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In Pursuit of a Safe Canadian Healthcare System
Matthew W. Morgan

Hippocrates Denied: Why Canada Has Yet to Act on the Patient Safety Imperative
Michael Guerriere

The Electronic Health Record: A Leap Forward in Patient Safety
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Grasping the Opportunity to Improve the Safety of Care
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The Impact of the Electronic Health Record on Patient Safety: An Alberta Perspective
Patrick Binns

Improving Patient Safety through Computerized Drug Management: The Devil Is in the Details
Robyn Tamblyn

Envisioning Safer Healthcare
Lucy Savitz

Next Steps for Patient Safety in Canadian Healthcare
G. Ross Baker and Peter G. Norton

The Author Responds
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In This Issue

4 Editorial: Notes from the Editor-in-Chief

Invited Essay
10 In Pursuit of a Safe Canadian Healthcare System
Matthew W. Morgan, MD, MSc, FRCPC
Vice President Clinical Informatics Misys Healthcare Systems
Assistant Professor, Department of Medicine, University of Toronto
General Internist, University Health Network, Toronto

Commentary
28 Hippocrates Denied: Why Canada Has Yet to Act on the Patient Safety Imperative
Michael Guerriere, MD, MBA
Managing Partner, Courtyard Group, Toronto, ON

33 The Electronic Health Record: A Leap Forward in Patient Safety
Richard Alvarez
President and Chief Executive Officer, Canada Health Infoway

37 Patient Safety: Is the Evidence Strong Enough That Information Technology Can Help?
Denis Protti
Professor, Health Informatics
University of Victoria

43 Grasping the Opportunity to Improve the Safety of Care
David Classen, MD, MS
Vice President, First Consulting Group (FCG)

47 The Impact of the Electronic Health Record on Patient Safety: An Alberta Perspective
Patrick Binns
Executive Director, Alberta Wellnet, Alberta Health and Wellness, Edmonton, AB

52 Improving Patient Safety through Computerized Drug Management: The Devil Is in the Details
Rabyn Tamblyn, PhD
Professor, Departments of Medicine and Epidemiology and Biostatistics, Faculty of Medicine, McGill University
Envisioning Safer Healthcare
Lucy Savitz, PhD, MBA
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The Author Responds
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In 1999, when Lucian L. Leape, MD, heard then-President Bill Clinton affirm that bad systems—not bad people—cause hundreds of thousands of preventable medical errors every year, the Harvard professor knew he had done his job. “He got it!” Leape said (2004).

Professor Leape was the driving force behind the Institute of Medicine’s report *To Err Is Human*, which when published crushed perceptions, not only in the US but also throughout the world, that healthcare systems are safe.

It seems clear that in order to begin to have an impact on the levels of healthcare safety, we must communicate not only with the providers of healthcare but also with the politicians. In this issue of *HealthcarePapers* we build upon the pioneer work of Baker and Norton, who wrote the lead paper for us in 2001 on “Making Patients Safer! Reducing Error in Canadian Healthcare.” Since then, the two authors conducted the Canadian Adverse Event Study that was published this year in *CMAJ*.

The lead paper for the current issue is Dr. Matthew Morgan’s “In Pursuit of a Safe Canadian Healthcare System,” which reviews the state of evidence on a safe Canadian healthcare system. Part of the goal in this issue is to accelerate the action required by all levels of government to pay full attention to the problem of safety in health services in Canada. As a physician, Dr. Morgan is able to provide insights into the extent and seriousness of the problem from a provider perspective. He does an excellent job of describing the need for a Canadian patient safety board as well as the benefits that might be gained from the use of information technology to reduce errors. Specifically he makes a plea for the use of computerized order entry systems that have been shown in the US to reduce errors in hospitals, especially medical errors.

Clearly the problem of patient safety is one of profound interest to both the academic and the practitioner communities in Canada. To some extent Canada has been slow to get off the ground with a focus on errors—other countries such as Australia, the UK and the US have at least a decade of experience as a head start on seriously addressing this issue. Responding to the perspective of Morgan, we have a wide variety of opinions, but clearly all authors are of the opinion that not enough timely action is being taken in Canada.

Michael Guerriere sets the stage for Canada by describing the slow response by Canadians to the epidemic of medical errors. He rightly indicates that Canada has not been willing historically to
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invest in health information management at either a provincial or a national level. Richard Alvarez indicates that Infoway is working now in seven areas to improve electronic access to health information in an attempt to reduce errors and improve accurate diagnosis and treatment. Denis Protti sees the problem as a “return on investment” issue to explain why there has been reluctance for governments to pay more attention to the need for electronic records. David Classen points out that in many ways Canada has an easier challenge to introduce an electronic health record because of the funding and structure of healthcare in Canada. Certainly with regionalization of services, albeit incomplete, there might be incredible benefits to a well-organized health information system.

Patrick Binns describes Alberta Wellnet, a provincial project to develop an electronic health record that can provide immediate access to a comprehensive database for patients no matter which region of the province they are located in. Robyn Tamblyn very aptly identifies the problems of safety associated with prescription drugs in the ambulatory setting and some possible information technology solutions to address them.

But in all, these are relatively small and slow achievements. Lucy Savitz in her commentary helps us understand the global nature of the safety problem and indicates that for progress to be made more work needs to be done to define benchmarks for safety and specific national and provincial goals to be achieved. With this in mind G. Ross Baker and Peter G. Norton make a plea for better documentation of adverse events and for decision-makers and policymakers to take the lead to gather information on errors, to publicize them and to take corrective action. In his concluding comments, Morgan aptly summarizes and draws conclusions from all the commentaries.

So as we look ahead, what advice does Lucian Leape have for us? Here are some of the strategies he indicates need to happen:

1. Efforts to computerize patient records and order entry must be implemented quickly – thousands of errors per year might be prevented.
2. Working conditions in hospitals and other health facilities must be improved so that there are a sufficient number and quality of prepared nursing and other staff to ensure a safe environment.
3. Patients should be informed immediately and compassionately when errors are made – full disclosure is essential.
4. A system of no-fault, enterprise responsibility should be put in place to compensate for medical injuries.
5. A federal agency such as the one proposed by Morgan should be established to determine and monitor safety standards.
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Vice President, Chief Nursing Officer Gloria Whitson-Shea: “McKesson’s electronic documentation system enables clinicians to chart patient data faster and more accurately. It allows staff members to think about how they are doing assessments. And, it improves communication among care team members — not only nurses and physicians, but others such as respiratory and physiotherapists — as we collect, review and share data necessary to coordinate patient care.”

Chief Information Officer Glen Kearns: “McKesson’s clinical systems give Grand River’s clinicians and physicians easier access to information, and that improves clinical outcomes. Providing comprehensive, consistent patient data enables them to make faster and more effective decisions about patient care and helps Grand River fulfill its mission of having greater capacity to serve the patient population.”

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There is a lot of work to be done for Canada to make headway in the area of patient safety, and every consumer, healthcare provider, executive and policymaker needs to feel that the politicians understand the magnitude of the issue and that they have political support.

References
Healthcare Papers

INVITED ESSAY
IN PURSUIT OF A SAFE CANADIAN HEALTHCARE SYSTEM

INVITED ESSAY

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ABSTRACT
This paper provides evidence that Canada’s healthcare system is not as safe as it needs to be, and suggests ways to make it safer. Healthcare leaders must recognize that patient safety is indistinguishable from the delivery of high quality, affordable healthcare, and they must become more knowledgeable about the extent of the patient safety problem in Canada. The creation of a Patient Safety Board, modelled after Canada’s Transportation Safety Board, will provide the authority healthcare leaders require to reduce medical errors. Without a national Patient Safety Board we cannot efficiently and effectively identify, quantify and address medical errors in Canada.
This paper also urges healthcare leaders to recognize that a fundamental tool in improving patient safety is the electronic health record (EHR). Return on investment data for a national EHR strategy are presented. The author focuses on three EHR initiatives: outpatient electronic prescribing; in-patient computerized physician order entry; and home-based diabetes disease management. Potential net savings to Canada from these three EHR initiatives alone approach $2 billion annually. We must accelerate our EHR investment. Coordinated national EHR initiatives will cost less, save lives and prevent harm when compared to the status quo. These initiatives will also provide the foundation for transforming our healthcare system and will assist in building a better-educated, healthier and therefore more economically competitive nation.

Introduction
It has been almost four years since the Institute of Medicine (IOM) published its first report on the patient safety crisis in the United States. The report estimated that between 44,000 and 98,000 Americans die each year from medical errors at a cost to the nation of $8.5 to $19 billion annually (Kohn et al. 2000). The most recent IOM report, Patient Safety: Achieving a New Standard of Care (Institute of Medicine 2004), demanded that all healthcare organizations establish comprehensive patient safety systems and that an electronic health record (EHR) form the foundation of these systems. The report called for the establishment of national EHR and patient safety standards and emphasized that the federal government should accelerate adoption of those standards through incentives and other measures. In short, the report stated that patient safety is indistinguishable from the delivery of quality healthcare and that an EHR is a fundamental tool in improving patient safety. Other countries including the United Kingdom (National Health Services 2000) and Australia (Wilson et al. 1995) have investigated the extent of the problem and clearly shown that medical errors are a global patient safety concern.

More than two years ago in this journal, Baker and Norton published a lead paper that eloquently summarized the patient safety literature, politely pointed out the lack of Canadian research on medical errors and provided 14 valuable recommendations that together outlined an initial action plan for medical error reduction in Canada (Baker and Norton 2001). Are Canadian patients safer today? Has the national rate of medical errors decreased? Are fewer hospitalized patients in Canada dying from medical errors? Are Canadians less likely to experience an adverse drug event in the outpatient setting? Is our growing home-care delivery safe? One would hope that, by now, Canadians would have answers to these questions. A safe healthcare system should also provide Canadians with answers to the following: Are diagnostic investigations being performed in a timely and effective manner? Are the right medications being prescribed in the right dosages for the right duration? Are patients achieving the expected and desired outcomes?

Unfortunately, we do not know the
answers to these questions. With so much attention focused on waiting times and access to services, our healthcare leaders remain unaware of the extent of the patient safety problem in Canada. However, access to care and patient safety are very closely related. For every medical error that occurs, additional scarce resources are consumed, which places additional demand on the system. For example, everyone loses if, in our haste to decrease emergency department waiting times, we prematurely discharge patients who then go on to experience adverse drug events requiring readmission to an acute care bed. Preventing medical errors can result in greater access to the healthcare system. Until this relationship between patient safety and access to care is acknowledged attempts at reform will remain focused on increasing supply of services rather than decreasing demand, in part, by decreasing error rates.

One Physician’s Testimonial
I graduated from medical school in 1991 and completed my internal medicine and clinical epidemiology training in 1995. Throughout my career I have worked mainly in large academic teaching hospitals. I recognize that I was trained by one of the best medical education systems in the world. I truly appreciate the dedication of my teachers, the wealth of resources made available to me, and the willingness of clinicians and patients to accept me and trust me at all stages of my training. Yet I rarely recall any discussions on medical errors, and I cannot remember a single lecture on patient safety. To be fair, I do remember one of my wisest clinical teachers saying on a regular basis: “Hospitals are dangerous places. It is important to get our patients home as quickly and safely as possible.” I also remember morbidity and mortality rounds, at which recent patient deaths were discussed. Rarely did these “M&M rounds” involve discussions of error and the need for a systems approach to medical error reduction.

But I do recall medical errors. I remember the woman who was discharged from hospital on the blood thinner “coumadin” and then at home continued on the “warfarin” she was taking prior to admission. The patient did not realize that “coumadin” and “warfarin” were the same medication. As a result, she double-dosed and suffered a devastating intracranial bleed and stroke. I remember the man who underwent aortic valve replacement and was discharged home prior to the results of a positive blood culture being known to the attending physician. The results remained unknown and the patient returned weeks later with bacterial endocarditis requiring urgent valve replacement. I also remember countless patients being admitted through the emergency department for outpatient medical errors that included adverse drug events, drug-drug interactions and inadequate monitoring of medications and disease. In fact, I would suggest that outpatient medical errors are the bread and butter of internal medicine hospital admissions. Common admission diagnoses at hospitals across Canada include digoxin toxicity; drug-induced hyperkalemia (high potassium); pulmonary edema from inadequate diuretic usage; gastrointestinal bleeding from anti-inflammatory medications; stroke secondary to untreated atrial fibrillation; delirium secondary to polypharmacy in the elderly. Almost by defini-
tion, although there are exceptions, these diagnoses are medical errors. Yet as doctors we have come to accept them as billable admitting diagnoses that we need to manage instead of medical errors that we need to prevent. This current attitude to medical errors by physicians is in direct conflict with our duty to “do no harm.” We must first acknowledge this behaviour before we can change it.

If only half of my testimonial above is true, why aren’t alarm bells ringing? Why does the patient safety focus in Canada centre on “more study”? In a recent editorial Don Berwick states that we remain blind to the problem. He suggests that if “100 patients die from injuries in U.S. hospitals each day and there are 5,000 hospitals, that is roughly 1 patient per hospital every two months – at a statistical level, an almost unobservably low rate, even if every death caused by error was known to be so, which is far from the case” (Berwick 2003). Berwick goes on to say that this invisibility of injuries makes them seem trivial or infrequent to healthcare leaders. He further states that even when hospitals do notice errors and resulting injuries, the reasons given for them “remain scientifically Neanderthal.”

Berwick’s comments are revealing and point to a central problem in patient safety: How can we identify, quantify and then address error? The answer is to incorporate lessons learned from other industries that have invested in information technology and are therefore able to: (1) prevent error in delivery (e.g., ensuring the required information is available to those on the frontline); and (2) identify and address systemic errors, even those that occur rarely. The Firestone tire deaths investigation is a good example of this.

The National Highway Traffic Safety Administration (NHTSA) of the United States is responsible for reducing deaths, injuries and economic losses resulting from motor vehicle crashes (www.nhtsa.gov). Each year the NHTSA investigates crashes that kill over 43,000 people and injure close to three million people. Yet they were able to detect an initial cluster of 62 deaths and determine that the cause was related to defects in Firestone tires used on certain sport utility vehicles. Clearly, 62 deaths out of 43,000 is a low-event rate. This detection was a phenomenal achievement, made possible because of the safety focus of the transport industry. If we are to reduce medical errors we must also invest in information technologies and organizational systems that are data-driven and that allow all medical errors to be reported and tracked on a national level.

To conclude this testimonial, perhaps it can be put as follows: What we do not look for, we will not see. What we do not measure, we will not investigate. What is perceived as unbroken, we will not fix. Canadians are no safer today than they were four years ago when that landmark Institute of Medicine report on patient safety was published. Canadians continue to suffer unnecessary harm and die from medical errors. Our healthcare system is not as safe as it needs to be.

**Patient Safety Research Update**

The Baker and Norton paper (2001) delivers a comprehensive summary of medical error research. Together with the accompanying responses, that issue of HealthcarePapers serves as an excellent primer on patient safety. Another excellent source of information is the report *Building a Safer System: A National*
Integrated Strategy for Improving Patient Safety in Canadian Healthcare (National Steering Committee on Patient Safety 2002). The report, sponsored by the Royal College of Physicians and Surgeons of Canada, made 19 recommendations. One of the key recommendations was to establish the Canadian Patient Safety Institute (CPSI), which only became a reality in December 2003 (www.hc-sc.gc.ca/English/care.cpsi.html). In addition to these Canadian recommendations, the New England Journal of Medicine has published several patient safety articles over the last year; Berwick (2003) provides a summary of these papers in his editorial.

A progress report on the 14 recommendations that Baker and Norton made in this journal in 2001 is provided in Table 1. Additional studies concerning patient safety include the following:

- Bonney and Baker reported on patient safety initiatives underway across Canada in a recent issue of Healthcare Quarterly (Bonney and Baker 2004).
- A prospective randomized trial studied the effectiveness of computerized clinical decision support (CDS) for medication prescribing for the elderly in Quebec primary practice (Tamblyn et al. 2003). The CDS software was used by doctors during chart documentation but was not integrated with computerized physician order entry (CPOE). The study revealed that almost one-third of all patients had at least one potentially inappropriate medication. The number of new, potentially inappropriate prescriptions was significantly lower (18% reduction) in the intervention group, but there was no effect on discontinuation of prescriptions.
- A review of the 10-year Promise program (Prevention of Medication Incidents and System Errors) at the Hospital for Sick Children in Toronto suggested that a multi-pronged approach, including the use computerized medication ordering, removal of hazardous drugs from nursing wards, and specialized training of residents, can reduce medication errors by 50% (Koren 2002).
- A recent prospective cohort study revealed a high incidence of hospital-acquired infection rates in the intensive care unit of one Alberta hospital (30%) (Ledgerwood et al. 2003).
- A national survey of Canadian nurses, perceptions of patient safety was conducted in 2002. The results of the survey suggested that increased workload, nursing shortages, restructuring and several other factors were perceived as negatively impacting patient safety (Nicklin and McVeety 2002).
- A recent prospective study from Ottawa determined that 25% of medical patients discharged from hospital experienced a medical error, including adverse drug events, therapeutic errors and nosocomial infections. Of these patients, 21% required an additional physician visit, 12% required an emergency department visit and 17% required readmission to hospital. Half of all the adverse events were deemed preventable or ameliorable (Forster et al. 2004).

In August 2001, the Canadian Institute for Health Information (CIHI)
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<tr>
<th>Norton/Baker Recommendations</th>
<th>Progress to date</th>
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<tbody>
<tr>
<td>1. Create a national panel of experts</td>
<td>• CPSI established December 2003</td>
</tr>
<tr>
<td>2. Set improvement targets in high-risk clinical areas</td>
<td>• No national targets set</td>
</tr>
<tr>
<td>3. Set a target of 50% for medical error reduction over the next five years</td>
<td>• No national targets set</td>
</tr>
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</table>
| 4. Professional and accreditation bodies should review professional standards and expectations to ensure patient safety is a priority | • CMA and CNA have patient safety position statements  
• CCHSA developing new patient safety accreditation standards |
| 5. Government funding and review of existing medical error monitoring systems and development of reporting model | • Development of a Canadian Medication Reporting System as a joint project of Health Canada, ISMP Canada and CIHI |
| 6. Development and evaluation of a voluntary reporting system | • May be part of CPSI activities |
| 7. Provincial governments review and pass legislation to protect peer review and voluntary reporting of medical errors by healthcare professionals | • Only Saskatchewan and Quebec are enacting legislation to mandate medical error reporting  
• Only the College of Physicians and Surgeons of Saskatchewan requires physicians to report mistakes to patients |
| 8. Professional associations should provide their members with additional skills in risk management and quality improvement | • A few professional associations are responding to this need |
| 9. Patient safety topics must be part of core curricula in clinician training programs | • A few medical schools are acting: University of Toronto, Dalhousie University and University of Calgary |
| 10. Government funding of efforts to disseminate patient safety knowledge across the country | • One report disseminated by Health Canada |
| 11. Government funding of Internet-based patient safety educational efforts | • Not aware of specific government-funded Internet-based efforts |
| 12. Healthcare organizations should implement proven medication safety practices | • No national or provincial standards  
• No ongoing measurement of implemented practices |
| 13. Capital funding for CPOE and other proven technologies that reduce medical errors | • CHI funding some EHR projects |
| 14. CIHI should establish patient safety as a crosscutting theme in all institutes | • Not established  
• Adverse events study underway but limited to hospitals |

CPSI: Canadian Patient Safety Institute  
CMA: Canadian Medical Association  
CNA: Canadian Nursing Association  
CCHSA: Canadian Council of Health Services Accreditation  
ISMP Canada: Institute for Safe Medication Practices  
CIHI: Canadian Institute for Health Information  
CHI: Canada’s Health Infoway
and the Canadian Institutes of Health Research (CIHR) issued a request for proposals to study adverse events in Canada. The winning proposal was announced in May 2002. Drs. Baker and Norton are leading the study to evaluate the prevalence of adverse events in acute care hospitals in Canada. Results are anticipated sometime in 2004. There is no doubt that this important study will shed light on the patient safety crisis in Canada. It may further validate what we’ve learned from the American, British and Australian research teams, or it may show a uniquely Canadian patient safety reality. But we need to move faster. Contrast this with the speed in which Dr. Naylor and the National Advisory Committee on SARS and Public Health responded to the federal Minister of Health’s call to assess current public health efforts and lessons learned for ongoing and future infectious disease control in 2002 (Transport Safety Board 2003). This effort was completed in six months. The SARS report addresses aspects of patient safety and helps to lay a foundation to build a safer public health system. However, unlike SARS, medical errors are a chronic problem, with annual morbidity and mortality that far exceeds the toll from the SARS outbreak. We should be able to do at least as good a job in properly understanding and addressing medical error in Canada.

To summarize, Canadian patient safety research is underway, but it is insufficient in scope and results are slow to be published. The research confirms what has been reported internationally and is mainly focused on determining the existence of medical errors in Canadian hospitals. We should not wait for further research before acting. Medical error reduction programs, presently in their infancy in Canada, should be better funded and evaluated, and those deemed successful should be widely adopted.

**Canada’s Patient Safety Board: A Model for Federal, Provincial and Territorial Collaboration**

The events of September 11, 2001, made national security a high priority for all levels of government. The recent appointment of a federal Minister of Public Safety and Emergency Preparedness is further evidence of the importance of public safety and Canada’s leadership in this area. However, the reality is that medical errors are a daily cause of Canadian deaths and injuries. This immediate and persistent national patient safety threat demands as much attention and leadership as the ongoing threat of terrorism. Yet there is no minister of patient safety at any level of government in Canada charged with the responsibility of improving patient safety. The recent establishment of the Canadian Patient Safety Institute is an important step, as is the establishment of mandatory patient safety registries. However, these are early steps; additional action is needed.

This additional action must be pan-Canadian and coordinated if we are to have the greatest impact on improving patient safety for all Canadians. Medical errors and their consequences are the same for patients in all regions of this country. If we are to efficiently and effectively identify, quantify and address medical errors we must take advantage of our collective knowledge, experiences and skills. As discussed above, it is difficult to argue against the need for the National

I suggest that it is also difficult to argue against the need for a national patient safety investigative agency in Canada. The good news is that we have proven Canadian safety successes if we look beyond the healthcare industry. Canada’s Transportation Safety Board (TSB) was created by an Act of Parliament in 1990. The TSB has acquired a reputation, both nationally and internationally, as a skilled multi-modal investigation agency. Its mandate is to “advance transportation safety, accomplished by:

- conducting independent investigations, including public inquiries when necessary, into selected transportation occurrences in order to make findings as to their causes and contributing factors;
- identifying safety deficiencies, as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- reporting publicly on investigations and finding” (Transportation Safety Board 2003).

As part of its ongoing investigations, the TSB also reviews developments in transportation safety and identifies safety risks that it believes government and the transportation industry should address to reduce injury and loss. The TSB’s jurisdiction is any transportation occurrence in or over Canada. A transportation occurrence is defined as any accident or incident associated with the operation of a ship, pipeline, railway rolling stock, or aircraft. An occurrence is also any hazard that the TSB believes could cause an accident or incident if left unattended (Transportation Safety Board 2003).

Figure 1 depicts the number of transportation occurrences from 1998 to 2002. There is a continuing trend downwards in annual transportation incidents, and the number of transportation fatalities in Canada is at an all-time low (Transportation Safety Board 2003). The TSB’s annual budget is $28 million and consists of a team of 220 professionals (see Figure 2). In 2002, 1,812 accidents and 1,374 incidents were reported in accordance with the TSB’s regulations for mandatory reporting of occurrences. There were also 657 voluntary incident reports. Clearly, the TSB is advancing transportation safety in Canada.

This proven, made-in-Canada approach to transportation safety is

![Figure 1: Occurrences reported to the Transportation Safety Board of Canada, 1998 – 2002](Source: Transportation Safety Board of Canada (www.tsb.gc.ca).)
worthy of serious consideration as a model for advancing patient safety. Borrowing from the above wording of the TSB’s mission statement, the mandate of the Patient Safety Board (PSB) would be to advance patient safety, accomplished by:

- conducting independent investigations, including public inquiries when necessary, into selected medical errors in order to make findings as to their causes and contributing factors;
- identifying safety deficiencies, as evidenced by medical error occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- reporting publicly on investigations and findings.

As part of its ongoing investigations, the Patient Safety Board should review developments in patient safety and identify safety risks that it believes government and the healthcare industry should address to reduce injury and loss. The PSB’s jurisdiction should be any medical error in Canada. The board’s findings should be reported directly to the Health Council of Canada, to provincial and territorial governments and to Parliament.

The organizational structure of the TSB could be adopted by the Patient Safety Board and funding shared by the federal, provincial and territorial governments. Table 2 compares the basic economics of the Canadian transportation industry with the Canadian healthcare industry. The TSB’s annual budget of $28 million represents 0.07% of total industry spending committed to safety. A similar commitment to patient safety would suggest an initial annual budget of $80 million for the Patient Safety Board.

For the PSB to be successful there would also be the need for legislation to

| Table 2: Comparison of Canada’s commercial transportation industry and Canada’s healthcare industry, 2002 |
|---------------------------------------------------------------|---------------------------------------------------------------|
| **Canada’s** | **Canada’s** |
| Transportation | Healthcare |
| Industry 2002 | Industry 2002 |
| Revenues | $39 billion | 113 billion |
| GDP | 4% | 10% |
| Gov’t expenditures | $19 billion | $78 billion |
| Safety Board budget as a percent of revenue | 0.07% | 0.07% (proposed) |
| Safety Board annual budget (proposed) | $28 million | $80 million |

protect those who reported patient safety occurrences (medical errors or potential medical errors). The TSB has implemented SECURITAS, a confidential reporting program, allowing individuals to report potentially unsafe acts or conditions relating to the Canadian transportation system (Transportation Safety Board 2003). Adoption of SECURITAS or a similar tool would be required by the PSB.

A team of patient safety investigators and experts (nurses, doctors, pharmacists and other clinicians) could be recruited, trained and mandated to advance patient safety in Canada. The Transportation Safety Board could assist with the initial management of the PSB and training of PSB investigators.

In short, the Health Council of Canada and the federal, provincial and territorial governments should commit to the creation of a national Patient Safety Board modelled after Canada’s Transportation Safety Board. Such a commitment would provide Canada with the needed investigative agency to seriously address medical errors. The PSB would work in conjunction with the Canadian Patient Safety Institute. Together, they would position Canada as an international leader in patient safety.

**National Patient Safety Infrastructure: Focus Must Be on the Electronic Health Record (EHR)**

Canada’s healthcare system will deteriorate in terms of safety and quality if its foundation remains paper-based. On a weekly basis additional research is reported, mostly from the United States, that adds further evidence to the value of information technology and the need for a comprehensive and coordinated approach in building an electronic health record (EHR) to support improved quality, patient safety and cost containment. Our best hope now lies with those provinces and healthcare organizations that have recognized the importance of migrating to an EHR. If their leadership and progress can be accelerated, building a national patient safety infrastructure is possible.

A key driver for our national EHR strategy and adoption is Canada’s Health Infoway (CHI). Its mission is “to foster and accelerate the development and adoption of electronic health information systems with compatible standards and communications technologies on a pan-Canadian basis with tangible benefits to Canadians” (www.infoway-inforoute.ca). CHI’s funding is currently $1.2 billion, yet patient safety is not highlighted among CHI’s seven investment programs and CHI-funded projects are not required to demonstrate safety improvements. CHI should play a larger role in advancing patient safety in Canada by requiring that all EHR research proposals describe how they will reduce medical errors and improve patient safety. Additional investment, at a minimum of 5% of total healthcare spending, must be committed to achieve a pan-Canadian EHR.

**Ambulatory Electronic Prescribing EHR Initiatives**

A promising example of a CHI-funded project that could radically improve patient safety in Canada is Alberta’s Wellnet Pharmaceutical Information Network (PIN), a core component of the province’s EHR strategy. The Alberta PIN will allow pharmacies and physicians, and eventually patients, to share information electronically about a patient’s prescrip-
tion history and will enable electronic prescribing with clinical decision support. If successful, it will eliminate the deadly pen and prescription pad, which has been shown to be a leading vehicle for medication errors. This project aims to decrease prescription errors and adverse drug events. Other potential benefits include improved diagnostic support through availability of complete drug profiles; fewer callbacks by pharmacists to physicians for clarification; and lower costs through reduced hospitalization, long-term-care admission and physician visits secondary to errors. At this time participation by Alberta physicians and pharmacists is voluntary. Implementation of Alberta’s Wellnet Pharmaceutical Information Network is scheduled for completion in 2005.

It is in the best interest of all Canadians that Alberta’s electronic-prescribing EHR pilot project be accelerated, completed and evaluated. If it is proven to be effective, Canada should take the bold step of legislating the end to paper-based prescriptions in Canada and set a three-year timeline to achieve this. The impact from a patient safety, quality of care and cost-containment perspective is enormous. Medication prescriptions in Canada are the most rapidly growing healthcare expense, now responsible for $14 billion in annual expenditures, with non-prescribed drugs accounting for an additional $4 billion per year. Only hospital expenditures consume more of the Canadian public healthcare budget (CIHI 2002). As pointed out by numerous experts, drug expenditures continue to accelerate in Canada (Laupacis et al. 2002). Physicians are ultimately accountable for their patients’ prescribed therapy, but they cannot be held to account if they are not provided with data on their prescribing patterns and the effectiveness and safety of therapeutic decisions. Furthermore, delivery of the latest evidence to physicians about therapy remains for the most part paper-based and therefore slow, ineffective and entirely dependent on a physician’s memory.

One example that illustrates the problems with how physicians prescribe drugs in Canada is the recent study cited above on prescriptions for the elderly, which found that one-third of patients were taking at least one inappropriate medication (Tamblyn et al. 2003). There is overwhelming evidence that medication errors are a leading patient safety concern. Preventing medication errors and adverse drug events is a great opportunity to improve patient safety in Canada and at the same time improve the quality of care and contain medication costs.

Let’s for a moment assume that only 10% of prescriptions for the elderly are inappropriate, instead of the one-third quoted above. And let’s also assume that this represents only 2% of the public money spent on prescription medications. If we could reduce inappropriate drug prescriptions by 50% through the implementation of ambulatory electronic prescribing nationwide, this would represent an annual saving of $140 million. If we expect a 10% return on investment (ROI), this would justify an investment of 10 times the annual saving, $1.4 billion.

Additional return on investment data are provided by a recent study from Massachusetts on the benefits of an EHR electronic-prescribing project (Massachusetts Technology Collaboration 2003). In this study the costs and savings
of fully integrated ambulatory electronic prescriptions were estimated using the results of recent studies. In calculating costs the investigators assumed that 75% of Massachusetts practising physicians would adopt the technology in their outpatient offices. Initial cost projections included the installation of hardware and software. Annual ongoing costs were also calculated. Savings were calculated based on increased physician practice efficiencies, increased use of generic and formulary drugs and decreased malpractice insurance.

Table 3 uses the above estimates to calculate costs and savings for Canada, assuming 75% of the 30,258 family physicians (22,500) in Canada adopted the technology in their ambulatory practices. Once fully implemented (steady state achieved), annual savings would be $236 million, representing a significant return on investment. In addition, what is not shown in Table 3 is the significant impact e-prescribing would have on patient safety in ways that are difficult to quantify with dollar amounts. Medication errors and adverse drug events would be significantly reduced, resulting in fewer visits to emergency departments, fewer hospital admissions and fewer injuries and deaths.

Healthcare leaders in Canada should provide their wholehearted support to Alberta’s electronic health record project and start laying the groundwork for a nationwide electronic-prescribing program. Specifically, they need to evaluate funding models; gain the confidence, trust and involvement of physicians, pharmacists and patients; address any legal issues around ambulatory e-prescribing; and develop technical and data standards to ensure interoperability across the country.

### In-Patient Computerized Physician Order Entry (CPOE) with Clinical Decision Support (CDS) EHR Initiatives

Patient safety benefits of the EHR go well beyond ambulatory e-prescribing. Perhaps the most proven but underutilized technology is in-patient computerized physician order entry (CPOE) with clinical decision support (CDS). There is overwhelming evidence that CPOE can drastically reduce medical errors and adverse events as well as

<table>
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<tr>
<th>Table 3: Estimated costs, savings and net benefits of ambulatory e-prescribing in Canada</th>
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<tr>
<td><strong>Per MD</strong></td>
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<tr>
<td>Projected Costs</td>
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<tr>
<td>Projected Savings</td>
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<tr>
<td>Total Savings</td>
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<td>Net Benefit to Canada</td>
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improve the efficiency of the complex world of hospital in-patient care delivery (Bates and Gawande 2003). When implemented successfully and embraced by clinicians, in-patient CPOE has been shown to decrease medical errors by more than 50%; reduce inappropriate utilization of resources; and decrease length of stay through improved clinical workflow. The recent Massachusetts ROI study also estimated the costs and savings of implementing in-patient CPOE with CDS (Massachusetts Technology Collaborative 2003). In calculating costs, the researchers determined one-time costs and annual maintenance costs for a typical 500-bed hospital and a smaller 250-bed hospital (see Table 4 for estimated costs extrapolated to Canada). Three main areas of savings were used to calculate CPOE benefits: reduced adverse drug events (ADEs); improved utilization of in-patient resources; and improved utilization of emergency department resources.

There are 747 hospitals in Canada, 612 with less than 300 beds and 135 with more than 300 beds (CIHI data). If we extrapolate the results from the Massachusetts study and apply them to small and large hospitals in Canada we can estimate the costs and savings of hospital-based CPOE to Canada. There were 2,818,650 acute care admissions (excluding newborns) in Canada in 2001/02. Research from the United States has suggested that each preventable ADE can result in $6,000 in savings per admission. In the Massachusetts study an ADE incidence rate of 1.46% was assumed (Massachusetts Technology Collaborative 2003). If for Canada, we assume that CPOE is adopted for 75% of all in-patient admissions and that CPOE is only effective at reducing preventable ADEs by 50%, the net savings from ADE prevention on an annual basis would be $92 million. Savings from improved utilization of in-patient resources in the Massachusetts study were estimated at $1,700 per in-patient (Massachusetts Technology Collaborative 2003). If for Canada, we assume that in-patient CPOE is adopted for 75% of all in-patient admissions and improved utilization savings are only 50% of those quoted above ($850), the net savings from improved utilization for Canada on an annual basis would be $1.7 billion.

Table 4: Estimated costs of CPOE in Canadian hospitals

<table>
<thead>
<tr>
<th></th>
<th>Cost per 250 (300) bed hospital (small)</th>
<th>Cost per 500 bed hospital (large)</th>
<th>Total Costs for all of Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial costs</td>
<td>$5 million</td>
<td>$7.9 million</td>
<td>$3.1 billion</td>
</tr>
<tr>
<td>Annual maintenance costs</td>
<td>$0.7 million</td>
<td>$1.35 million</td>
<td>$458 million</td>
</tr>
</tbody>
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Table 5: Estimated costs, savings and net benefits of CPOE in Canadian hospitals

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<thead>
<tr>
<th></th>
<th>Initial Costs</th>
<th>Steady State Costs and Savings (annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>$3.1 billion</td>
<td>$500 million</td>
</tr>
<tr>
<td>Savings</td>
<td>0</td>
<td>$1.7 billion</td>
</tr>
<tr>
<td>Net Benefit to Canada</td>
<td>$-3.1 billion</td>
<td>$1.2 billion</td>
</tr>
</tbody>
</table>

Savings from preventing ADEs = 2.8 million admissions × 0.75 × $6,000 × 0.0146 × 0.50
Savings from improved utilization of in-patient resources = 2.8 million × 0.75 × $850
Table 5 summarizes the costs, savings and benefits of nationwide adoption of in-patient CPOE. Once fully implemented (steady state achieved), the annual net benefit would exceed $1 billion. This analysis is conservative in terms of savings attributed to cost-avoidance of ADEs and improved utilization of resources. It does not consider costs and savings if CPOE was extended to emergency departments, where additional net benefit would be realized.

It is imperative that governments, hospital executives and physicians in Canada work together aggressively to achieve nationwide adoption of in-patient CPOE with CDS. Voluntary adoption of in-patient CPOE would be significantly aided by providing financial incentives to those hospitals that implement CPOE and show reductions in medical errors and improved utilization of resources. The Canadian Medical Association, its provincial counterparts and all other professional physician associations should rise to the challenge and commit to this proven technology. Reduced error rates associated with an EHR may provide the Canadian Medical Protective Agency with an opportunity to lower malpractice insurance rates for hospital-based physicians who utilize CPOE and for community-based physicians who utilize an electronic-prescribing system, and at the same time maintain current profit margins.

**EHR-Supported Disease Management in the Home**

The need to improve patient safety extends well beyond the physician’s office and the in-patient ward. Canadians are living longer and healthier lives, yet at the same time chronic medical illnesses are becoming more prevalent and are primarily managed at home by nurses and nurse practitioners. With over one million Canadians enrolled in home-care programs at any one time and with annual national expenditures that now exceed $3 billion – an increase of over 200% in the last decade – there is clear need to evaluate the safety, efficiency and quality of the care delivered at home (www.cdnhomecare.on.ca/info.php?id=8). Our home-care nurses and nurse practitioners should also be equipped with an EHR that facilitates care delivery and improves patient safety.

One example of how a home-based EHR could improve patient safety and quality of care is diabetes disease management. Over two million Canadians have diabetes, with reported costs of over $13 billion in 2002. The 2003 Diabetes Progress report (www.diabetes.ca/Section_Main/NewsReleases.asp?ID=89) advocated for the creation of a national diabetes strategy and the implementation of the Canadian Diabetes Association’s 2003 clinical practice guidelines. Extending the EHR through home-monitoring devices and improved communication between the patient and healthcare team could enable both of these mandates and significantly improve patient safety and reduce the costs of diabetic care. The Massachusetts study estimated annual savings of $747 per diabetic patient through home monitoring. Measured savings occurred mostly from decreased hospitalizations and emergency visits (Massachusetts Technology Collaborative 2003). The initial cost of such systems was estimated at $125 per patient, with ongoing annual costs of $360 per patient.

Table 6 summarizes the costs, savings
and benefits of nationwide adoption of EHR-supported disease management for diabetic patients in Canada. This analysis assumed home monitoring was made available to 50% of diabetic patients, one million Canadians. In addition to these cost savings, other potential benefits would include increased compliance with therapy and greater quality of life for diabetic patients.

<table>
<thead>
<tr>
<th>Costs</th>
<th>Diabetes</th>
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</thead>
<tbody>
<tr>
<td>Initial Costs</td>
<td>$125 million</td>
</tr>
<tr>
<td>Annual Costs</td>
<td>$360 million</td>
</tr>
<tr>
<td>Annual Savings</td>
<td>$747 million</td>
</tr>
<tr>
<td>Net Benefit to Canada</td>
<td></td>
</tr>
<tr>
<td>(steady state)</td>
<td>$387 million</td>
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**An Action Plan**

Creating a safer Canadian healthcare system requires fundamental change on the part of healthcare leaders and practitioners. This change must take place on two fronts: the adoption of new information technologies that will change how we work, and a change in our attitudes. We must admit error: that error exists and is a fundamental problem in delivering care, but also that error can be corrected. It is, after all, an extension of good scientific practice to assess, to act, to reassess and to act again in new ways. An electronic health record offers the single most powerful tool the healthcare community has discovered to assess and to change our practices in order to provide better, safer and more efficient care. We start by shining light on current patient safety practices and implementing worthy recommendations.

The Canadian Patient Safety Institute should review, prioritize and act on the recommendations of Baker and Norton (2001) and those of the National Steering Committee on Patient Safety (2002). Action should be swift, coordinated and pan-Canadian.

The Health Council of Canada should evaluate the merits of a Canadian Patient Safety Board modelled after Canada’s Transportation Safety Board and, if deemed worthy, lobby federal, provincial and territorial governments for its immediate creation.

Canada’s Health Infoway must ensure patient safety is a cornerstone of all EHR projects and validate the evidence supporting compelling returns on investment. Alberta’s Wellnet Pharmaceutical Information Network EHR project should be accelerated, and planning should be initiated for a national rollout that mandates ambulatory electronic prescribing with clinical decision support for all physicians. The prescription pad must become extinct in Canada.

The governing entities responsible for the 747 hospitals in Canada must invest in computerized physician order entry with clinical decision support. Their management teams must work tirelessly to overcome the inherent obstacles that such change creates. Canada’s healthcare professionals, led by physicians, nurses and pharmacists, must become staunch supporters of CPOE, CDS, e-prescribing and other proven but underutilized EHR technologies. They must advocate for change, data-driven decision-making and greater individual accountability in order to carry out the commitment to “do no harm.”

Healthcare leaders must acknowledge that home-based disease management is a
growing component of healthcare delivery in Canada. Home-care practitioners and their patients require EHR tools to delivery safe, high-quality and efficient care. The introduction of a national EHR home-care diabetes management pilot project will result in immediate patient safety improvements for one million Canadians and serve as a model for disease management.

Conclusion

Canadians have a proud record in the pursuit of a just society. But there is nothing just in lobbying for increased healthcare funding while at the same time accepting medical errors that contribute to operational inefficiency, preventable patient morbidity and mortality and an increased burden on our healthcare system. If we continue to spend more and more on healthcare, it will be to the detriment of other priority government programs that build a better-educated, healthier and therefore more economically competitive nation.

Healthcare leaders must become more knowledgeable about the extent of patient safety issues in Canada. The leadership, actions and information technologies needed to create a safe healthcare system are the same as those needed to transition the system from its present unsustainable predicament to an efficient and safe system of the highest quality.

This paper provides evidence that Canada’s healthcare system is not as safe as it needs to be. Canada has a proven track record as an international leader in transportation safety, and a similar investment in patient safety is warranted if we are to take advantage of our collective knowledge and aggressively attack medical errors. Current research and return on investment data supports a national EHR strategy as an essential tool in patient safety. Potential net savings to Canada through the nationwide implementation of the three EHR initiatives presented in this paper approach $2 billion annually. The economics of a national Patient Safety Board and EHR are robust and compelling. Further economic evaluations are required, but not at the expense of action. Adoption of the action plan outlined above will improve patient safety and revitalize our healthcare system.

References


Hippocrates Denied:
Why Canada Has Yet to
Act on the Patient
Safety Imperative

COMMENTARY

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ABSTRACT
A review of patient safety literature reveals clear documentation of significant patient safety concerns in many countries going back over two decades. However, it was not until the publication of the Institute of Medicine’s To Err Is Human about four years ago that widespread attention was at last drawn to this issue. Even with this attention, there has been a very limited response in Canada to the well-documented need for action to address preventable errors. After some reflection, it is clear that a whole series of factors may be conspiring to slow or blunt our response to this issue. This commentary explores these factors and endorses strategies for moving forward.

As I read Dr. Morgan’s article, I could not help but wonder why Canada’s response to the patient safety issue has been so tepid. It has taken a long time to muster even a muted response to the call to arms from the research community. Dr. Morgan’s paper illustrates this in spades.

If one reviews the patient safety literature, one sees clear documentation of significant patient safety concerns in many
countries going back over two decades. It was not until the publication of the Institute of Medicine’s *To Err Is Human* about four years ago that widespread attention was at last drawn to this issue. Even with this attention, there has been a very limited response in Canada to the well-documented need for action to address preventable errors. After some reflection, it is clear that a whole series of factors may be conspiring to slow or blunt our response to this issue. These hypotheses are outlined here, in no particular order of importance.

The first and perhaps most obvious impediment to concerted action on the patient safety issue is that patient safety problems are hard to recognize. In the transportation system, a death is invariably due to an error, which is always preventable. Furthermore, these deaths are easily counted and very well documented. In healthcare, many patients die despite receiving optimal care. Hence, recognition of adverse events or preventable deaths is a more difficult statistical challenge. Furthermore, these deaths are easily counted and very well documented. In healthcare, many patients die despite receiving optimal care. Hence, recognition of adverse events or preventable deaths is a more difficult statistical challenge.

The statistical studies that have been done to quantify adverse events do not yield the names and faces of those affected. Although a few well-documented examples of victims have been reported in the press, for the most part these cases are anonymous and not published. Transportation mishaps, however, are very well documented in a multitude of news media. Without the benefit of graphic coverage in the press, it is difficult to get the topic of patient safety to the top of the public policy agenda.

Another issue that has hampered recognition of the degree of patient safety problems is a lack of the information systems necessary to detect these events. Clinicians do not usually receive statistical analysis about their day-to-day practice. They are often surprised when they review feedback information comparing their practice to that of other clinicians or to best-practice benchmarks. In the absence of good feedback reporting, clinicians and other health professionals are left with anecdotal impressions about the safety and quality of their care. Often, patient safety problems result from conflicting treatment ordered by different clinicians for the same patient in the absence of a common patient record. Hence it is not surprising that many of these errors go unrecognized by the clinicians themselves.

There is also the fundamental relationship of trust that exists between patient, and the medical provider. Patients depend on this trust relationship if they do not have the knowledge or experience to make choices without the assistance of a clinical professional. In many cases, this trust takes the form of an unquestioning relationship. Indeed, patients are often in denial about the existence of varying degrees of quality across clinical practitioners and institutions. Patients often do not want the burden of identifying quality clinical care, and cling to the hope that health authorities will guarantee an acceptable level of quality across the entire system. The result is a failure to hold the system to account for lapses in safety.

Another issue that overshadows patient safety concerns in Canada is that of access to care. Any criticism of the system is seen as an attack on public
healthcare or as a conspiracy to undermine support for the public health system. Also, access issues dominate the agenda of ministries of health, government officials and institutional leadership. Hence patient safety becomes a secondary concern. Ironically, access and the incidence of adverse events are quite closely linked. As Dr. Morgan correctly outlines in his paper, many demands on the system are caused by these adverse events. Preventing them would improve access to care.

The issue of significant turnover in system leadership also militates against a concerted program to address patient safety. The short tenures of most health ministers and deputy ministers across the country make it difficult to implement longer-term programs. And given the rather dramatic nature of access to care issues which dominate the news, it is difficult to get the patient safety issue to the top of the political agenda long enough to receive some attention.

It is clear that patient safety is a systemic issue best solved using process design and operations management techniques. Patient care is fragmented across a variety of providers and organizations, making it necessary to use a systems approach to address patient safety effectively. This conflicts with the culture of the clinical professions, which do not focus on designing the care delivery process as a whole. Clinicians focus more on the solo interaction with the patient rather than the performance of the entire care process. Perhaps we need teams of systems design engineers working in our health organizations to realize the substantial improvements in care delivery that might result from a systems-based approach.

There is also the difficulty that the healthcare system has in dealing with the conflict between immediate needs (i.e., access to care) and the need for capital investment to achieve long-term improvement. Clearly the solutions Dr. Morgan outlines for addressing patient safety involve significant reengineering of the care delivery process and investment in infrastructure such as electronic health records. These investments will involve hundreds of millions or perhaps billions of dollars. Although these endeavours will doubtlessly yield significant benefit down the line, funds for large capital investments have to be raised in the present. In the face of significant access problems, it is difficult to justify spending on future improvements rather than current needs. Furthermore, once investments are made, good systems for achieving expected savings are not in place. Significant reengineering and restructuring would be necessary to realize the gains. The system is not geared to reap the benefits from these investments.

Indeed, there is a pervasive belief that efficiency gains or improvements in productivity are not possible in healthcare. After the downsizing experiences of the 1990s, the industry has largely given up on trying to reduce costs. People working in the health industry generally believe that improving efficiency is tantamount to asking people to work harder. Other industries, of course, are quite focused on productivity improvement. They understand that more can be achieved with less manual effort after an investment in infrastructure. Healthcare has to renew its faith that this is possible. Of course, this type of productivity improvement will require the substantial investments in infrastructure that failed to happen in the 1990s.
We also have the significant challenge of worsening shortages of clinical professionals. In this environment, it is difficult to introduce substantial change. People feel overworked and overwhelmed with the current patient demand. Adding the burden of significant restructuring and organizational change on top of the daily care load is something organizations are reluctant to do, as it may drive away professionals who have myriad other employment options.

In dealing with the patient safety issue, there is also substantial concern about assignment of blame and liability. When contemplating the cultural changes that are required to achieve a patient safety orientation, it must be recognized that healthcare is designed around the concept of the “most responsible physician.” Accountability has been based on individual physicians rather than on the system as a whole. This will require a significant change in orientation, culture and perhaps the legal framework in order to achieve the agenda that Dr. Morgan challenges us to address.

Another hurdle is the jurisdictional challenges that come with the distribution of responsibility for healthcare among the provinces and the federal government. Transportation is an example of a federal responsibility. Therefore, the Transportation Safety Board mandated by the federal government addresses issues that are in the federal jurisdiction. Healthcare of course is in the jurisdiction of the provinces and hence responsibility for patient safety is more diffuse. A national body with enforcement responsibility and the power to deal with improving patient safety may be seen as a federal intrusion into provincial matters. Perhaps this can be resolved by making the federal government responsible for investing in capital improvements that will mean long-term future benefit to the system. The provinces can then deal with current operating requirements that are more directly related to access to care. This might be a reasonable division of responsibility across the two levels of government that attends to both the short- and the long-term needs of patients.

Finally, there is our approach to building electronic health record systems. With the advent of Canada Health Infoway, we are moving into an era of substantial investment in EHRs. However, the clinical objectives of this EHR investment are not well articulated. Indeed, patient safety was not directly addressed in the original Infoway strategy. There is an opportunity to focus more of these investments on addressing the patient safety issue rather than the more intermediate goal of automating clinical information management.

Clearly there is an urgent need to establish routine statistical monitoring of patient safety and the quality of care. Compared with the careful monitoring of transportation safety, clinical monitoring is woefully inadequate. It is astounding that the Firestone Tire safety problem was actually detected. As Dr. Morgan points out, a cluster of 62 deaths over several years was detected against a backdrop of 43,000 deaths per year. This concept of identifying excess preventable mortality needs to be brought to healthcare expeditiously. If the money is invested to develop systems to detect these preventable events, the system will improve immeasurably and savings will result that offset investments over a very short period of time.
All of these issues present significant challenges for addressing the patient safety issue. Nevertheless, Dr. Morgan paints a compelling picture of the reason why this issue needs to be addressed. It is clearly a dominant strategy. By making the investments he suggests, patient outcomes will improve and costs of the system will be reduced. This is the type of quality and productivity improvement the private sector cites when it makes technology investments. It can be achieved in healthcare as well.

It is difficult to say which of the aforementioned issues is most important in blunting the Canadian response to the patient safety challenge. Perhaps all of them have some impact. None, however, provides any justification for not moving expeditiously to address the need for investment in systems to address the issue. The health and well-being of thousands of patients depend on it.

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The Electronic Health Record: A Leap Forward in Patient Safety

COMMENTARY

Richard Alvarez
President and Chief Executive Officer,
Canada Health Infoway

ABSTRACT

In his review of patient safety issues in the Canadian healthcare system, Dr. Matthew Morgan states that “coordinated national EHR initiatives will cost less, save lives and prevent harm when compared to the status quo.” Canada Health Infoway is spearheading this initiative in Canada. Infoway’s No. 1 guiding principle for investment is that projects undertaken must “enhance the quality of patient care, healthcare services and patient safety.” They must also support the development and adoption of pan-Canadian interoperable EHR solutions. Infoway is working in seven major areas to improve electronic access to accurate and timely health information in order to reduce errors, facilitate accurate diagnoses and speed treatment. These areas include the building blocks of the EHR: infrastructure, registries, digital imaging systems, and drug and laboratory information systems. Infoway is also developing and expanding telehealth networks to increase the scope of the Canadian healthcare system. Infoway was recently mandated to develop a public health surveillance system for infectious diseases to give healthcare providers a tool for tracking and managing disease outbreaks in the Canadian population. These systems will improve safety, quality, accessibility, cost-efficiency and the sustainability of the healthcare system. Patient safety is a cornerstone of Infoway’s activities.
Patient safety issues have been featured recently in many news articles and are a concern for all Canadians. In his paper “In Pursuit of a Safe Canadian Healthcare System,” appearing in this issue of HealthcarePapers, Dr. Matthew Morgan discusses the need to improve patient safety and strongly endorses accelerated development of an electronic health record (EHR) for all Canadians.

Dr. Morgan urges healthcare leaders to recognize that a “fundamental tool in improving patient safety is the electronic health record (EHR).” He cites several studies that show the efficacy of electronic systems in improving patient safety and, thereby, access to appropriate healthcare for Canadians. “Coordinated national EHR initiatives will cost less, save lives and prevent harm when compared to the status quo,” Dr. Morgan says.

Concern about patient safety in Canada was also brought to the fore recently with the publication of the CIHI/CIHR Adverse Events Study. This report also endorsed the EHR as a necessary building block to improve our healthcare system and urged acceleration of its implementation.

Canada Health Infoway is helping to spearhead this initiative in Canada. Infoway, founded in 2001 in response to an initiative arising out of the 2002 First Ministers Conference, is a not-for-profit organization with a unique mandate: to facilitate and accelerate the development and adoption of electronic health information systems in Canada. Infoway’s work with its partners in federal, provincial and territorial jurisdictions will improve safety, quality, accessibility, cost-efficiency and sustainability of the healthcare system.

Patient safety is one of Infoway’s guiding principles. In our business plan, we state that, in order for projects to be eligible for investment, they must “enhance the quality of patient care, healthcare services and patient safety. They must also support the development and adoption of pan-Canadian interoperable EHR solutions.”

Our activities are focused on providing the benefits of an interoperable pan-Canadian EHR. We strongly believe providing access to reliable electronic patient encounter data will result in improved diagnostic capability for providers and consequently more appropriate treatment.

The EHR gives healthcare providers access to accurate and complete patient information, including clinical notes, diagnostic images, laboratory results and medication profiles. Having access to comprehensive information enables providers to make well-informed diagnoses and treatment decisions. The EHR is designed to be accessible at all times and from anywhere in Canada.

Infoway is working in seven major areas that include the building blocks of the EHR:

- Infrastructure
- Registries
- Digital imaging systems
- Drug information systems
- Laboratory information systems
- Telehealth
- Public health surveillance

Health record-keeping in Canada is a mix of paper records and stand-alone local and regional electronic systems that do not communicate with each other. Filing of patient data and the criteria used for
accurate patient identification varies from one jurisdiction to another. In one area the identification criteria might be name and birth date, in another the mother’s maiden name and place of birth.

To bring these systems into line so that interoperable electronic systems can be implemented, Infoway has been working with its partners at the federal, provincial and territorial levels to put in place the building blocks that will ultimately work together to form an interoperable EHR.

Registry pilot projects are under way to devise standard processes for the identification and storage of patient data. This will ensure appropriate healthcare providers are accessing the right patient and the right health information.

Drug information systems will be implemented that allow healthcare practitioners to view patient medication history electronically. When healthcare practitioners have access to information containing a patient’s complete medication profile, they can make more informed decisions when prescribing medication – a key element in patient safety. Initial e-prescribing solutions will reduce drug prescribing errors. Later, more robust solutions that are connected to a comprehensive EHR, as well as clinical decision support tools, will significantly reduce inappropriate medication use, as well as drug-drug, drug-patient and drug-disease interactions. In a recent Canadian study, prescribing errors in the elderly population decreased from 32 to 18% through use of a drug information system (Tamblyn et al. 2003).

Digital imaging will replace film, facilitating the sharing of imaging data between health providers. Infoway is currently investing with two major diagnostic imaging projects that will share images electronically across large groups of hospitals (Fraser Health Authority and southwestern Ontario hospitals). Smaller hospitals, in particular, will benefit from these shared systems by receiving timely access to high-quality interpretations by radiology specialists. Once these initial shared digital imaging systems are fully developed, they can be replicated for implementation in other sectors across the country, creating a national network of digital imaging data to support the EHR.

Similarly, Laboratory Information Systems will provide test results online in a format that will dovetail with the EHR. The result will be a complete data profile for each patient, correctly identified, eliminating the need for costly duplication of tests and treatments, and also reducing errors in diagnosis.

Infoway is also engaged in expanding the use of telehealth networks to increase the scope of the Canadian healthcare system. This will increase patient/provider access to specialty consultations, resources often limited by time, distance and travel restrictions. The expansion of telehealth networks will increase the healthcare provider’s ability to diagnose accurately and initiate appropriate treatment. In particular, it will benefit remote areas and rural communities by bringing them online and giving them access to improved healthcare resources.

Infoway recently undertook another major role in patient care and safety when it was mandated to help develop a public health surveillance system for infectious diseases. When the SARS epidemic hit last year, for example, Canadian healthcare providers found themselves reduced to using Post-it notes to manually track patients,
their relatives and contacts in a bid to control the outbreak. Infoway’s crucial role will help create a tool that will give Canadian healthcare providers the ability to track and manage infectious disease outbreaks in the Canadian population.

This interoperable combination of registries, digital imaging networks, laboratory and drug information systems, expanded telehealth and public health surveillance will give Canadian patients and healthcare providers access to comprehensive health data.

Dr. Morgan states in his article that there is a need for Infoway to “validate the evidence supporting compelling returns on investment.” Infoway is currently developing an EHR Composite Index designed to measure the overall effectiveness of proposed EHR projects in improving outcomes for patients.

We fully support Dr. Morgan in his call for urgency in implementing an EHR for all Canadians. He cites, for example, the Alberta Wellnet Pharmaceutical Information Network (PIN) project, which will allow pharmacists and physicians, and eventually patients, to share information electronically about prescription histories, and will enable electronic prescribing with clinical decision support. Infoway is a co-investor in this project and is working closely with Alberta to accelerate implementation.

Acceleration of EHR development, implementation and adoption are Infoway’s core priorities. Our approach is to implement and fine-tune systems prior to replication and implementation in other sectors. Failure to ensure success in the early phases of systems development will lead to premature national implementation of a non-optimized solution. This would result in the use of strategies and systems not geared to handle the volume of data or other requirements necessary to support a national EHR initiative. Systems should be operational on a regional and provincial level before moving to a pan-Canadian implementation.

The existence of Infoway and its unique mandate already ensures acceleration of EHR implementation through its investment and support of more than 50 projects across the country – and this number will grow to over 100 by 2005. Infoway believes that patience and diligence will ensure the standards-based systems we implement meet the needs of the Canadian population, not only today but for future generations.

In his conclusion, Dr. Morgan states: “The leadership, actions and information technologies needed to create a safe healthcare system are the same as those needed to transition the system from its present unsustainable predicament to an efficient and safe system of the highest quality.”

We highly concur with this view and are working with federal, provincial and territorial jurisdictions to ensure that the EHR becomes a reality for Canadians. We have invested $125.5 million in 53 projects nationwide. By 2005, investments are targeted to total $400 million and 100 projects. The EHR must become a reality if patient care and safety in Canada is to be ensured. Canada Health Infoway is proud of its role in this vital initiative.

References
Patient Safety: Is the Evidence Strong Enough That Information Technology Can Help?

COMMENTARY

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ABSTRACT

It is not difficult to prepare a commentary on Dr. Morgan’s invited essay “In Pursuit of a Safe Canadian Healthcare System” if one agrees with almost everything he reveals and postulates. When a respected young practising physician candidly and forcibly makes a case for the need for significant healthcare system reform, one must sit up and take notice. If nothing else, his statement “outpatient medical errors are the bread and butter of internal medicine hospital admissions” should cause us to be deeply concerned.

Dr. Morgan pleads for a number of reforms, such as the creation of a Patient Safety Board akin to Canada’s Transportation Safety Board, the demonstration of an ROI for the electronic health record, the introduction of computerized physician order entry, and a number of other suggestions. Due to limitations of time and space, we will react to only a few of his views, mildly disagreeing with some while strongly reinforcing others.
The Classic Argument for ROI
One might take issue with Dr. Morgan’s numbers and argue the validity of his statement “If we expect a 10% return on investment (ROI), this would justify an investment of 10 times the annual saving, $1.4 billion.” However, more would be gained by directing attention to the patient safety issue than to dollars and cents. Is it possible to cost-justify an EHR (electronic health record) in a local hospital or regional health authority, let alone a provincial EHR? Can a strictly financial case be made for such a large investment?

The English government has very recently committed itself to £6 billion (about $15B) for a national Electronic Health Record and there appears to be no “business case” in sight – at least none the public has been able to view. Rather, the Minister of Health is publicly stating: “The NHS Care Record will make sure that all doctors, nurses and allied health professionals can access vital patient information 24 hours a day, seven days a week. It will revolutionize the way that information is managed by the NHS. It will not only help clinicians to deliver the best care to patients in the most efficient way but will also mean patients will get access to more comprehensive information. This will help them make choices and they will eventually be able to access their own health records” (Department of Health 2004).

Traditionally, chief information officers (CIOs) in the healthcare sector have been challenged by boards and senior management to present a “business case” for requesting significant capital and operating budgets for information technology (IT) initiatives. These cases, for the most part, attempt to quantify financial savings resulting from decreased tests, decreased paperwork and more intangible and qualitative benefits such as more timely access to test results, full medications profile, ability to track waiting lists, etc. The senior management discussions that follow almost always end up trying to weigh the importance of IT against competing priorities. CIOs, and the senior managers supporting them, find it very difficult to argue against cases for more clinical staff or a new piece of medical technology – both of which are seen to have a more obvious direct patient impact. What makes it even harder is that the competing priorities rarely have to argue a “business case.” Is it time for a change in paradigm within the health sector to reflect current evidence as it relates to the EHR and move from building a “return on investment” case strictly on financial bases and concentrate more on building a “return of patient safety” (ROPS) case (Protti and Catz 2002)?

To date, the discussions and investment decisions around IT have usually been framed in a primarily financial context and have rarely recognized the mounting evidence that links the EHR to patient safety, particularly through the medication errors and computerized physician order entry (CPOE) literature – a point made strongly and convincingly by Dr. Morgan. The time seems ripe for a paradigm shift similar to that which took place when those working in the field of addictions changed their thinking from “abstinence” to “harm reduction.” In that field, the entire focus changed, and so did investments and research. There was a similar paradigm shift when antitobacco lobbyists started to reframe the debate in terms of the economic impact of tobacco...
on society. The “lost years of productivity” argument was convincing – to the point that it has been accepted as a valid ROI for governments to actively intercede to control and reduce tobacco consumption. Business, for the first time, understood the issue not just as one of personal choice but also as one of the bottom line (Protti and Catz 2002).

What further complicates a financially dominated view of ROI is that much of the EHR is about infrastructure. As with any infrastructure, information technology infrastructure does not provide direct business performance; rather, it enables other systems that do. IT infrastructure is strikingly similar to other public infrastructures such as roads, hospitals, sewers, schools, etc. They are all long-term and require large investments. They enable business activity by users that would otherwise not be economically feasible. They are difficult to cost-justify in advance, and it is also hard to show their benefits in hindsight. They require a delicate balance – too little investment leads to duplication, incompatibility and suboptimal use, while too much discourages user investment and involvement, and may result in unused capacity (Protti 2001).

In healthcare, IT has a much larger potential to improve patient safety than it has to save money.

The Davies Computer-Based Patient Record (CPR) Recognition Program recognizes exemplary CPR implementation achievements. When studying the commonalities of the Davies award winners, it was found that because of the strategic importance assigned to information management, the CPR systems generally had not been subjected to classical cost-benefit or ROI analyses. Value had not simply been assumed, however; project sponsors had to justify an EHR upon a series of demonstrated successes, justifying each new phase of the expansion on the basis of its value to the care process (Metzger et al. 1995).

**Supporting Evidence from the United Kingdom**

Dr. Morgan presents an impressive array of evidence of the research on patient safety, ranging from the work of Baker, Norton, Bates and Berwick to the findings from Canada’s Royal College of Physicians and Surgeons. One might add to the list the work emerging from the United Kingdom.

The 2001 National Audit Commission’s *A Spoonful of Sugar: Medicines Management in NHS Hospitals* reported that the status quo is unsustainable, as hospital medication errors are unacceptably common; the efficacy of medicines is increasing, but costs are rising; the complexity of ensuring the safe use of new medicines is growing; and there is an urgent need to review medicines management across whole health economies, as the distinction between primary and secondary care becomes increasingly blurred.

The report also concluded that there are some important obstacles to improving medicines management arrangements:

- Many boards are concerned with short-term financial targets and are unwilling or unable to invest money to achieve sustainable quality and cost improvements.
- Some pharmacists are content with their traditional dispensing and...
monitoring functions – the word “pharmacy” conjures up in their minds a room in a hospital, not a patient-centred service where the pharmacist is a key member of the clinical team.

• Some doctors and nurses have neither the will nor the incentives to change traditional ways of working.

Recognizing the above obstacles, as well as reacting to the multiple American Institute of Medicine reports, in July 2001 the National Patient Safety Authority (NPSA) was created as a special health authority to coordinate the efforts of the entire country to report, and more importantly to learn from, mistakes and problems that affect patient safety. As well as making sure errors are reported in the first place, the NPSA is trying to promote an open and fair culture in the NHS, encouraging all healthcare staff to report incidents without fear of reprimand. It will collect reports from throughout the country and initiate preventative measures, so that the whole country can learn from each case, and patient safety throughout the NHS can be improved.

In addition to the NPSA, England’s National Programme for IT in the NHS has as one of its four main priorities the introduction of electronic transmission of prescriptions (ETP). The intent is to enable the electronic transfer of prescriptions between prescribers, pharmacists and the Prescription Pricing Authority, with the aim of delivering improved patient safety by reducing prescription errors. The new system will be a national version of British Columbia’s PharmaNet, which was implemented in September 1995. PharmaNet is a province-wide computer network in which all the pharmacies in

BC are connected to a single database that records all medications dispensed to British Columbia citizens in the past 14 months. As a result of PharmaNet, over-consumption of prescription medications has been virtually eliminated and the dispensing of inappropriate therapies has been reduced. The major difference between ETP and PharmaNet is that currently the majority of prescribers in BC do not enter/order prescriptions into a computer, let alone electronically transmit them to a pharmacy. ETP in some ways will be more similar to the emerging PIN network in Alberta, in that English GPs already enter almost all prescriptions from their offices.

Comments on Computer Software to Support Patient Safety

In his essay, Dr. Morgan reports an incident involving the effectiveness of computerized clinical decision support for the elderly in Quebec. One can be certain this example is just one of many he is aware of. He was perhaps not aware of the recent December 2003 report released by the aforementioned NPSA in the UK entitled “Realising the Potential of GP Computer Systems to Improve Patient Safety.” That report was the conclusion of a four-part study that had the following objectives:

• To identify the most important safety issues regarding GP computer systems
• To assess GP computer systems in terms of these safety features
• To determine GPs’ knowledge, usage and training needs in relation to computerized safety features
• To work with stakeholders to produce specifications for GP computer suppliers and for training practice staff
Since over 95% of GP practices in England are automated and the most commonly used clinical applications are medication prescriptions printed and carried to the pharmacy by the patient, there was a common belief that medication errors were not a significant issue in primary care in that country. But to the surprise of many, the assessment of GP computer systems revealed, among other problems,

- Lack of alerts in relation to contraindications – for example, there was no warning of the risk of Reyes’ syndrome when prescribing aspirin to an eight-year-old child
- Spurious alerts – for example, a serious alert warning was given for a commonly used and relatively safe drug-drug combination
- Failures of drug allergy warnings – depending on how the allergy history had been recorded, warnings might or might not be displayed
- Risks of prescribing drugs with similar names – particularly with penicillin (frequently used) and penicillamine (rarely used and likely to harm some patients)
- Lack of warning for inappropriate dosages – for example, trying to prescribe methotrexate daily instead of weekly

Perhaps the most worrisome finding was that English GPs had come to rely on their computers to provide alerts. More than 90% of GPs regarded computerized alerts (including contraindication alerts) and systems for recall for patient monitoring to be important. The vast majority also agreed with the idea of making it more difficult to override critical alerts. The survey revealed that some GPs are not fully aware of the safety features on their computer systems and that only a minority have had training on their use.

The English study uncovered clinically important deficiencies in the safety features of the GP computing systems currently in use in approximately three-quarters of GP practices in the UK. In the opinion of the researchers, all of them may fail to warn in situations when a warning might be expected, creating a health hazard.

**Conclusion**

The thrust of Dr. Morgan’s essay is that: (1) Canada needs a Patient Safety Board and (2) a commitment needs to be made to electronic health records and computerized physician order entry. We must ask what is stopping us from making the kind of commitment proposed by Dr. Morgan and a few years ago by William C. Richardson, Chair of the Institute of Medicine Committee in *To Err Is Human: Building a Safer Health System*:

Our health care system is a decade or more behind other high-risk industries in adopting safety principles. We should call on Congress to create a national center for patient safety in the Department of Health and Human Services. Just think of how dramatically the risk of dying on a domestic airline flight or at the workplace has declined in recent decades, in part because federal agencies focused on safety. By creating a national center to set patient safety goals and track progress, we could do the same for the health care industry. (Kohn et al. 1999)
The reporting approach used by the FAA for air traffic incidents in the United States merits consideration in healthcare (Ruchlin et al. 2004). The system, which is based on the National Aeronautics and Space Administration’s Aviation Safety Reporting System, is non-punitive, confidential, independent of any authority with the power to punish, timely and systems-oriented. It is also responsive and built on analyses performed by experts who understand the operational circumstances. The President’s Advisory Commission on Consumer Protection and Quality in the Health Care Industry (1998) recommended it as a model, as did Leape (2002). The Veterans Health Administration has recently initiated a safety-oriented program that embodies many of these elements (Weeks and Bagian 2000).

Perhaps the much-awaited and soon to be released CIHI report on medical errors in Canada will make Dr. Morgan’s essay and the advice it contains all the more pertinent.

References


Grasping the Opportunity to Improve the Safety of Care

COMMENTARY

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ABSTRACT

Clearly a wakeup call for the healthcare industry, the IOM report of 2000 To Err Is Human now appears to have been a sentinel event, at least in the United States (Institute of Medicine 1999). Given that the practice of medicine in the United States is, in many ways, very similar to that in Canada—for example, our physician trainees are educated and evaluated using similar models—it is unfortunate that the IOM report was not also a wakeup call for Canada. Four years have passed, and apparently Canadians have only recently woke up to front-page newspaper headlines that point out that Canadians, like Americans, are being harmed and killed as a result of medical errors.

Now that Canada has awoken, what is to be done? Dr. Morgan, in his paper “In Pursuit of a Safe Canadian Healthcare System,” lays the groundwork for investments that might lead to a significant reduction in medical errors. He is on the right track, and his ideas should be taken to heart. Recently, the President of the United States and the Secretary of Health and Human Resources called for widespread adoption of an EHR within the next decade. The United States faces immense challenges on many fronts to achieve this vision; nonetheless, it has begun to move decisively in this area. Canada needs to mobilize quickly, collectively and efficiently to accelerate the adoption of the EHR for all Canadians.
Fortunately, many of the complexities of the US health system do not exist for Canada. Additionally, Canada has distinct advantages over the US that make the likelihood of EHR adoption more probable. These include regionalization and a greater alignment of payers, providers and patients. I would suggest, as an outsider not knowing all the complexities and politics of healthcare in Canada, that if Canada got on with it an EHR for all Canadians could be achieved within the decade.

That said, I will focus my response to Dr. Morgan’s paper on providing additional direction for improving patient safety through the reduction of mismedication, a leading cause of medical errors. To start with, Canada should learn from the United States, where the patient safety movement stands at a crossroads. Will it continue to debate the merits of a focus on errors or a focus on injuries (with no apparent resolution) or will it begin to concentrate on building safer and more reliable processes of care? I would encourage Canada to focus on the latter, and not waste time wondering whether to measure errors or adverse events.

To briefly review, errors are failures in the process of medical management, and they have the potential to harm the patient. Adverse events, in contrast, relate to actual harm. Medical errors and adverse events represent two different categories of events, whose overlap – preventable adverse events – should clearly be the target of process and technology improvement efforts in the field of patient safety. Those efforts must go well beyond “chart reviews” and “sentinel event reporting,” for both have significant limitations. Chart reviews focus on errors that can be deduced by reading history; this is, at the very least, difficult, since a patient’s chart hardly ever tells the full story. Additionally, research has shown that consistent agreement on identification of an error in care is typically not reproducible either between centres or between trained reviewers. Sentinel event reporting, which goes after the “root cause,” is also not sufficient, because it has no formal way to assess the frequency of the relative contribution of these causes or errors. In addition, these queries tend to focus on sentinel or rare events that do not pertain to the most common types of harm that occur to patients.

A more comprehensive approach is the injury prevention model, which provides a coherent framework for addressing medical injuries, including a systematic sequence of methods to identify medical injuries, study their causes and intervene to reduce their occurrence or severity. An important principle of the injury prevention model is the comprehensive focus on injuries rather than on negligence, which avoids the pitfalls in determining negligence, error or subjective judgments about preventability. In efforts to improve patient safety, the injury prevention model with a focus on injury can provide a useful complement to those approaches that focus on error (McNutt et al. 2002). Indeed, the Australian approach to measuring safety incorporates both approaches (Malpass et al. 1999):

• A voluntary anonymous incident reporting system called AIMS (Australian Incident Management System) in which an incident is defined as “any event or circumstance which could have or did harm anyone or could result in a complaint”
A separate system called the Quality in Australia Health Care Study (QAHCS), which involves the non-voluntary retrospective analysis of medical records of hospital admissions in which an adverse event is defined as “any event or circumstance caused by healthcare management rather than a disease process that resulted in admission to hospital, prolongation of hospital stay, morbidity at discharge, or death”

Dr. Morgan’s suggestion of establishing a Canadian Patient Safety Board modelled on the Transportation Safety Board is intriguing, and might serve as the needed vehicle to turn the injury prevention model into reality. As Canada tackles medication safety, measuring safety rather than errors will prove to be an essential tool in both understanding the issue and tracking success in solving identified problems. As Canada implements the electronic health record, greater and more complete patient data will become available for analysis, significantly adding to the effectiveness of the injury prevention model.

The implementation of the EHR will allow Canada’s healthcare leaders to learn about its medication safety problems. In addition, it should provide the analytical tools to establish baseline metrics and outcome data. A reduction in actual adverse drug events (ADEs), an indisputable measure of quality, tracked over time is the best way to show meaningful progress and the value of the EHR in the pursuit of patient safety.

In addition, a national EHR implementation should include patient safety surveillance programs with real-time alerts, which will provide an important layer of redundancy over normal processes of assessing patient status, and speed up response to important new information. Even when other safeguards such as clinical decision support (CDS) tools and computerized physician order entry (CPOE) are in place, real-time surveillance can pick up situations otherwise missed or bypassed, such as a change in patient status. For example, if a patient is discharged home on heparin (a blood thinner), the surveillance system can monitor for a drop in platelet count – a complication that can result in major bleeding and death – and so alert the physicians, pharmacists and nurses in time to intervene. Such surveillance systems, which are commercially available, utilize interoperability standards that make them compatible with most EHR solutions. Table 1 summarizes the complementary roles played by an EHR that provides real-time CPOE with decision support, real-time surveillance and retrospective surveillance, all of which are essential in maximizing patient safety. Additional guidance on how to build an electronic measurement system for medication safety within your EHR can be found in a recent publication by Classen and Metzger (2003).

In conclusion, I believe Dr. Morgan has got it right: Canada stands at a crossroads. Like its neighbour to the south, it has discovered its healthcare system is not nearly as safe as had been assumed. As Dr. Morgan has outlined, either this can be a call for rapid initiatives to improve the safety of care, or it can succumb to the more traditional approach of “This needs more study.”

Canada has great potential to quickly
improve the safety of healthcare for its citizens, perhaps much more so than the United States. The only question is: Will it grasp this opportunity?

References


Table 1: Complementary Roles of CPOE and CDS Compared to Real-Time Surveillance and Retrospective Surveillance

<table>
<thead>
<tr>
<th>Role of CDS in CPOE</th>
<th>Role of Real-Time Surveillance with Notification</th>
<th>Role of Retrospective Surveillance</th>
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<tbody>
<tr>
<td>Screens for errors in prescribing</td>
<td>Focused on intervention</td>
<td>Focused on detection</td>
</tr>
<tr>
<td>Applies various tools to guide orders and checks orders</td>
<td>Screens for problems as they are occurring</td>
<td>Screens for negative outcomes of prescribing</td>
</tr>
<tr>
<td>Helps avoid order-related problems</td>
<td>Delivers rules-based alerts based on screening of orders and new patient information</td>
<td>Provides data for investigating potential ADE</td>
</tr>
<tr>
<td>Occurs real-time</td>
<td>Can detect problems and speed investigation and response</td>
<td>Provides evidence of progress, and targets for further improvement efforts</td>
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Source: Adapted from Kilbridge and Classen (2002).


The Impact of the Electronic Health Record on Patient Safety:
An Alberta Perspective

COMMENTARY

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ABSTRACT

Alberta is at the leading edge in developing its electronic health record (EHR), a provincial initiative to provide healthcare providers with immediate access to a patient’s medication history and laboratory test results, regardless of where they are in the province, or where the patient’s drugs or other treatments were ordered. The Alberta EHR was launched in October 2003. So far 6,000 healthcare providers have voluntarily signed on to use it, and benefits to patient safety have been reported. The EHR is an important part of healthcare renewal that is required to improve patient safety; however, it must not be viewed as a stand alone cure-all solution to Canada’s patient safety challenge. The EHR will only reach its full potential if it is part of an integrated approach to health renewal that stresses consistency of healthcare, practice and information standards, and consistency and standardization of healthcare data. Without a sector-wide EHR like Alberta’s, the proliferation of computerized electronic medical records (EMRs) in hospitals, clinics and pharmacies might create “islands of information” that are not widely compatible. A national EHR approach must acknowledge the importance of improving broadly accepted practice standards and data consistency in order to reduce the islands of information and protect patients from medical errors as they move between them.
Lead author M.W. Morgan calls for the creation of a National Patient Safety Board and identifies provinces and organizations that are migrating to electronic health records (EHRs) as “the best hope” in building a national patient safety infrastructure (Morgan 2004). Given Alberta’s perspective as a leader in implementing a provincial EHR for healthcare providers, we are pleased to contribute to this discussion. Recommendations such as those made by Morgan and others on this topic provide a valuable framework that can be used to further examine the impact the EHR has in promoting patient safety.

As Morgan notes, improvements to the safety of Canada’s healthcare system require that medical errors be efficiently and effectively identified, quantified and addressed. The creation of the Edmonton-based Canadian Patient Safety Institute in 2003 represents progress in meeting this challenge. The institute will foster better reporting and analysis of errors, which will help healthcare providers identify and better understand points of risk in the existing health system. However, this type of analysis does not directly address changes to improve healthcare delivery or the reduction of risk points in existing workflow processes.

Many of these risk points exist because providers do not have access to the information they need. Healthcare reforms and the implementation of sector-wide EHR systems such as those established in Alberta have the ability to dramatically reduce medical errors by providing better access to patient information. The purpose of this article is to elaborate on how the EHR can improve patient safety, and why such an initiative must be accompanied by health reforms and the development of consistent information and healthcare standards. This article also addresses some of the challenges involved in implementing the EHR and suggests that Canada’s Transportation Safety Board has limited usefulness as a model for a National Patient Safety Board.

The reduction of medical errors requires that healthcare providers have access to the patient information they need, when they need it, regardless of where it is located. This concept is core to implementing a sector-wide EHR and represents a significant change in the way healthcare providers manage patient information.

In discussing the EHR and patient safety, however, it is first critical to distinguish between electronic medical records (EMRs) and EHRs. EMRs are defined here as a tool to manage clinical information within a single custodial organization. Many physicians or groups of physicians now record information about their patients electronically, rather than in paper files. Although EMRs have in many cases replaced paper records, they have not had a significant impact on how records are exchanged between custodians; paper (including fax) is still the primary mechanism used.

The EHR is defined here as a tool that allows healthcare providers in different organizations to electronically exchange patient information. The Alberta EHR, to elaborate, is a patient-focused network of health information systems that securely allows community physicians, pharmacists, nurses, hospitals, clinics and other authorized healthcare professionals to view and in some cases update components of a patient’s medical record elec-
tronically across the province. As well as giving a quick summary of a patient’s active medication profile and drug history, the Alberta EHR provides information on recorded allergies, intolerances and laboratory test results, regardless of where they were ordered in Alberta. Decision support tools in the Alberta EHR include a database of all available drugs and their common doses, and other reference information such as access to the clinical guidelines published by the Alberta Medical Association. Drugs can be searched by name, strength or compound. Drug-to-drug and drug-to-allergy alerts are automatically provided to avoid conflicting prescriptions and improve patient safety.

**How the EHR Can Reduce Medical Errors**

Experience gained from the Alberta EHR supports the author’s assertion that an EHR offers “the single most powerful tool the healthcare community has discovered.” Since the Alberta EHR was announced in October 2003, approximately 6,000 users have access to the benefits of the system and can retrieve patient medication, allergy and lab data gathered from points across the province. Initial surveys of Alberta EHR users have proven that access to drug and lab patient information, collected from multiple care providers, has impacted both the quality and the timeliness of patient care through more accurate and faster diagnosis. Physicians have indicated that their treatment plans have been impacted by the information entered by other healthcare providers, in some cases with significant improvement to the patient’s health and comfort. If a patient is delivered unconscious to an emergency room, for example, Alberta physicians can use the Alberta EHR to quickly obtain lifesaving information, including allergies and current medications. In the words of one physician who uses the system, “The Alberta EHR has given us a chance to do things we were not able to do before. I can look up lab test results over the last two years and immediately spot trends or values that have improved or deteriorated. It has enabled me and my colleagues to make better decisions and provide better care” (Sternberg 2004).

As all healthcare providers know, medical errors are sometimes caused by patients not disclosing medical facts. Although consents and data masking protect patient privacy, they also contribute to medical errors and sometimes the safety of care providers. Patients need to understand the risks of not disclosing information and how doing so reduces the ability of healthcare professionals to provide the best treatment. The evolution of the EHR provides a valuable opportunity to assess the impacts to patient safety and privacy that result from existing consent and data masking policies.

Population health trends and aggregate data are important research tools used to improve our healthcare system. As technologies improve, the quality of this aggregate data will enhance our ability to identify risk factors and root causes that impact the health of our population. The EHR provides the necessary infrastructure to help monitor medical errors.

**Safety Concerns with Patient Privacy and Inconsistent Standards**

In his paper, Morgan describes Alberta’s Pharmaceutical Information Network...
(PIN), and rightly notes that it is a core component of the Alberta EHR strategy. He goes on to say that healthcare leaders in Canada should wholeheartedly support Alberta’s electronic health record project and start laying the foundations for a nationwide electronic prescribing program. In Alberta, we share that wish, but we also strongly believe that healthcare leaders must be aware that the EHR is more than just technology.

Implementing a sector-wide EHR does require a significant amount of information technology; but, if we expect to achieve real healthcare reforms, significant changes to workflows and accepted practice guidelines are also required.

The root cause of many medical errors is information not being readily available during diagnosis and treatment – often because the information is located somewhere else and no cost-effective or time-effective mechanisms exist to access it. The challenge confronting healthcare leaders is to implement an EHR that provides access to patient information, when appropriate, in a secure and private environment.

Today it is not reasonable to put all patient information into an online shared repository; but, as our understanding of the benefits and capabilities of the EHR evolves, we will be able to put additional information into shared EHR repositories. Healthcare professionals will be provided with more and more of the information they require to improve their diagnosis and treatment plans and thus reduce the potential for medical errors.

One of the less obvious ways the EHR contributes to patient safety is in the development of data standards and standard processes. As the functionality of the EHR evolves, the need increases for clinical standards, process standards and technical standards. This is because the technology allows clinicians to become more and more interdependent. To put it simply, clinicians need to “speak the same language” when it comes to sorting out the best options for a patient’s care. In contrast, the continued proliferation of EMRs has the potential to create increasingly incompatible “islands of information.” In a society with increasing patient mobility, this implies a significant risk to patient safety.

Data consistency is also a significant challenge in today’s technical environment. Alberta recognizes the importance of consistently implementing EMR technology, and of ensuring that this technology is capable of exchanging information. Alberta’s Physician Office System Program (POSP) has undertaken work to define vendor conformance and usability requirements (VCUR) for physician office system software. These requirements are key to developing consistency in the tools that physicians use. The need to continue this work is underscored by the realization that decision support tools will evolve tremendously over the next few years.

Given the importance of information standards in any EHR and EMR scenario, we await further information on the role of the Canadian Patient Safety Institute in this critical area.

In Alberta, we foresee that the implementation of EHR standards and the increased consistency of health information will promote the development of clinical decision support tools that will have significant impact on patient safety. Improving the consistency of data in the
health sector will enable vendors to develop and deploy their products to a wider audience without the need to continually rewrite interfaces to the feeder systems that provide the data. Technology investment dollars will go toward functional enhancements, not integration and “plumbing” costs.

We welcome the recognition that Alberta is building a strong foundation for a national EHR initiative. Morgan’s paper, however, suggests that the model of the Canadian Transportation Safety Board would be helpful in developing a National Patient Safety Board. From our experience, we caution against making too much of such an analogy. The privacy issues involved in transportation safety are of a somewhat different nature than in the EHR. The transportation model may thus minimize the obstacles to be surmounted in designing an EHR strategy that is both effective and sensitive to privacy issues.

In conclusion, leaders in Alberta’s health sector firmly believe that the development of the EHR and associated practices contribute significantly to overall patient safety. We are already seeing the evidence. One of the key ways the EHR will lead patient safety is through the development of consistent healthcare and data standards. In light of this, we are eager to know whether the new Canadian Patient Safety Institute will recommend changes that support new ways to access patient information through shared data repositories such as the PIN and lab results history repositories of the Alberta EHR.

References

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Electronic prescribing and computerized drug management can improve the safety, quality and cost-effectiveness of prescribing. However, if the problems that lead to avoidable adverse events are not addressed by information technology, there is a risk of making considerable investment without the expected return of error reduction and improved patient safety. Improving the safety of prescribing is particularly important in ambulatory care, where most drugs are prescribed. To improve patient safety, IT solutions should be developed that provide: (1) access to the list of all currently active drugs, (2) alerts for relevant prescribing problems (therapeutic duplication, excess dose, dose adjustment for weight [children, elderly] and renal impairment, drug-disease, drug-drug, drug-age and drug-allergy contraindications), (3) the capacity to electronically submit medication stop orders to the dispensing pharmacy and (4) integration of electronic prescriptions (e-rx) into pharmacy software to avoid transcription errors. To improve quality of prescribing, IT solutions should be capable of providing physicians with reminders and alerts for evidence-based preventive care and disease management based on patient-specific drug, disease, thera-
Dr. Morgan’s view of the solutions for reducing medical errors in the Canadian healthcare system through electronic health records is on target and inspirational. Yet there is clearly no “silver bullet” remedy, as the causes of avoidable errors are indeed multifaceted. Even the most Star-Wars of information technology solutions cannot reduce errors unless they target the precise and critically important causes. The rah-rah rhetoric of the dot-com bubble pervades the territory of healthcare – promising returns that are not only unrealistic but totally off-target in relationship to the challenges faced by health professionals in caring for their patients. Multimillion-dollar failures in EHR implementation have been documented; and most seem to have a common cause (Littlejohns et al. 2003; Sicotte et al. 1998). Electronic health record technologies are implemented that do not solve problems in the delivery of care, and thus provide no value-added for users that would make it worthwhile for health professionals to migrate from a paper to an electronic system (Miller and Sim 2004). If this gap between what is needed and what is provided by information technologies is not addressed, there is a risk of making considerable investment without the expected return of error reduction and improved patient safety. In this regard, high priority has been placed on the introduction of computerized systems to reduce avoidable errors in prescribing and drug management (Schiff and Rucker 1998; Armstrong and Chrischilles 2000; Moulds 2003). Yet there is considerable variation in the capacity of computerized systems to address the critical problems that produce errors in drug management, particularly in ambulatory care where most drugs are prescribed (data provided by IMS Canada, 1999).

The intent of this commentary is to identify the problems that compromise the safety of prescription drug therapy in ambulatory care, and the IT solutions needed to address them. Quality and cost-effectiveness of prescription drug treatment, while important priorities, cannot be efficiently addressed until physicians are using computerized drug management systems for the majority of their practice population.

I. Safety
The Problems
The potential benefits of drug treatment are compromised by avoidable errors in the drug, dose and duration of therapy prescribed. Drug-related illness accounts for 5 to 23% of drug-related hospital admissions (Grymonpre et al. 1988; Ives et al. 1987; Hurwitz 1969), and is now claimed to be the sixth-leading cause of mortality in the United States (Lazarou et al. 1998). Results from population surveys indicate that 24–29% of seniors were taking at least one medication that is contraindicated in the elderly (Wilcox et al. 1994; Tamblyn et al. 1994), and 8% to 29% were prescribed at least one inappropriate drug or drug combination.
Similar estimates of the prevalence of inappropriate prescribing are found in clinic-based and institutional reviews of prescriptions (Kurfees and Dotson 1987; Beers et al. 1990; Bloom et al. 1993; Shorr et al. 1990; Maronde et al. 1971; Beers et al. 1992; Beers et al. 1993; Lesar et al. 1990; Svarstad and Mount 1991) and in a Canada-wide assessment conducted as part of the Canadian Health and Aging Survey (Hogan and Ebly 1995). Multiple-prescribing physicians and dispensing pharmacies increase the risk of avoidable errors (Tamblyn et al. 1996), likely because of the inability to readily access accurate information on all current prescriptions. Transcription errors, mistakes made in transcribing the written prescription into the appropriate drug dispensed, are estimated to occur in 15% of prescriptions (Kistner et al. 1994), of which 1.5% might cause serious harm (Kistner et al. 1994). Indeed, there is sufficient concern over this avoidable source of error that the US Medicare Prescription Drug and Modernization Act of 2003 requires the nationwide implementation of an electronic prescription drug program by January 1, 2006 (Blendon et al. 2002). Florida has already implemented state legislation that requires typed rather than handwritten prescriptions.

The Objective for IT Solutions

IT solutions should be able to reduce avoidable errors in prescribing and dispensing by providing (1) access to the list of currently active drugs, (2) alerts for relevant prescribing problems (therapeutic duplication, excess dose, dose adjustment for weight [children, elderly] and renal impairment, drug-disease, drug-drug, drug-age and drug-allergy contraindications), and (3) integration of electronic prescriptions (e-rx) into pharmacy software to avoid transcription errors.

Requirement #1: No professional should be prescribing or dispensing without access to a patient’s list of current medications. The optimal approach for providing physicians and pharmacists with information on current medication is to electronically retrieve information from community-based pharmacies’ software on all dispensed prescription medication (commonly referred to as a pharmanet). Assembly of claims-based information on dispensed medication such as used by Rx-Hub in the US is a second alternative, but only if all prescription information is retrieved, not just the drugs that are covered by the insurer. It would be ideal if patients also had access to their medication file, so that they could add over-the-counter drugs and naturopathic products, and receive drug-related product information. While Alberta is in the process of developing a pharmanet, the B.C. PharmaNet, developed in the early '90s, is only now considering how to provide community-based physicians with access to current drug lists, even though they prescribe the majority of medication (data provided by IMS Canada, 1999). Despite the obvious benefits for patient safety, the failure to provide prescribing physicians with current drug information can only be explained by a poor match between what IT solutions are developed and what are needed.

Requirement #2: All prescriptions (dispensed and new) should undergo computerized review for therapeutic...
duplication, excess dose, drug-disease, drug-drug, drug-age and drug-allergy contraindications and alert the professional about potential problems at the time they are prescribed or dispensed to minimize opportunities for human error. Prototypes for automated drug reviews in hospital-based order entry systems have been successfully developed because complete information on current medication is available through in-hospital pharmacy information systems (Bates et al. 1998). However, in ambulatory-based care, the development of IT solutions to detect prescription errors has been extremely limited, as no information is typically available on current drugs, diseases or allergies, at least not in a standardized coded form that could be used for drug problem surveillance. As a result, most systems in ambulatory care require the physician to enter relevant drug information to determine potential problems (Schiff and Rucker 1998). Almost all computerized screening programs are limited to drug interaction screening, even though drug interaction problems account for relatively few avoidable adverse drug-related events (Soumerai and Lipton 1995). One of the greatest gaps is between what is needed to address potential prescribing errors and what is included in provincial and federal plans for IT development. Consider the obvious. Drug-disease and drug-allergy surveillance cannot be conducted unless there is a method to (a) collect and upload relevant disease and allergy data and (b) code disease and allergy information in a standardized format so data can be used to construct alerts for clinically relevant drug-allergy and drug-disease problems (Schiff and Rucker 1998). Yet there is no apparent plan to collect disease information or drug allergy data as part of the $1.2 billion Canada Health Infoway.

Figure 1: The Automated Problem and Allergy List

The potential problem list is presented after opening the patient’s chart. The problem list is created by (a) retrieving ICD9 codes from medical service claims for the past 12 months for each patient as well as for every new medical service provided, (b) converting prescription of single-indication drugs (e.g. insulin) to the likely disease (e.g. diabetes), and (c) using electronic Rx indications to populate the problem list. Problems are verified by the physician, and verified problems are incorporated into drug-disease contraindication screening. Physicians can add problems and allergies to the list.
(CHI) investment. In this respect, I agree with Dr. Morgan’s sentiments that the CHI plan has failed to attend to key elements needed to address the patient safety agenda. The challenge is how to retrieve these data easily, before we achieve the more difficult and long-term goal of implementing a full electronic health record (Miller and Sim 2004). The Quebec-based MOXXI-III prototype has provided a proof-of-concept solution for how disease and allergy data can be collected through e-rx and integrated drug management systems, without the requirement of a full electronic health record (Figure 1). Strategic stepwise developments to obtain the critical data needed to minimize errors are essential if error reduction strategies are to be implemented rapidly in the population.

**Requirement #3:** Physicians should be able to transmit medication stop and change orders electronically to the dispensing pharmacy to avoid adverse drug events due to communication failures. Typically when a medication is to be stopped or changed, physicians advise their patients, and the patients in turn provide this information to their pharmacists. This approach is prone to failure, as less than one minute is spent in the average doctor-patient encounter in communicating information about treatment decisions (Ong et al. 1995), and most patients remember less than 50% of the information communicated during the visit (Development and Validation 2003). As a result, patients may continue to refill prescriptions for drugs that have been stopped as well as new medication prescribed. This dilemma is particularly problematic for patients admitted to hospital. Medications are stopped at admission, and re-prescribed in hospital. For the most vulnerable elderly patients,
about half of their medication is changed during hospitalization (Beers et al. 1989), and new medication is re-prescribed at discharge. Upon discharge, patients and community-based pharmacists are confronted with a host of new medications as well as outstanding refills from pre-hospitalization therapy. The primary-care physician is unable to advise the pharmacist about current treatment, as he/she will be lucky to receive a hospital discharge summary within three months, if ever. For this reason, community-based physicians, ER physicians and hospital-based physicians need to be able to efficiently communicate stop and change orders to the community-based pharmacies. With an integrated e-rx and phamanet system, the current drug list could readily be used to transmit stop- and change-medicine orders to dispensing pharmacies. Despite the obvious benefits of this functionality for improving safety as well as efficiency in communication, it has never been implemented. The first trial of stop-change orders worldwide is being conducted in the MOXXI-III prototype in Quebec (Figure 2).

Requirement #4: Prescriptions should be transmitted electronically and integrated into pharmacy software programs to eliminate transcription errors. The handwritten prescription is an obvious recipe for dispensing errors. Dispensing errors could be minimized by requiring a typed prescription, and virtually eliminated by the capacity to send and integrate electronic prescriptions into pharmacy software. Quebec was the first province to establish standards for electronic prescribing through a joint committee of the Order of Pharmacists and College of Physicians. On the basis of these standards, a prototype for transmitting electronic prescriptions to community-based pharmacies was developed. A key requirement of pharmacy owners was that patients should be able to decide, after leaving the physician’s office, where they would fill their prescription. As a result, pharmacies use a unique prescription number to pull prescriptions from a central server, and once client data is verified the prescription is automatically integrated into their software (Figure 3).

II. Quality
The Problems

Prescription medication can be expected to improve health status if it is prescribed in accordance with current scientific evidence. In this respect, both over- and underuse of prescription medication has been documented. Overuse of medication is particularly evident in drug groups that may be used to treat common complaints such as antibiotics for viral infections (Avorn et al. 1988; Katz and Beam 1990; DeSantis et al. 1994; Brook et al. 1989; Pitts and Vincent 1989; McConnell et al. 1982), non-steroidal anti-inflammatory drugs (NSAID) for musculoskeletal problems (Hogan et al. 1994; Roth 1988; Keys et al. 1992; Holt and Mazzuca 1992; Mazzuca et al. 1991; Ashton 1991) and sedatives-hypnotics for anxiety and insomnia (Tamblyn et al. 1994; Ashton 1991; Westerling 1988; Weyerer and Dilling 1991; Raynes 1979; Garrard et al. 1991; Cafferata and Meyers 1990; Morabia et al. 1992; Schnarch et al. 1993; Copperstock 1971; Hohmann 1989).

Unnecessary use of benzodiazepines and NSAIDs are considered to be important, and potentially avoidable risk factors for
The drug management system is a light client, heavy server architecture. The beneficiary and drug database and application are located on the MOXXI server, behind the McGill University Health Centre firewall. A replication of the application and the encrypted drug and beneficiary database is also on the physician’s pocket PC (iPac). Physicians connect to the server by wireless modem through the Bell 1x network (after device and password authentication) to automatically update the database of dispensed prescriptions, visits and new problems, and to send new prescriptions and stop prescription orders via their iPac. Locally, a Bluetooth wireless network is used to print a copy of the prescription and Rx identification number. The pharmacist uses the Rx identification number to pull the prescription from the MOXXI server. The prescription is integrated into their clinical software so that it does not have to be transcribed. Information on dispensed prescriptions for the patient is sent back to the MOXXI server. Beneficiary names and RAMQ numbers, dispensed prescription and visit records for each physician’s patient are sent from RAMQ in Quebec via the Internet SSL to the MOXXI server. Physicians can add new patients locally, information is transmitted to the RAMQ via the MOXXI server, and drug and visit data are returned to the physician in five seconds.

Figure 3A: Architecture of the MOXXI-III Integrated E-Rx System

The drug management system is a light client, heavy server architecture. The beneficiary and drug database and application are located on the MOXXI server, behind the McGill University Health Centre firewall. A replication of the application and the encrypted drug and beneficiary database is also on the physician’s pocket PC (iPac). Physicians connect to the server by wireless modem through the Bell 1x network (after device and password authentication) to automatically update the database of dispensed prescriptions, visits and new problems, and to send new prescriptions and stop prescription orders via their iPac. Locally, a Bluetooth wireless network is used to print a copy of the prescription and Rx identification number. The pharmacist uses the Rx identification number to pull the prescription from the MOXXI server. The prescription is integrated into their clinical software so that it does not have to be transcribed. Information on dispensed prescriptions for the patient is sent back to the MOXXI server. Beneficiary names and RAMQ numbers, dispensed prescription and visit records for each physician’s patient are sent from RAMQ in Quebec via the Internet SSL to the MOXXI server. Physicians can add new patients locally, information is transmitted to the RAMQ via the MOXXI server, and drug and visit data are returned to the physician in five seconds.

effective treatment such as beta blockers for secondary prevention of myocardial infarction (Soumerai et al. 1997; McLaughlin et al. 1996; Pashos et al. 1994) and inhaled steroids for asthma (Gottlieb et al. 1995; Griffiths et al. 1996; Shelley et al. 1996; Engel et al. 1989; Kesten et al. 1993; Horn and Cochrane 1989; Wareham et al. 1993; Crain et al. 1998; Legorreta et al. 1998; Friday et al. 1997; Homer et al. 1996; Hartert et al. 1996) is also common. Only 21 to 53% of MI survivors are receiving recommended preventive therapy (beta blockers) (Soumerai et al. 1997; McLaughlin et al. 1996; Pashos et al. 1994). This problem
alone results in an estimated 705 avoidable deaths and admissions among the 6,272 elderly MI survivors in Quebec each year (Levy et al. 1998). Furthermore, potentially avoidable visits, procedures and hospitalizations attributable to suboptimal management of asthma are considered to be important contributors to the cost of asthma care – an estimated $297 million in Canada every year (Krahn et al. 1996).

The Objective for IT Solutions
IT solutions should be able to improve evidence-based prescribing by providing physicians with reminders and alerts for evidence-based preventive care and disease management based on patient-specific clinical information.

Requirement #1: To trigger relevant treatment recommendations, the therapeutic intent for each prescription needs to be documented, as well as current health problems and other relevant clinical data (e.g., labs). To facilitate the application of evidence-based guidelines for disease management to prescribing decisions, patient-specific recommendations should be provided at the time decisions are being made (Bates et al. 1998; Hunt et al. 1998; Burack et al. 1994; Frame et al. 1994; McPhee et al. 1991; Turner and Peden 1994; McPhee et al. 1989; Rind et al. 1994; Montgomery et al. 2000; Vadher et al. 1997; Poller et al. 1993; Wagner et al. 2001; Mungall et al. 1994; Verner et al. 1992; Pestotnik et al. 1996; Evans et al. 1998; Dexter et al. 1998). This is because computer-generated recommendations and reminders have a substantially greater impact on prescribing decisions than feedback or academic detailing (Bennett and Glasziou 2003). To trigger the appropriate guideline, you need to know why the drug is being prescribed. Pharmacists also need to know the treatment indication for a prescription, as a safety check to verify that they are dispensing the right medication, as well as to counsel patients appropriately about taking their medications. As many drugs have multiple indications, documentation of the treatment indication at the time an electronic prescription is being written should be required. The MOXXI-III prototype has instituted required documentation of therapeutic intent as part of the electronic prescription system (Figure 4). Documentation of treatment indication appears to be feasible, acceptable to physicians and productive of valid indications (Tamblyn et al. in press).

Figure 4: Documentation of Treatment Indication

For each prescription, the MD must select at least one item from a menu of possible indications. Selected indications are added to the problem list.
Requirement #2: Disease management guidelines should be selected that target common problems, are supported by level 1 evidence from clinical trials, can be implemented using the clinical data available and can be updated easily and inexpensively to accommodate changes in the evidence. Guidelines vary in quality, and recommendations within guidelines vary in the strength of evidence used to support them. In the absence of a rigorous approach to the identification and development of computer-based guidelines for patient-specific treatment recommendations, there is a risk that computer-generated recommendations may cause more harm than good. Methods such as the AGREE appraisal instrument (AGREE Collaboration 2003) should be employed to judge and select high-quality guidelines, and Graham's assessment tools should be employed to select level-1-supported recommendations. As physicians are resistant to entering data to obtain patient-specific treatment recommendations, selected guidelines should be limited to those that use available clinical data (Maviglia et al. 2003). As science changes rapidly, models of guideline translation and updating through rules engines such as used by the Brigham and Women's Hospital group should be implemented (Maviglia et al. 2003). As the mandate of CHI is to improve the quality of care through an interoperable EHR, it would be appropriate and desirable for CHI to play a leadership role in this area.

III. Cost-Effectiveness
The Problems
Drug expenditures are responsible for an increasing proportion of health costs. In 2000, 15.4% of healthcare spending in Canada – $15.1 billion – was on drug treatment, whereas less than $1.8 billion was spent on drugs two decades ago (Canadian Institute for Health Information 2003). The annual increase in drug expenditures, 5% worldwide and 11% in Canada (PMPRB 2002), has been attributed primarily to two factors: the availability of new drug treatments (34% of the increase) and increased utilization rates (24% of the increase) (Anderson et al. 1993). Population aging, even in Canada, accounts for a surprisingly small proportion – less than 15% (Anderson et al. 1993). While increasing drug expenditures may be an appropriate response to the availability of better treatments, less than 2% of new drugs reviewed by the Canadian Patented Medicines Review Board in 2002 were classified as breakthrough treatments that would offer substantial improvement over existing therapies (PMPRB 2002). The majority of new drugs were treatments that offered little or no improvement over existing medicines (38%) or new dosage or delivery forms for existing drugs (61%). Similarly, increasing utilization rates do not appear to be a reflection of new drugs targeting otherwise “untreated” populations, but rather an increase in the number of prescriptions per person among those already using drug therapy (Régie de l’assurance-maladie 1992). While the choice of a drug may be clinically appropriate, it may not be cost-effective. Ideally, the least expensive drug is selected among drugs that have equivalent clinical benefits for the treatment of a given condition. This is important, because patients bear the cost, and higher out-of-pocket expenditures negatively impact on medication...
compliance and lead to avoidable hospital admissions (Tamblyn et al. 2001). Studies of prescribing rates for new drugs suggest that prescribing consistently exceeds the expected incidence of health problems for which such drugs would be indicated (Ferguson and Maling 1990; McGavock et al. 1993; Bradlow and Coulter 1993; Maxwell et al. 1993; Morton-Jones and Pringle 1993a; Morton-Jones and Pringle 1993b). Physician knowledge of the costs of the drugs they prescribe is notoriously poor (Ryan et al. 1990; Steele et al. 1989; Hershey et al. 1986) and there are dramatic differences in the rates of prescribing new and more costly drugs among different physicians (Pitts and Vincent 1989; Molstad et al. 1990). When physicians are surveyed with respect to their drug choices for hypothetical cases, unnecessarily costly drugs are selected in 79% of prescriptions (Holmes 1992).

The Objective for IT Solutions
IT solutions should provide physicians with the cost of medications at the time of prescribing, and provide recommendations, when appropriate, for alternative less expensive medication that may be equally effective.

Requirement #1: Physicians should know the cost of the prescription medication selected at the time they are prescribing. Prescription cost will vary by drug and quantity dispensed. To enable automated calculations, the drug directive (frequency of administration and duration of treatment) needs to be standardized. There are presently no standards. Cost for medication will vary over time, by province and by pharmacy, and between publicly and privately insured patients. Methods of retrieving and updating cost information should be incorporated into an integrated drug management system to minimize overhead in maintaining current cost data.

Requirement #2: Evidence-based drugs of choice recommendations should be implemented for common health problems and incorporated into an electronic prescribing system, to provide individualized patient recommendations. With the availability of treatment indications, recommendations for first-, second- and third-line therapy can be incorporated into computer-based treatment recommendations. By retrieving a 12-month drug history, treatment recommendations for first-line therapy could be appropriately targeted at new users of treatment. Selection of recommendations will require the same systematic and rigorous assessment as for disease management guidelines.

Conclusion
While I support Dr. Morgan’s conclusions that electronic prescribing could improve patient safety, the devil is in the details. Unless e-Rx is part of an integrated drug management system that addresses the key causes of errors that lead to adverse events, there is a risk of investing in information technologies that will not address the problem.

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Envisioning Safer Healthcare

COMMENTARY

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ABSTRACT

Morgan provides an action plan for safer Canadian healthcare and argues that needed, fundamentally safer healthcare requires commitment to change from policymakers, healthcare leaders and practitioners. He posits that safer healthcare in Canada can be achieved through information technology (IT) and a national patient safety investigative agency.

Even with such initiatives in place, we are left with several key questions that will need to be considered to monitor progress toward the goal of safer healthcare:

• What is the acceptable safety level or attainable safety benchmark for healthcare delivery in Canada? The epidemiology of errors and ability to classify and monitor error typologies needed to set such boundaries are not currently available.

• Should safety benchmarks be related to a national goal or shared, global goal? Uncoordinated efforts to enhance patient safety are reported for the United States, Australia and Canada among others. The World Health Organization has visibly demonstrated the global commitment to patient safety through its International Alliance for Patient Safety in May 2002 (Donaldson 2004).
Some thought to how we might proceed in a unified fashion may both be cost-effective and lead to timely goal attainment.

A shared understanding of healthcare safety – a nondisciplinary area that professionals learn from experience vs. classroom lecture – is key. Morgan calls upon healthcare leaders to become more knowledgeable about safety, relying on a fundamental premise whereby safety should be viewed under the overarching quality-of-care umbrella. The article notes that one of the most highly visible acknowledgments of the patient safety problem in healthcare delivery occurred over four years ago with the Institute of Medicine report (Kohn et al. 1999). Morgan’s frustration over the continual call for study vs. steps taken to actively enhance safety is clear. From a quality improvement perspective, change agents at the “microsystem level” characterized by Berwick (2002; IOM Committee 2001) are acculturated to rapid-cycle improvement, using a plan-do-study-act cycle (Bauer et al. 2002).

Furthermore, the need to accelerate the change process with respect to safety is problematic:

- Has a causal link between a safety problem and associated outcome been clearly identified?
- What level of evidence is sufficient to act/implement change?

Shojania et al. (2001) provide an evidence report, comprehensively analyzing patient safety practices in the literature. Using a systematic literature search process, they report 11 promising practices, but clearly note that the evidence base for safety is limited because: (1) there is a problem with blinding in such studies; (2) the multidimensional nature of many safety practices makes them difficult to study; and (3) it is difficult to measure important outcomes. The fact that those safety practices with the strongest evidence tend to be clinical in nature and not necessarily high incidence makes investment decisions challenging in the face of large-scale, competing priorities (e.g., evolving diagnostic technologies, chronic disease management, health disparities).

Morgan advocates a model approach that would allow us to advance our epidemiological understanding of safety, modelling the Canadian Transportation Safety Board, in order to identify patterns and trends in rare events. The electronic surveillance system would serve as a vehicle for investigation of patterns and trends in reported, rare events; and the Board would have authority and responsibility for investigation of events. Morgan argues that such a commitment by the Canadian government would put patient safety on a par with Public Safety and Emergency Preparedness and the National Transportation Safety Board. This may be a first step for Canada, but it is clearly not a reach goal. The last Institute of Medicine (IOM) patient safety report, Patient Safety: Achieving a New Standard for Care (Aspden et al. 2004), describes “state of the art” injury tracking. The four parallel elements that the report describes are prospective clinical triggers, ICD-code-based case finding, criteria-based case finding and voluntary reporting. Retrospective efforts are most common and include such criteria-based case finding initiatives as Quality Assurance Royal North Shore Case
Finding (QaRNS from Royal North Shore Hospital, Sydney, Australia), Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Sentinel Events and National Quality Forum (NQF) Never Events initiatives. These combined with voluntary reporting in a culture of safety have resulted in relatively poor case findings. Thus, efforts have pushed onward to ICD-code-based case finding with more positive results, such as reports from the US Agency for Healthcare Research and Quality (AHRQ) funded patient safety demonstration grant to Utah-Missouri. As the field advances and our IT systems evolve, we are striving to move closer to detection either concurrently or, more desirably, on a prospective basis before an error occurs. Cutting-edge work done at LDS Hospital and Brigham & Women's Hospital are noteworthy efforts that provide a strong foundation for encouraging this prospective, error-detection direction vs. a retrospective, surveillance approach.

Compared to traditional voluntary incident reporting systems, a comprehensive system that involves multiple “triggers” may increase detected injury rates by more than 100 times (Evans 1998; Bates 1995). Such a system may also detect large numbers of “near misses.” According to Brent James (2004), “Injury detection and tracking is an essential first step in consolidating professional opinion to significantly reduce injury rates (i.e., keep the pressure on). It is also an essential component in understanding the epidemiology of injury, in testing possible solutions, and in establishing transparent accountability for health care delivery.”

Event monitoring systems are intended to identify critical events based on clinical rules as data enter a data repository, and to generate alerts. Hypothetically, trigger alerts are consequently routed to appropriate providers for more detailed examination of patient records. Clinical triggers embedded in electronic health records (EHRs) are flags to clinicians that identify the potential for error; these can be retrospective (i.e., voluntary reporting, code- or criteria-based case finding), concurrent or positive. A set of triggers related to a single adverse event class are then viewed together as an adverse event detection system, which can be manual or supported by IT. Prospective trigger surveillance methodology was originally developed at LDS Hospital (the flagship hospital of Intermountain Health Care) to detect adverse drug events (ADEs) by integrating computer programs with the hospital information system (Classen et al. 1991). Retrospective trigger tools such as AHRQ’s Patient Safety Indicators are generated with administrative data that can be used to compare performance across similar in-patient facilities and/or monitor trends in measures over time. Prospective trigger tools are intended to provide rapid, real-time identification of adverse events and enable timely opportunities for intervention.

A review of the literature from 1990 to date of MEDLINE on error detection systems shows that available, IT-based tools are predominantly retrospective and focused on ADE systems. This is summarized in Exhibit 1. Nevertheless, there are other types of prevalent errors that warrant such attention such as decubitus or pressure ulcers, hospital-acquired infections and mechanical device failure. As noted in the IOM report, “Better
management of health information is a prerequisite to achieving patient safety as a standard of care” (Aspden et al. 2004: 3).

The model Transportation Safety Board is augmented by Morgan’s belief that the EHR is a fundamental tool for achieving safer healthcare. We know that EHRs are defined differently and can have vastly differing levels of functionality – electronic outpatient prescribing, in-patient computerized physician order entry and home-based disease management. Accelerated diffusion of this technology-based solution in a coordinated manner is advocated by Morgan in order to reduce costs, prevent harm and save lives. Implementing standardized systems that can be linked and offer a level of prospective error detection would be a real leap in putting Canada ahead of the curve. Morgan provides synthetic estimates in making the business case for such an investment. As previously mentioned, such systems can be developed in a way that facilitates both manual and electronic adoption, allowing a phased strategy for

Exhibit 1: Reported Electronic Trigger Tool Applications in Identifying Adverse Events

<table>
<thead>
<tr>
<th>Type of Error</th>
<th>Author(s)/ Year Published</th>
<th>Data Sources</th>
<th>Detection Timing</th>
<th>Brief Description</th>
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<td>Laboratory and pharmacy</td>
<td>Prospective</td>
<td>Event monitor based on 52 rules</td>
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<td>Raschke et al. 1998</td>
<td>Patient demographics, radiology orders, pharmacy and lab results</td>
<td>Prospective</td>
<td>Targeted 37 drug-specific ADEs</td>
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<td>Levy et al. 1999</td>
<td>Lab results</td>
<td>Prospective</td>
<td>Monitored for 25 laboratory abnormalities</td>
</tr>
<tr>
<td></td>
<td>Classen et al. 1991</td>
<td>Lab and pharmacy data</td>
<td>Prospective</td>
<td>Multiple sources of detection based on potential ADE signals</td>
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<tr>
<td></td>
<td>Honigman et al. 2001</td>
<td>Lab, pharmacy, administrative data and free-text searches of outpatient records</td>
<td>Retrospective</td>
<td>Rules based on ICD-9, free search and 29 drug-laboratory and allergies rules</td>
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<tr>
<td>Nosocomial infections</td>
<td>Evans et al. 1986</td>
<td>Microbiology, laboratory and pharmacy</td>
<td>Prospective</td>
<td>Monitors antibiotic use in relation to infectious disease</td>
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<td></td>
<td>Rocha et al. 1994</td>
<td>Microbiology</td>
<td>Retrospective</td>
<td>Boolean logic activated by positive microbiology results</td>
</tr>
<tr>
<td>Surgery</td>
<td>Iezzoni et al. 1994</td>
<td>California discharge abstract data</td>
<td>Retrospective</td>
<td>Screening program identifying 27 preventable in-hospital complications</td>
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<td>Weingart et al. 2000</td>
<td>Administrative</td>
<td>Retrospective</td>
<td>Computer algorithm that screens potential medical and surgical complications</td>
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<td>General Hospital</td>
<td>Bates et al. 1995</td>
<td>Administrative</td>
<td>Retrospective</td>
<td>15 screening criteria and multiple screen strategies</td>
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<tr>
<td>Anesthetic procedures</td>
<td>Benson et al. 2000</td>
<td>Data from all anesthesia procedures</td>
<td>Retrospective</td>
<td>Screened for hypotension, hypertension, bradycardia, tachycardia and hypovolemia</td>
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IT system implementation with the vast diversity of providers located across the urban-rural continuum in Canada.

Global momentum and diffusion initiatives aimed at enhancing patient safety as a priority area for ensuring high-quality healthcare are well documented. From a policy perspective, national efforts to secure a safer healthcare delivery system remain fragmented and nonspecific. As health services researchers, we are challenged by the very nature of such initiatives and lack of funding to imbed evaluations into our demonstration projects, limiting the evidence base. We remain stuck in “study” vs. “action” mode, to the frustration of clinicians at the “sharp end.” In his paper, Morgan offers an action plan for Canada to move forward. This will require both the intellectual and the monetary teaming of Canadian policymakers, researchers, administrators and clinicians to collaboratively move forward in achieving well-defined patient safety goals.

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Next Steps for Patient Safety in Canadian Healthcare

COMMENTARY

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ABSTRACT

Morgan outlines some important elements necessary for improving patient safety in Canadian healthcare. But these steps are likely to require considerable time and resources and may be difficult to implement. In the light of the evidence of adverse events in Canadian hospitals, all Canadian healthcare organizations need to begin to measure the numbers and types of adverse events experienced by their patients and clients. Staff need to learn new skills for investigating and improving care. A variety of tools and resources are available for these tasks. Leadership both in senior management and on the front lines must learn to shift the focus from blaming individuals to improving systems of care. Leaders must also acknowledge that most healthcare organizations have failed to gather the necessary information on adverse events, and they must invest in building knowledge and implementing practices that reduce the current levels of injury.
Morgan begins his paper by noting that five years have elapsed since the Institute of Medicine issued its report To Err Is Human. The appearance of this publication was clearly a “sentinel event” for healthcare. Yet there is only modest evidence that much progress has been made in US healthcare organizations – or elsewhere – in improving patient safety.

Research in Canada suggests that the incidence of adverse events may be higher in Canadian hospitals than in their US counterparts, although some of this difference is likely due to variations in research methods rather than quality of care. We now know that 7.5% of adult acute care patients in Canadian hospitals in the year 2000 experienced an adverse event. If this rate is applied to all similar hospitalizations in Canada, then there were 180,000 adverse events in Canadian hospitals that year. About 37% (or 70,000) of these were preventable (Baker, Norton et al. 2004).

Patient safety clearly presents important challenges to Canadian healthcare organizations. Few Canadian healthcare organizations have invested in developing the knowledge and skills necessary to improve safety; fewer still have begun to employ that knowledge to assist caregivers and managers in identifying vulnerabilities and increasing the reliability of patient care. Morgan identifies several critical needs. First, improved reporting and, in particular, a heightened understanding of the “human factors” and system vulnerabilities that contribute to current level of performance is needed. His model of a Canadian Patient Safety Board offers an appealing vision of an agency that could stimulate improvement across the country. But the mandate of this agency, and its fit with existing bodies, including the Canadian Patient Safety Institute and the Canadian Medication Incident Reporting Program, among others, is unclear.

There is also little doubt that development and implementation of an electronic health record (EHR) is a critical step in transforming healthcare and improving patient safety. Healthcare organizations that have implemented an integrated EHR with decision support systems provide safer care. But most healthcare organizations have only partial EHRs. For example, data from the Ontario Hospital Report indicate that as of 2001–2002 only 15% of Ontario teaching and community hospitals reported that they relied primarily on electronic records for information about medications (Canadian Institute for Health Information 2003). Full implementation of EHRs in Canadian hospitals is several years off. Moreover, the experience of Cedars Sinai Hospital in Los Angeles, which had to uninstall its Computerized Physician Order Entry system to avert a full-scale revolt among its physicians, reminds us that the implementation requires careful planning to ensure usability (Scanlon 2004).

So what are the critical next steps? Clearly there have been a number of important national and provincial initiatives to support patient safety in Canada, including the funding of the Canadian Patient Safety Institute, that lay the groundwork for identifying the tools and approaches that will be necessary. However, the data on adverse events in Canadian hospitals and other healthcare organizations suggest that we cannot wait for electronic health records or new reporting agencies. We must begin to
show results in improving patient safety. These results require changes in delivery organizations, both at the bedside and in the systems supporting care. Concerted efforts are needed now to begin to implement knowledge about improving safety and reliability in hospitals and other healthcare organizations.

Building on a framework we developed several years ago, we suggest that patient safety efforts should address three areas: (1) measurement of adverse events and the conditions and behaviours that contribute to these events, (2) system tools and change strategies to improve care and reduce the opportunity for error and (3) leadership and culture to make safety a priority and create environments in which caregivers and other staff can help to identify the conditions and behaviours that contribute to unsafe care (Baker and Norton 2001).

**Measurement.** The Canadian Adverse Events study offers a national assessment of adverse events. If the results of the study were applied (say) to a 500-bed community hospital, then that hospital would have 69 to 134 preventable adverse events each month. Yet such numbers are not likely to provide enough evidence to engage many local caregivers who may not see sufficient evidence of this many adverse events. As a first step for building a case for patient safety, many organizations will need to determine the incidence and types of adverse events that occur within their walls or communities. This local data will be more convincing than national data – and more useful. The information will help to direct the kinds of interventions that healthcare organization should undertake to improve safety and provide a baseline for assessing improvements in results.

Most Canadian hospitals have existing incident reporting systems. But the evidence suggests that most of these systems identify only 10% of the adverse events that occur and that many adverse events go unrecognized by caregivers. New tools, including electronic incident reporting tools, have been very useful in improving the reporting of incidents. These tools allow staff to report incidents with relevant details. Other assessment instruments, such as the Adverse Drug Events trigger tool, have been used to identify medication errors and weaknesses in medication systems (Resar, Rozich et al. 2003; Rozich, Haraden et al. 2003). The Adverse Drug Event tool has been used in the Calgary Health Region to identify adverse drug events in patient records, and staff there uncovered many events that were not previously recognized as adverse drug reactions or medication errors. Hospitals that want to replicate the data collection used in the Canadian Adverse Events study will be able to access a simplified version of the chart review tool available later this year. This tool will allow healthcare organizations to examine a sample of patient records to determine the number and types of adverse events that have occurred in various areas of their organization.

Knowing what adverse events occur is only the first step. Most adverse events result from a complex series of behaviours and failures in systems of care. Investigation of the patterns of adverse events requires unearthing the latent conditions and systemic flaws as well as the specific actions that contributed to these outcomes. Root-cause analysis and Failure Mode Effects Analysis (FMEA)
provide tools to help front-line caregivers, managers and patient safety experts to go beyond the immediate events and examine the less obvious conditions such as maintenance of equipment or the lack of clear policies that undermine defences against error. Root analysis software and training are available from a number of vendors. The tools developed by the Veterans Health Administration have been used by many health organizations in the US and are freely available on the Web (Bagian, Gosbee et al. 2002). An FMEA tool is available at the Institute for Healthcare Improvement (IHI) website (www.ihi.org/ihi/workspace/tools/fmea).

**System Tools and Change Strategies.** Hospitals and other healthcare organizations need to consider three types of investments to improve safety in care delivery systems. First they need to develop knowledge and skills both at senior levels and among front-line staff. Assigning responsibility for patient safety in a senior leadership portfolio ensures that senior leadership understands this critical issue and can consider patient safety as a critical factor when making operational or strategic decisions. In addition, many hospitals have designated one or more caregivers as patient safety champions who have additional skills and knowledge to assist in improving systems. These champions can support root-cause analysis, help to ensure implementation of new protocols and procedures and assist in staff orientation and patient safety education. In most cases, these are clinicians who have been freed from their patient care responsibilities for a day or more per

<table>
<thead>
<tr>
<th>Table 1: A Curriculum for Patient Safety Officers</th>
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<tbody>
<tr>
<td>• Reliability science: Using proven principles that pick up where vigilance leaves off</td>
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<tr>
<td>• Human factors: Creating systems that compensate for the limits of human ability</td>
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<tr>
<td>• Accountability: Moving away from blame and shame</td>
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<tr>
<td>• Rules and regulations: A guide to ensuring compliance with private, state and federal standards</td>
</tr>
<tr>
<td>• Interpersonal communication and teamwork: Developing a framework for working together and supporting each other in care delivery</td>
</tr>
<tr>
<td>• Influencing others: Understanding and shaping stakeholder perspectives</td>
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<tr>
<td>• Improvement: Using tested safety improvement techniques</td>
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<tr>
<td>• Safety measures: Knowing what to measure, and how</td>
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<tr>
<td>• Critical analysis: Using investigative tools such as root-cause analysis and proven observational techniques</td>
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<tr>
<td>• Training others: Creating safety champions</td>
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<tr>
<td>• Presentation: Choosing the right media, messages and audiences</td>
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<tr>
<td>• Project management: Putting and keeping it all together</td>
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<tr>
<td>• Technology: Understanding the promises, pitfalls and realities of technology</td>
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<tr>
<td>• Leadership: Taking it from the top: connecting the CEO with the safety agenda</td>
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<tr>
<td>• Positioning patient safety within the organization: Integrating patient safety into the organizational structure and daily life</td>
</tr>
<tr>
<td>• Strategy and implementation: Creating a comprehensive safety program and implementation plan</td>
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week to assist in patient safety rounds, staff education and the analysis of events within their organizations.

Larger organizations may want to consider creating a “safety officer” who has the skills to facilitate patient safety efforts throughout the organization. The Institute for Healthcare Improvement has developed a “curriculum” for safety officers that includes a range of new knowledge and skills that few healthcare professionals now possess (see Table 1).

Developing staff with the skills to analyze events and see the vulnerabilities that exist in healthcare systems provides expertise to redesign those systems. Healthcare leaders in every Canadian healthcare organization need to target one or more key areas for improvement that they have identified through incident reporting, chart review or some other measurement. Medication safety, surgical site infection, falls and restraint use are some of the important topics in hospitals and the community. Fortunately, a number of useful resources exist for this work. For example, the Institute for Safe Medication Practice (Canada) (www.ismp-canada.org) is a reservoir of information on improving medication practices. The IHI maintains a website (www.ihi.org) that features many tools, tips and experiences for improving safety in many different patient care areas.

Still, knowing what to change does not ensure that such changes will actually happen. Thus, organizations need to develop a change strategy and provide training and tools in methods such as rapid-cycle improvement and the concurrent measurement of local improvements to ensure that new practices are implemented and remain in place. To improve safely in the use of coumadin, insulin, chemotherapy and other high-risk medications, for example, changes in clinical practice and protocols need to be woven into the fabric of daily work, and these practices must be measured over time.

Some needed changes will require major investments by healthcare organizations. For example, the elimination of infusion pumps that do not offer free-flow protection will require substantial capital outlays. However, other changes will focus on changing behaviours, not equipment. For example, requiring “readback” of verbal orders or systems to ensure more consistent hand-washing by clinical staff are relatively inexpensive initiatives but by no means easy to achieve.

Leadership and Culture. Patient safety can never be assured until caregivers and managers embrace new expectations. Currently most healthcare organizations expect perfect performance and blame individuals who fail to deliver such performance. Our new expectations need to specify the shared responsibility of healthcare teams and managers to achieve excellent care and to identify when and where current systems fail. Until caregivers feel secure in reporting errors and near misses without fear of blame and punishment, there can be little progress. Senior leadership must declare patient safety an important priority, while realizing that it is clearly not the only priority.

Leadership needs to be visible on this issue. One successful strategy for linking leadership action to front-line issues is Executive Walk-Rounds (Frankel, Graydon-Baker et al. 2003). In this strategy, senior leaders meet small groups of staff to identify patient safety issues in their environment. Senior leaders can also
assess their leadership strategies for patient safety. Jim Conway, CEO of the Dana Farber Cancer Institute in Boston, has led the development of a self-assessment tool for hospital executives.

Another strategy for cultural change starts with an organizational survey of staff on their perceptions of the safety climate. A number of healthcare organizations in the US and Canada have done such surveys. Singer and colleagues, for example, found that the patient safety culture varied widely between hospitals and between different roles within hospitals (Singer, Gaba et al. 2003). Identifying the characteristics of culture that support – or impede – the development of patient safety is an important first step to instituting the changes that will create a more receptive environment.

**Conclusion**

Morgan's overview of the current state of patient safety in Canadian healthcare clearly identifies the need for increased attention to this critical issue. We agree with his long-term goals, including the need to improve reporting of sentinel events and to develop an electronic health record that provides a more reliable information database for clinical care. But these efforts alone are insufficient. Canadian healthcare organizations need to begin work immediately, using the tools and ideas generated by their colleagues in this country and elsewhere to improve care on the front lines.

**References**


All of the responders have added significantly to the lead paper by further illustrating the patient safety battlefield. Their commentaries further define the etiology of medical errors and the barriers to overcoming them. They validate the need for new information management tools including the EHR and the importance of learning from others in using information technology to effect change and improve patient safety. They describe the mechanisms of clinical decision support and patient safety surveillance systems. They illustrate working Canadian EHR solutions that are beginning to make a difference, and they suggest ongoing commitment from governments to patient safety.

However, four times as many Canadians are dying every year from medical errors as from motor vehicle accidents according to Statistics Canada data for 2001. Canadian healthcare leaders must unite, declare war, commit the resources to ensure winning conditions, draw up battle plans and execute them swiftly and decisively. If we do not, the healthcare delivery battlefield casualties will continue to mount.

We now have the facts; it is time for action. The research by Baker et al. gives more than enough reason to declare war. They have used good science to show that in a single venue of care, “Canadian hospitals,” 70,000 admissions every year are associated with a medical error and possibly 14,700 Canadian deaths (Baker et al. 2004). The death toll will only grow as we learn about medical errors in the other venues of care including the doctor’s office, long-term-care facilities and the patient’s home. We must now marshal all needed resources to move from a country
focused on studying errors to a nation dedicated to winning the war by building a safe patient care delivery system.

As we prepare to wage war, let us review the battle plans devised by our wise and experienced generals.

General Protti’s reputation precedes him; he strikes fear in the enemy (AKA survived the longest). He needs no further convincing in terms of ROI for this war. He is ready to sacrifice whatever it takes, but as he leads his troops into battle he reminds us that our allies such as the United Kingdom have committed over $15 billion to fighting this war. He suggests we examine other weapons such as Great Britain’s National Patient Safety Authority. Being the most successful of warriors of all, he teaches us a very important lesson. When it comes to new weapons such as CPOE and CDS, whether they are successful depends very much on whether they were designed correctly and how well our fighters are trained to use them.

General Alvarez, responsible for statistics, logistics and winning conditions (AKA funding), is also totally committed. He has already spent more money at the federal level than our great ally, the United States, in waging this war. He is ready to deploy more troops and resources on EHR weapons that are battle-worthy and proven, and has begun numerous advance campaigns to ensure the building blocks are in place to provide winning conditions for the main assault. He points out that to win the war, not just the battle, interoperability for a pan-Canadian EHR assault is needed. His troops are working diligently to develop the EHR Composite Index to ensure that we can remove ineffective weapons from the battlefield quickly and reallocate resources to more worthy weapons.

General Guerriere, responsible for special forces (AKA the consultants), also needs no further convincing. He has identified at least 10 different weaknesses in our defensive and offensive plans and has a battery of highly trained troops, weapons and other measures to deploy. He has no time for the archaic, paper-based hand grenades being used ineffectively today, and his forces have readily embraced the EHR and other information systems as the weapons needed for success. He points out how difficult the battles will be if we do not recognize that the morale of our front-line clinicians must be improved and that these troops must be given body armour and effective weapons.

General Binns, responsible for ground forces (AKA getting shot at), is advancing our lines. He is utilizing the EHR on the Alberta front, and the troops, even the doctors, are marching forward. His battlefield reports show growing evidence that the EHR is preventing casualties and deaths, proving to be a powerful weapon.

General Savitz, responsible for policy advice (AKA keeping HQ committed), is communicating the need to stay focused on prospective error detection and not to spend scarce resources on measuring what happened in the past. She also pushes those of influence to take this war globally, not just nationally, and that as a coalition we must use our combined resources and proven weapons to win. Along with being prospective, these weapons must be comprehensive in nature and involve multiple triggers.

General Classen, responsible for weaponry research and innovation (AKA
blowing up things), is eager to field-test new weapons of …

Generals Baker and Norton, responsible for intelligence (AKA interrogation of the enemy), are focused on equipping our troops with basic survival tools to mount a defence against insurgent attacks. Although these tools are for the most part paper-based, and will not ultimately be the deciding factor in winning the war, they can be partially effective as a defensive manoeuvre.

Then there is General Tamblyn, who, although supportive of e-prescribing, has not been impressed with the battlefield trials to date. It appears her experience of stand-alone e-prescribing has fallen short of the mark for many reasons, and rightly so. Such weaponry must be part of a comprehensive EHR strategy that provides fully integrated decision support with other pertinent patient data to be fully effective. It is hoped that Tamblyn will take an opportunity to evaluate some of the e-prescribing success stories south of the border and be ready to try it again.

As for me, the foot soldier, I have faith in our leaders, but I remain deeply troubled by the fact that our patients are unaware of the enemy, are uninformed about the dangers and have not been consulted about the need to go to war to make our healthcare system safe as well as accessible. Canadians are unknowingly at risk every time they seek care; they have not been told how to mount a defence and are being maimed and killed by the worst kind of friendly fire. When drawing up battle plans, I would ask the generals to reconsider their cool reaction to the idea of a Canadian Patient Safety Board modelled after the Transportation Safety Board. The objections raised focused on the federal–provincial power struggle and the need to protect patient privacy. I would simply state that to win this war we must rise above politics and recognize that in the current environment the only thing being protected is the enemy – medical errors.
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