Implementation of a Computerized Physician Order Entry System of Medications at the University Health Network – Physicians' Perspectives on the Critical Issues

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SYNOPSIS

While computerized physician order entry is recommended to improve patient safety, the implementation presents significant challenges. As physicians involved in the recent implementation of computerized medication order entry at University Health Network, we advocate the importance for physicians to be closely engaged in the implementation process. We discuss our experiences and solutions to critical issues such as physician adoption, training, user support, computerized decision support and technology.

BACKGROUND

There is broad support for the adoption of computerized physician order entry (CPOE). The Institute of Medicine, the Agency for Healthcare Quality and Research and the Leapfrog Group all advocate CPOE as a method of reducing medical error and adverse events. Certain benefits of CPOE are self-evident such as reduction in transcription errors due to poor handwriting, recopying of orders and improving computerized decision support. Other types of errors, however, may result from CPOE implementation (Koppel et al. 2005).

Successfully implementing such a change can be difficult. Recent estimates are that only 2.5% of hospitals within Canada and the US have achieved over 50% of computerized physician ordering of medications (KLAS Enterprises 2005). Indeed, similar to many other information technology interventions in healthcare, CPOE implementations can be complex and can fail (Connoly 2005).

Why is this change so difficult?

The medication ordering process is extremely complex. New medication orders, change orders, self-medication, patient's-own-medications, automatic stop orders, restricted drugs, intermittent intravenous medications and continuous intravenous medications are only some of the procedures requiring incorporation into the CPOE process. Information technology systems replacing the paper system are by necessity complex and costly.

The environment also adds risk to implementing this change. As the main users of the order entry system, physicians work in a busy environment. Learning or using a new system is a low priority competing with many other tasks, including direct patient care. Turnover among staff is also high, especially in a teaching hospital with medical, nursing and pharmacy trainees.

Present generation electronic patient record systems are often limited by poor interface design, lack of user customization and reliance on aging enterprise infrastructure. Although clinicians usually appreciate benefits of CPOE, written and verbal medication orders are generally easier and faster to perform at the point of care. It is anticipated that both technological advances and increasing convergence of information technology systems will result in improved interfaces and more benefits from CPOE.

Thus, one of the crucial challenges to CPOE is physician adoption. We will provide our experiences from the physician perspective with the adoption of CPOE at a large tertiary care teaching hospital.

SETTING

The system was implemented at the University Health Network (UHN), a teaching institution of the University of Toronto comprised of three hospitals: Toronto General, Toronto Western and Princess Margaret. Altogether, there were 700 beds, 27,600 admissions and 873,000 clinic visits in 2003.

THE ELECTRONIC MEDICAL RECORD SYSTEM

The electronic patient record in place at UHN is Misys CPR. Clinical information contained in our system includes demographics, patient notes, laboratory results and medical imaging reports. Since 1988, physicians have been ordering laboratory and medical imaging tests through the electronic patient record. The following are the changes recently introduced with the new system.

Computer Order Entry of Medications

The goal of this implementation was to improve patient safety by shifting physician ordering of medications from paper to on-line.

Electronic Medication Administration Record with Documentation on the Computer by Nurses

The goal was to have the full cycle from ordering to administration on-line.

Interface of the EPR (Misys CPR) with the Pharmacy System (BDM, RxTFC)

A decision was made that the pharmacy module within Misys did not meet the needs of our pharmacists. It was decided that an interface was the desired solution instead of using the Misys pharmacy module.

Progress to Date

There was an initial pilot study of the system in February 2003 for one month on internal medicine. The system then went live in June 2004 on internal medicine. Further rollouts to psychiatry, gastroenterology, nephrology, cardiology and surgery, including operating rooms, have followed.

PHYSICIAN INVOLVEMENT

It was recognized that there would be a large impact on physicians, as they would enter orders on-line instead of on paper. Due to the large impact on physicians, the medication order entry project team enlisted physicians' input at multiple levels. The physician-in-chief (MB) led the Medication Order Entry steering committee. Since internal medicine was the initial site to go up, several internists were part of the initial steering committee as well as the unit implementation committee (RW, HA). One of these physicians (HA) was also director of the internal medicine clinical teaching unit at Toronto General Hospital. One of the physicians (RW) was involved with initial workflow changes, implementation decisions and assessment of system readiness. The Director of Medical Informatics and co-chair of the Electronic Health Record Clinical Advisory Committee (PGR) of the hospital was directly involved in testing the application on a developmental server and in suggesting changes to the application before the live rollout, in addition to serving on the steering committee.

PHYSICIAN ADOPTION

One of the major hurdles in adoption of CPOE is helping the physicians manage the change in their workflow. CPOE dramatically affects the way a physician practises and increases the order entry time (Bates et al. 2001).

For this implementation to be successful, we found that it was critical to have physician champions. This included a champion at the top medical level and leaders within the specific implementation units. While the top management leadership could promote the benefits and vision, the implementation leaders would deal with day-to-day issues.

Communication to users was felt to be critical and regular forums with residents were held during morning report and noon rounds to discuss new changes, provide tips and receive feedback. We felt it was crucial to get residents' feedback on the new system. In fact, many residents experienced "feedback fatigue" and commented that they were tired of giving MOE feedback and just wanted to do their jobs!

For several weeks after the go-live date, daily meetings were held with physicians, nurses, pharmacists and project team members. Critical issues were discussed and resolved. This allowed both the rapid problem solving of issues and also conveyed to the front-line users our commitment to making this work.

TRAINING

Ensuring all physicians were trained on the system presented challenges. Ideally, an intuitive interface would require minimal training. Realistically, however, the medication-ordering process is complex. Even with a paper system, training is required for medical students to learn to write orders.

One important decision that we faced was whether physicians should be allowed to enter orders without training. Our hospital previously had a policy that physicians could use the electronic order entry system without prior training for chart review or order entry of tests. Ultimately, this was deemed not to be safe for medication ordering as the chances for medical error were too high without training. At our hospitals' Electronic Health Record Clinical Advisory Committee meeting, the decision was made that training was mandatory for medical students, residents and staff physicians before they could place an electronic medication order.

Once the decision was made to make sure everyone was trained, we encountered several challenges. One of these was that, as a teaching institution, residents and medical

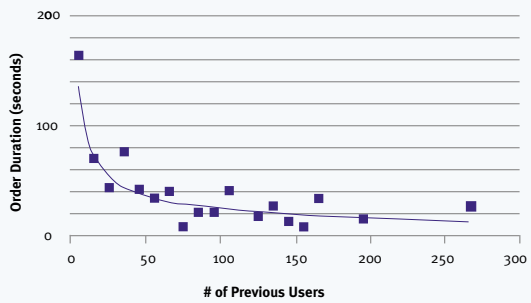
students change services and hospitals every one to two months. Ensuring that they have appropriate security and training before beginning their clinical rotation at our hospital can be difficult.

Several scenarios highlight the difficulty. Regularly, residents who were previously at different hospitals arrived for their first day at work on our MOE floor and were also on call and responsible for a team of 20 inpatients. We regularly have residents from other services who fill in for internal medicine night call. When this occurs because of illness, there is not always time for training to occur. While most residents understood, the physician leaders were at times required to explain to noncompliant housestaff that writing medication orders on paper was no longer the way we practised internal medicine at UHN.

Training sessions were also redesigned and reviewed to make sure that they were relevant and allowed for hands-on experience as much as possible.

We measured the time it took doctors to order through the system. Not surprisingly, we found that there is a learning curve to the system (Figure 1). After approximately 50 order entry sessions, the time it took for doctors to order decreased from initial times of over a minute to less than 30 seconds.

Figure 1. Learning curve to the system



SUPPORT

It is critical to have proper support for the implementation of a process that dramatically affects the workflow. The level of support provided by the information systems department was excellent at the go-live, with 24-hour, 7 days a week support for the first several weeks. This was maintained initially with on-the-ward support and then with pager support.

The importance of timely and expert support was highlighted when the decision was made to switch to the standard support service in August 2004 after two months and calls to the dedicated MOE support had been low. Unfortunately, the standard support service usually supported hardware, log-in and printing issues, but they were untrained and unfamiliar with medication order entry. Without this expert support, there were occasions when staff physicians, residents and nurses spent hours trying to understand what happened with a specific complex order. Not surprisingly, user dissatisfaction increased. Emergency meetings were held and full support was re-established.

These new requirements in support structure were a major change to how we implement information technology. The traditional process of a quickly handing over support to the standard service desk did not work for the MOE project. The complex nature of the system, the learning curve and the time-critical nature of the work dictated readily accessible expert user support.

We feel that it was critical to the continued success of the rollout to have sufficient knowledgeable support staff available. Indeed, the support structure for the rollout to the remainder of the organization was increased to four weeks of on-site support. As well, the support desk personnel were trained to quickly route MOE-related calls to MOE support experts.

DECISION SUPPORT

While CPOE in itself has been shown to reduce errors, a key goal is to provide decision support at the time of ordering (Kaushal et al. 2003). This would include drug-lab, drug-drug and drug-allergy checking. From our initial pilot, we found that this checking would slow physicians down while providing minimal added benefit.

While it would seem counter-intuitive to turn off decision support, in this case the benefits (at times minimal) were outweighed by the risks (slowing down physicians and causing dissatisfaction). One of the most common drug-drug interactions was ASA and enoxaparin, commonly and appropriately ordered together in acute coronary syndromes.

Thus, our current strategy is to gradually implement decision support, beginning with only the most highly relevant information. To date, we have drug-allergy checking and duplicate checking and are introducing drug-drug checking for major reactions.

TECHNOLOGY

CPOE systems need to be stable, intuitive and have favourable response times (Ahmad et al. 2002). This is required to ensure users can place orders efficiently.

Our initial pilot study revealed system issues of slow response and instability. To ensure that the system was ready for the full implementation, the system was tested under a heavy workload prior to the "go-live." Instead of relying on testing that usually occurred on a "development" system, test patients were created on our production system. Ordering scripts of medications based on real patient visits were created. Testers would run through these scripts, evaluating the system performance for expected response, any errors and response time. This occurred

for three weeks, involving eight team members resulting in a compilation of issues. Our vendor, Misys, worked closely with us and was extremely responsive in resolving these issues for us. Without this close vendor support, the implementation would have been very difficult.

Since residents were going to be the prime users of the new order entry system, we held usability sessions with 10 residents before the go-live. Feedback was obtained through usability sessions and through surveys. By the time we were ready to go live with the new system, 90% found the new system to be intuitive. Their feedback was also used to change ordering screens as well as to learn what to stress during training sessions.

SUMMARY

There are many reasons why most hospitals have not adopted physician order entry systems for medications. It is a costly endeavour (Kuperman and Gibson 2003) that can cause major disruptions to workflow for physicians, pharmacists and nurses. Yet, the technology can reduce medication errors, especially with sophisticated decision support. We have presented many of the lessons learned from our successful implementation experience. To date, over 90% of medication orders are entered by physicians.

The technology must be ready for the implementation. System issues such as errors, slowness and freezing give ready opportunity for critics who will claim the system is just not ready for real-time. Through rigorous testing, we were able to avoid issues previously seen in our pilot study. Usability testing with end-users was also critical in both guiding decision-making as well as validating that the system was ready for implementation.

Proper training and support were also necessary. To ensure ready adoption, decision support was optimized to reduce the volume of less important alerts.

Most importantly, we found that active physician involvement at multiple levels was key. This ensured that physicians understood from a high-level perspective that this change was necessary. Planning for specific implementation details had the benefit of input from physicians working in the area. Day-to-day issues of our residents and staff were also addressed promptly.

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