The **Business Case** for Patient Safety

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C onventional wisdom dictates that hospitals are institutions in which ailing or injured people go for a temporary visit, their discharge ultimately dependent upon either a partial or complete recovery. Unfortunately, the most well-intended acts sometimes result in tragedy. Depending upon the severity of a patient's condition, sometimes a visit to the hospital is a one-way excursion. And in some cases (most would argue in too many cases), the reason a patient dies within the confines of a hospital is due to the lack of a systems approach to patient safety.

With this in mind, the leadership team at University Health Network decided to pursue a new information technology initiative to substantially reduce human and system errors and omissions as it pertains to medication management and patient safety. As the leadership team, we collectively decided that, since the technology was now available, and had been shown to be proven but underutilized within our industry, the time had come for our organization to apply it.

In particular, what caught our attention in recent years was a pair of groundbreaking studies. These studies confirmed that patient safety in a hospital setting can be sometimes seriously compromised due to medical error. In the report, *To Err Is Human: Building a Safer Health System*, published by the U.S.-based Institute of Medicine of the National Academies (IMNA) in 1999, IMNA found that nearly 100,000 patients per year were dying in U.S. hospitals due to adverse complications stemming from medical errors (Kohn and Corrigan 2000).

"The Canadian Adverse Events Study" determined that errors were occurring in 7.5% of annual hospital admissions. More unsettling was the fact that more than one-third of these mistakes (36.9%) were entirely preventable.

Closer to home, we were apprised of some equally disturbing statistics reported in "The Canadian Adverse Events Study: The Incidence of Adverse Events Among Hospitals in Canada" (Baker et al. 2004). This study was developed by the Harvard Medical Practice Study and based on a protocol similar to that used by the authors of the IMNA paper. It examined chart audits at a teaching hospital, a large community hospital and two small community hospitals. The hospitals were situated in five provinces (British Columbia, Alberta, Ontario, Quebec and Nova Scotia), and the data were amassed during the 2000 fiscal year. The findings were subsequently published in the May 2004 issue of the *Canadian Medical Association Journal*. In a

nutshell, "The Canadian Adverse Events Study" determined that errors were occurring in 7.5% of annual hospital admissions. More unsettling was the fact that more than one-third of these mistakes (36.9%) were entirely preventable and that 20.8% of these mishaps actually resulted in the death of a patient.

By extrapolating the data, an unsettling picture eventually emerged: Of the almost 2.5 million annual hospital admissions in Canada during the time of the study, roughly 185,000 were associated with an adverse event. Ultimately, these adverse events resulted in between 9,250 and 23,750 preventable deaths.

What was the leading cause of these sometimes-fatal errors?

"Based on the literature, there was strong consensus that errors around the administration of drugs were the most critical problem contributing to adverse events," says the Chief of Surgery at UHN. "This [incidence of adverse events] could result from any mix of incorrect writing of prescriptions by physicians, illegibility of the written orders, the prescribing of inappropriate meds, the incorrect interpretation/transcription of written orders by nurses, or the incorrect administration and documentation of the meds."

If anything, the studies indicated that there is an urgent need to improve patient safety in acute care hospitals. As well, the studies suggested that when it came to administration of medications in hospitals, changes were required to reduce the frequency of errors and adverse events.

In fact, part of the reason why mistakes are typically made vis-à-vis the administration of medications is due to the archaic nature of paper-based medication management in an increasingly digital world.

Thus, in 2001, we at UHN undertook one of the largest patient safety initiatives in Canada by requiring all medications to be ordered, administered and documented electronically. The system became known as the Medication Order Entry/Medication Administration Record project (MOE/MAR).

While not necessarily followed in a systematic fashion, we took the following key steps in making our decision to pursue MOE/MAR:

- articulating the problem that the organization was trying to solve
- identifying a credible and feasible solution
- determining the true costs and risks of the project
- defining the benefits to get support for the project
- ensuring commitment to mitigate inevitable challenges

The process of transforming clinical practice for medical, nursing and pharmacy staff across three campuses of the nearly $1 billion (annually) hospital organization was not without its challenges. First, MOE/MAR came with a lofty price tag, ultimately costing more than $5 million. It was also a time-intensive project, requiring nearly five years in which to imple-

ment from investigation to complete implementation. This paper documents our decision-making process undertaken by the Executive Management team at UHN that ultimately led to the implementation of MOE/MAR.

Background on UHN

UHN, the eighth-largest acute care institution in Canada, encompasses three hospitals located in downtown Toronto: Toronto General Hospital, Toronto Western Hospital and Princess Margaret Hospital. It also encompasses Toronto Medical Laboratories. As well, UHN is a major teaching hospital for the University of Toronto with care delivered through seven program groupings: Advanced Medicine & Surgery, Community & Population Health, Heart & Circulation, Musculoskeletal Health & Arthritis, Neural & Sensory Science, Oncology & Blood Disorders, and Transplantation.

The oldest site in the UHN group is Toronto General Hospital, which has provided services to the community for more than 165 years. UHN has approximately 11,000 affiliated staff, more than 1,200 physicians, an operating budget of nearly $1 billion, 30,000 annual inpatient cases and 950,000 annual outpatient visits.

Articulating the Problem the Organization Was Seeking to Solve

In 2001, UHN completed a 10-year corporate strategic plan in which "improving the patient experience" was a key organizational strategy. As a result, moves were undertaken to implement new processes and structures within UHN to support improvements in patient safety. Senior management observed a strong movement toward improving patient safety (particularly in the hospital setting) throughout the entire healthcare industry in the early 2000s.

Meanwhile, the federal government had established the Canadian Patient Safety Institute (CPSI). CPSI acts as an independent, not-for-profit corporation dedicated to achieving measurable improvement in the incidence of patients experiencing adverse events while in the care of the Canadian health system. These activities, which were all taking place two or three years ago, served to galvanize the industry – and UHN – into looking closer at patient safety in the context of quality improvement.

Further examination of the literature indicated that MOE/MAR-type systems were seen as being highly effective in helping hospitals track and mitigate adverse drug events. An analysis by the U.S.-based Leapfrog Group in 2003, for example, indicated that the full implementation of a Computer Physician Order Entry (CPOE) system decreased serious medication errors by 55% (Birkmeyer and Dimick 2004). As well, a more recent study by Grandville et al. (2006) pointed to a significant 62% error reduction rate.

These findings led the Leapfrog Group to include CPOE in its list of the three recommended quality and safety practices that have the most potential to prevent medication errors and save lives. The studies also indicated that CPOE reduces the length of stay, reduces repeat tests and reduces turnaround times for laboratory, pharmacy and radiology requests. As an added benefit in this day of fiscal restraint, CPOE also delivers cost savings (Birkmeyer and Dimick 2004).

While this groundswell of concern for patient safety was occurring throughout the industry, UHN independently initiated several major organizational patient safety efforts. For example, UHN launched a Quality Clinical Risk Management and Incident Reporting Committee chaired by the then Chief Operating Officer of the Princess Margaret Hospital site (who would go on to become UHN's Chief Executive Officer in 2005). To support this committee, UHN leadership formed a Patient Safety Council. This council was given the mandate to address specific patient safety risks resulting in reported adverse events.

University Health Network (UHN)
Network of three sites in Toronto, Ontario: Toronto General Hospital, Princess Margaret Hospital, Toronto Western Hospital

As well, a major corporate culture renewal initiative was also underway led by Nursing. This initiative included training for all nurses and others to emphasize patient-centred care in all aspects of the care process. A key component of this training focused on patient safety.

"By the time our council was formed, however, we felt we were already behind by both Canadian and North American standards," says UHN's Medicine Physician-in-Chief. "Our hospital likes to be at the leading edge, so we created a strategic plan to jump into the lead on patient safety, at least on the national level."

UHN had already implemented CPOE for labs and medical imaging since the late 1980s. However, it had not yet implemented medication order entry or electronic medication administration. As a result of this increased attention in the industry, coupled with the organization's commitment to step up its own patient safety efforts, UHN's senior management increasingly felt compelled to consider electronic medication order entry and medication administration systems.

Identifying a Credible and Feasible Solution

Although there was not much information in the literature regarding the actual implementation efforts for CPOE initiatives in other hospitals, UHN realized that implementing medica-

tion order entry and medication administration on-line would make for a highly complex project and would impact every clinical program in the organization. Successful implementation would require proper scoping up front, adequate staff training and change management throughout all stages of the project.

There would also have to be a demonstration of patient safety and other benefits in order to justify the organization's efforts and investment.

The hospital's Information Management and Information Technology department, known as "SIMS" (Shared Information Management Services), had already been experimenting with clinical decision support software. SIMS was developing an understanding of how automated alerting (for drug-drug and drug-allergy incompatibilities as well as for duplicate orders or orders that might show a contrary indication based on lab results) could be introduced with medication order entry.

The scope of the MOE/ MAR project was defined to include all inpatient units across all seven of the hospital's clinical programs. A physician order entry system would be required, as would a nursing medication administration on-line system and on-line pharmacy verification. And although not yet fully contemplated at this juncture, it was assumed there would be a need to redesign some of the clinical workflows supporting medication administration.

Finally, the scope of the MOE/MAR project would have to include implementation of wireless computer devices to support portability of the physician and nursing staffs.

Before the project received the green light, however, there was considerable debate among members of the executive team. The point of contention: Was the MOE/MAR project truly the best use of time and money in comparison to other much-needed and much-requested initiatives? Other initiatives that were considered included clinical documentation, clinical

decision support alerting for lab and diagnostic orders and incident reporting electronic system changes.

Ultimately, it was decided that attempting to manage multiple patient safety projects would be too much of a drain on financial and people resources. As well, implementing multiple initiatives simultaneously would likely be too much change for the organization to handle. Based on the expected relative impact on patient safety, compared with these other initiatives, the choice was made to support MOE/MAR.

Table 1. Costs per project activity area

MOE/MAR Project Activities	% of Total Project Costs
Project management resources & support	30%
External consultant support	15%
Technical design and development	25%
Point of care devices & set-up	20%
User training	10%
TOTAL	100%

Source: Shared Information Management Services

Determining the True Costs and Risks of the Project

The expected capital costs of the MOE/MAR project to UHN were estimated at $4 million over the duration of the implementation. This investment would cover project management, an information technology system build and testing activity, staff training, Medical, Nursing and Pharmacy Informatics support and evaluation. As well, an additional $1 million to $2 million in other staff resources from Medical Informatics, Nursing Informatics, Clinical Pharmacy and SIMS was required to further supplement the capital-funded project team and technical development. These costs did not include nursing or physician replacement costs while they would be receiving training to use MOE/MAR; rather, these costs were covered by the clinical program budgets.

SIMS developed a multi-year detailed project budget to examine the business case. The breakdown of the costs per project activity area as a percentage of the total project costs is shown in Table 1.

In addition, incremental, one-time resources would also be provided to Nursing Informatics to recruit seven clinical support analysts and to Pharmacy Informatics to support five full-time

and three part-time staff to further support the implementation outside of their departments' operating budgets. However, these were not part of the original business case, as they were unanticipated.

We knew that there were many risks associated with a project of this magnitude. Notably, a change management and information technology implementation of this size was unprecedented at UHN. While the technology certainly was not new, few other North American hospitals had successfully implemented MOE/MAR due to the clinical workflow complexities and costs. For example, the termination of the Cedars-Sinai Medical Center CPOE initiative in the United States (Wachter 2006) created uncertainty among some of the physician leaders that the lofty goals of MOE/MAR might not be achievable.

Even so, against these risks, the team always believed MOE/MAR could be successfully implemented. And management, it should be noted, was motivated by something other than blind faith. For example, the hospital's existing electronic patient record and pharmacy system vendors had very robust solutions. As well, clinicians at the Toronto General Hospital and Toronto Western Hospital sites had been using the electronic patient record for more than two decades, with order entry available for labs and medical imaging for the past decade. In other words, these various stakeholders were used to working with electronic systems.

Moreover, we looked upon MOE/MAR as a way to introduce additional functionality (i.e., drug order entry) to an existing system's environment with which staff were already familiar. The fact that the Medicine Physician-in-Chief was willing to step forward as project sponsor gave further credibility to the organization's commitment to MOE/MAR. SIMS was known throughout the hospital for having strong IM/IT project management capabilities; SIMS was also perceived by management to have a strong ability to effectively work with a broad set of stakeholders across the organization to ensure change management. The organization's Director of Medical Informatics, Director of Nursing Informatics, Manager of Pharmacy Clinical Informatics and all of their respective teams further rounded out UHN's support for MOE/MAR.

"Just by looking at who the project leadership would encompass – Nursing, Medical, Surgery, Pharmacy, SIMS – it was clear that this was absolutely not just an IT project," says UHN's Vice-President and Chief Information Officer. "Our technical people would have to be the least visible amongst the participating groups. If this had been just an IT project, it would have gone nowhere."

Even so, the senior management team acknowledged that the organization would need to depend on SIMS to pull off a project like MOE/MAR, orchestrating activity on the ground and getting people to meet, discuss, make decisions and change the way they do things.

"Although decent compared to other hospitals, we have

a relatively small budget for information systems initiatives compared to other industries – 4% versus the 10–12% often found in financial services, transportation and so on," notes UHN's Chief of Surgery. "And we knew that this would be all-consuming for our IS budget for at least two to three years. But we knew we had to get into this, so we simply bit the bullet and said this was important enough that we would commit what it took to make MOE/MAR happen at UHN."

Approval for MOE/MAR's implementation finally came during a UHN board of trustees meeting in the winter of 2003. The then chairman of UHN's board of trustees (a senior executive with a major Canadian bank) challenged the Medicine Physician-in-Chief and the Chief Information Officer to catch up with the financial industry in terms of information management. Both hospital executives accepted the challenge, responding that UHN would indeed proceed with MOE/MAR.

Defining the Benefits to Get Support for the Project

Although it was acknowledged that the project would ultimately yield many additional short- and long-term benefits, the decision to implement MOE/MAR at UHN was driven almost singularly by our commitment to improve patient safety. With less than 2% of North American hospitals having substantial CPOE implementations (Gale 2005), hospital executives saw this groundbreaking project as an opportunity for UHN to distinguish itself. There was a general consensus that if we could succeed with the MOE/MAR project, not only would it be an important victory for us in terms of patient safety, but also it would significantly strengthen UHN's position as a leader in the adoption of the Electronic Patient Record (EPR).

As such, benefits to the organization were the key factor in the business case for MOE/MAR. "We had to assess both short- and longer-term benefits relative to the expected costs to get executive commitment to the project," noted the Executive Director Information Management of SIMS. "While there was no denying that a reduction in transcription errors and a more efficient order-to-administration turnaround time would serve as key patient safety benefits, we also knew that clinical decision support alerts could further improve the quality of patient care by identifying drug-drug, drug-lab and drug-allergy interactions at the time a drug was ordered."

Enhancing communications within clinical teams – thanks to reducing verbal and telephone orders and extending EPR usage to a broader base of UHN physicians – was also considered to be paramount. UHN's Chief Nursing Executive had wanted to address the "no verbal order" goal for a long time. The reason: Nursing realized the potential errors and patient safety risks that were inherent in verbal miscommunications. By taking laptops to the bedside and using MOE/MAR to help with patient education, nurses would be in a far better position

to deliver patient-centred care. And because MOE/MAR would only allow medications to be ordered by physicians, verbal orders would no longer be accepted as part of the medication order workflow at UHN.

Although not decision-drivers for senior management, other benefits in pursuing MOE/MAR included efficiencies from updated order sets and better compliance with drug formulary. Finally, with UHN's vision statement of "achieving global impact," the opportunity to demonstrate CPOE leadership in Canada was certainly a key factor for UHN's board.

Finally, UHN extrapolated its adverse event rates and medication errors from the findings in Baker et al. (2004) in order to assess the opportunity for improvement in patient safety. While the project team would have preferred to complete a chart audit to gather actual baseline data, this approach was turned down due to the costs and time it would have taken to complete. Nevertheless, this baseline information – coupled with plans for how ongoing metrics would be reported to show improvement – compelled the senior management team to enthusiastically move forward with MOE/MAR.

Ensure Commitment to Mitigate Inevitable Challenges

As part of the decision to proceed with MOE/MAR, the senior management team had numerous discussions about the inevitable challenges this project would have as well as mitigating strategies. The primary concern was to ensure Physician, Nursing and Pharmacy engagement throughout the duration. The Medicine Physician-in-Chief committed to being executive sponsor for MOE/MAR. The Pharmacy department reported to him, which would help ensure alignment of that team with the project priorities. Further, a MOE/MAR steering team would be established that would encompass key Physician, Nursing and Pharmacy clinical leaders from across the three hospital campuses and SIMS.

Meanwhile, the steering committee would be accountable to senior management, including UHN's CEO, for directing the project and to serve as the point of escalation for any challenges that could not be addressed by the project team including clinical resistance to change.

"Perhaps most important of all, however, is that there was already a good relationship between the medical staff, Nursing, Pharmacy and our SIMS group that allowed them all to work closely as a multidisciplinary team," says UHN's Pharmacy Director.

A related challenge raised by the Pharmacy department: With new drug protocols being introduced on a daily basis, new drugs coming onto the market and changes in the way physicians, nurses and pharmacists act and work with respect to patient care, the hospital was a highly dynamic environment. With the hospital landscape in a continual state of flux, imple-

menting new MOE/MAR functionality meant that implementing change would become a continuous process, both from a clinical and technical perspective. The departments involved would require sufficient staff to handle these changes on an ongoing basis, and the electronic systems would have to be flexible enough to incorporate those changes in real time as they occurred. In light of this concern, the senior management team approved one-time staffing increases within Pharmacy, Nursing Informatics and SIMS. This increase in funding would address the initial effort but would not commit to increasing operating budgets until after the project was completed. By embracing such a strategy, it was hoped that the ongoing effort would be better understood.

Critical Factors in the Decision to Undertake MOE/MAR

1. The strong movement already afoot in the healthcare industry to improve patient safety in the acute care hospital setting provided considerable external impetus.
2. Existing UHN initiatives around patient safety and patient-centred care created an internal environment and momentum conducive to the advent of MOE/MAR.
3. Studies and work by various patient safety groups had already identified medication errors as the most critical problem contributing to adverse events, and CPOE as the most effective way to reduce those errors.
4. Executives saw MOE/MAR as an opportunity to distinguish UHN on the patient safety front and as a leader in the adoption of the Electronic Patient Record (EPR).
5. The Executive team was willing to embrace the MOE/MAR vision, commit hospital resources and take the necessary actions to see it through to completion.
6. UHN invested in Physician, Pharmacist and Nurse Informatics professionals to work cooperatively in guiding their respective colleagues through the clinical transformation.
7. Rigorous, proven project management skills orchestrated all the project logistics to ensure appropriate change management support across the organization.

The final major challenge identified by medical leadership was the need to ensure adequate training for the July and January intake of new residents every year. As the largest teaching hospital in Canada, UHN typically receives approximately 150–200 residents and 200–250 clinical fellows every 12 months. MOE/MAR would add significant additional training to the residents' UHN orientation requirements – especially since none of the other teaching hospitals in Toronto had MOE/MAR in place yet. Thus, ongoing resources were added to the SIMS Education budget to address the continual training requirements into the future as well as the development of multiple training modalities to accommodate flexibility in training residents.

It was expected that implementing MOE/MAR would be a Herculean effort, given the amount of time, effort and money required. But considering MOE/MAR was focused on reducing medication errors and adverse events – and thereby reducing unnecessary patient morbidity and mortality – the project was more than merely a way to increase efficiencies. Rather, in the final analysis, the choice as to whether to implement MOE/MAR was no choice at all. If UHN was serious about enhancing patient safety, MOE/MAR had to be developed and adopted.

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Commentary

They Must Embrace the Vision

David A. Collins

Justifying the expense of health information technology undergoes unparalleled scrutiny. Competing priorities for expenses must be balanced by revenue, all within the confines of the "service" industry. Whether for profit or non-profit, healthcare is ultimately a business.

Technology in healthcare is not always viewed as a tool to increase efficiencies, unlike other industries where technology is pivotal to competitive advantage. The absence of even simple, day-to-day technology in the healthcare environment – the dead battery in the physician's pager or the inconvenience of only one functioning elevator – and, suddenly, technology finds it relevance! Technology enables workflow efficiencies: "Implementing an EMR is a strategic undertaking – not simply an operational endeavour. In addition to understanding this distinction, they must embrace the vision and be proactive in advancing it at all levels of the organization" (2006 HIMSS Davies recipient, Cardiology of Tulsa, www.himss.org/ASP/davies_organizational.asp).

UHN's MOE/MAR implementation was leveraged by embracing it as the "right thing to do" rather than just jockeying for a competitive advantage in the marketplace. Even with the obvious overall benefit, however, UHN was scrupulous with its business decision:

> Before the project received the green light, however, there was considerable debate among members of the executive team. The point of contention: Was the MOE/MAR project truly the best use of time and money in comparison to other much-needed and much-requested initiatives? Other initiatives that were considered included clinical documentation, clinical decision support alerting for lab and diagnostic orders and incident reporting electronic system changes.
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> Ultimately, it was decided that attempting to manage multiple patient safety projects would be too much of a drain on financial and people resources. As well, implementing multiple initiatives simultaneously would likely be too much change for the organization to handle. Based on the expected relative impact on patient safety, compared with these other initiatives, the choice was made to support MOE/MAR. (Excerpt from "Executive Perspective: The Business Case for Patient Safety," by Anderson et al., at p. 20 in this issue of *Healthcare Quarterly*.)

UHN's business decision can be supported by organizations recognized for their excellence in implementation and use of electronic health record systems, such as those receiving the HIMSS Nicholas E. Davies Award of Excellence. Two past Davies award recipients cite a number of patient safety improvements in several areas in addition to improving prescription practices:

Maimonides Medical Center (Davies 2002, www.himss.org/content/files/davies_2002_maimonides.pdf), a 705-bed hospital, saw problem medication orders drop by 58% and medication discrepancies by 55% in 2001 after its EMR-EHR implementation. That same year, the decision support feature identified 164,250 alerts, resulting in 82,125 prescription changes. The provider's EMR-EHR addressed "high alert medications," confusing look-alike and sound-alike drug names, as well as patients with similar names that could potentially cause the pharmacy confusion.

> **Technology in healthcare is not always viewed as a tool to increase efficiencies, unlike other industries where technology is pivotal to competitive advantage.**

On-line medication charting saw errors in transcription drop to zero for departments in which EMR-EHRs were in full use at Ohio State University Health System (Davies 2001, www.himss.org/content/files/davies_2001_osuhs.pdf). In areas where the EMR-EHR had not been implemented, transcription errors ran as high as 26% in its system. Other healthcare providers also saw transcription errors drop to zero.

Although healthcare is ultimately a business, the patient must stay anchored at the core. UHN's decision to improve patient care through its MOE/MAR implementation is an example of industry leadership for others to embrace.

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