set intervals, automatically deliver electronic patient chart summary and e-MAR to a downtime computer on each unit
- Automatically deliver recent laboratory test results, point of care laboratory test results, orders, and vital signs to a PDA on each unit (two PDAs on larger units)
- Provide access to the latest backup e-MAR via the hospital’s in- house computer system for printing
- Print patient summary in IS department and deliver to unit, store in file on cart with all needed paper forms

After every downtime in one hospital, staff members conduct a formal critique to identify improvements that could be made to the procedures. Following an extended, unplanned downtime, one hospital changed the frequency of capturing patient information for downtime access from every four hours to every two hours. After a downtime another hospital changed the twice daily queuing of patient summaries to hourly queuing. In another, the e-MAR is saved every hour for possible use during downtime.

None of the hospitals rehearsed downtime procedures; they feel that planned downtimes keep many staff sufficiently familiar with the procedures. They do, however, provide education and rely upon highly competent CPOE users to provide on-the-spot downtime support. During both planned and unplanned downtimes, clinical support staff members try to be available on the units as well.

Ideally, following a downtime all patient information recorded on paper is electronically entered so that the EHR is complete. However, this is not always practical. In one hospital, if downtime is longer than four hours, orders and documentation remain on paper and are not entered into the system; if the downtime is shorter than four hours, pharmacy staff enters the medication orders and nursing staff enters medications administered. In all of the study hospitals nurses, unit secretaries, and sometimes pharmacy staff are responsible for entering downtime information rather than physicians. Some of the hospitals arrange ahead of time for extra staff to enter data following a planned downtime.

Appendix A - Hospital Profiles

| Appendix A - Hospital Profiles | |
|---|---|
| | |
| | |
| 1. Newport Hospital (LifeSpan System) | Newport, RI |
| Number of Beds | 129 |
| Vendor | Siemens |
| CPOE Rollout Completion Date | November 2004 |
| Orders Entered by Physicians | 92 percent |
| Community Physicians | 219 |
| 2. Baystate Franklin Medical Center (Baystate System) | Greenfield, MA |
| Number of Beds | 130 |
| Vendor | Cerner |
| CPOE Rollout Completion Date | 2004 |
| Orders Entered by Physicians | 99 percent |
| Community Physicians | 120 |
| 3. St. Mary's Health Care (Trinity System) | Grand Rapids, MI |
| Number of Beds | 230 |
| Vendor | Cerner |
| CPOE Rollout Completion Date | 2004 |
| Orders Entered by Physicians | 98 percent |
| Community Physicians | 700-800 (200-300 regular admiters) |
| 4. Glens Falls Hospital | Glens Falls, NY |
| No. of Beds | 410 |
| Vendor | Cerner |
| CPOE Rollout Completion Date | November 2006 |
| Orders Entered by Physicians | 80 percent; (90 percent outside of operating rooms, labor and delivery) |
| Community Physicians | 220 |
| 5. Citizens Memorial Hospital | Bolivar, MO |
| Beds | 74 |
| Vendor | Meditech |
| CPOE Rollout Completion Date | December 2003 |
| Orders Entered by Physicians | 100 percent |
| Community Physicians | 71 |
| 6. Alamance Regional Medical Center | Burlington, NC |
| Beds | 238 |
| Vendor | Eclipsys |
| CPOE Rollout Completion Date | 2000 |
| Percent of Orders Entered by Physicians | 87 percent (100 percent by end of 2007) |
| Community Physicians | approximately 220 |

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*New England
Healthcare
Institute*

Massachusetts Technology Collaborative
75 North Drive
Westborough, MA 01581
tel: 508.870.0312
fax: 508.898.2275

MTC Boston Office:
2 Center Plaza
Suite 440
Boston, MA 02108-1904
tel: 617.371.3999
fax: 617.725.8938
www.masstech.org

New England Healthcare Institute
One Broadway, 12th Floor
Cambridge, MA 02142
tel: 617.225.0857
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