Developing Tomorrow’s Workforce Today

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eHealth in Canada
Current Trends and Future Challenges

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The eHealth industry is a crucial element in building the foundation for a robust health system infrastructure and infostructure. eHealth will play a critical role in the development and application of systems and processes that support quality patient care through evidence-based clinical decisions and in the provision of the right information to the right person at the right time.

As the health system becomes more fully e-enabled, the roles of the various players within eHealth will become even more important. The three groups working within eHealth—health informatics (HI) professionals, health information management (HIM) professionals and technical specialists—will be required to provide the context and tools to organize a vastly increased amount of information and to integrate this information into health system tools that allow clinicians to use this information.

This paper begins by describing the history of the eHealth industry and the development of the professions working within the industry. This is followed by an overview of the industry’s stakeholders and the roles they play in advancing the eHealth agenda. The paper then turns to a detailed examination of the current status of IT installations across Canada and what the future holds, particularly with respect to the implementation of Electronic Health Records (EHRs) and Electronic Medical Records (EMRs).

The trends the paper describes will have significant implications for employment in the eHealth industry. As the health care system increases its use of technology to capture data and information, the role of HI and HIM professionals is also changing. HI and HIM professionals will need to have advanced competencies in building systems and processes to access, analyze and manage greater amounts of data and information to support and meet the clinical and business objectives of the health care organizations.

There are a number of barriers to building the industry’s human resource capacity. One of the biggest issues is the ability to attract and retain human resources. The health care organizations surveyed for this paper noted there is a general shortage in both the HI and HIM categories, and budgetary constraints pose a significant problem in being able to provide competitive financial remuneration vis-à-vis the private sector. With respect to competencies, the organizations surveyed believe their greatest gaps are in project management, technical analysts and clinical informatics analysts.

The paper concludes that the preliminary findings of a labour shortage demonstrate the need for further research that will allow the development of a comprehensive eHealth human resource strategy. Detailed research at the national level will provide a clearer picture of both the current labour supply and demand, and eHealth labour market needs in the near future. While awaiting the development of a comprehensive human resource strategy, the paper offers a number of concluding observations about addressing current competency gaps that have been identified.
eHealth is an innovative response to the need to make health-related information accessible and meaningful. While there are numerous definitions of eHealth, the following one by Gunther Eysenbach is the most encompassing:

“e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.”

This paper will focus on the development of three primary groups involved with eHealth – health informatics (HI) professionals, health information management (HIM) professionals, and technical specialists. The following sections outline the evolution of the first two disciplines and the role they play in the development of our health care system.

Health Informatics

Donald Lindberg was an early champion for eHealth in his use of information and communication technology (ICT) to manage the quality of his microbiology lab processes, including the automated transmission of lab results to the wards. Lindberg believed that ICT resolved two fundamental needs:

1. Data analysis; and
2. Reduction of lab errors.

Allan Levy, another early proponent of eHealth and the emerging field of medical informatics, defined the scope of medical informatics as “dealing with the problems associated with information, its acquisition, analysis and dissemination in health care delivery processes.” Both Lindberg and Levy, among others supported the idea that informatics in health care needed to bring together health care professionals, engineers and computer scientists to develop systems which improved clinical outcomes.

G.O. Barnett, in recounting some of his early work at Massachusetts General Hospital, noted that while technology has advanced at an incredible rate, its adoption in the field of medicine has been slow. In this article, Barnett asserts that “the use of computers in hospitals will not reduce a total of medical-care costs, but will lead to more effective use of the resources at hand and to improved patient care.” Some of the early projects under his management were an admission-discharge census system, a laboratory reporting system, and a medication ordering system. However these projects were never operational. The technical barriers to adoption included the unreliability of the computer system, slow communication speed and the user unfriendliness of the data input terminal. But the single most important impediment was the incompatibility between the goals of the lab and the technology vendor.

Progress into the utilization of technology to develop information systems in health care came in 1966 with the development of MUMPS, a programming system created by Nell Pappalardo and Curt Marble. The system supported the development of medical information systems and was heralded as an easy to use and powerful programming language. The success of MUMPS has been attributed to the collaboration throughout its development by end users and system designers.

A major contribution from the health informatics discipline has been the work done on clinical decision support systems (CDSS). Homer Warner was interested in applying mathematical models to assist in clinical decision making, and he used Bayes’ rule to develop a computer-aided medical diagnosis application. Tony Gorry advanced this early work by using mathematical models to develop a sequential decision-making application to balance the risk of making a diagnosis versus further diagnostic testing.

1. What is e-health? Gunther Eysenbach. Journal of Medical Internet Research. 2001. http://www.jmir.org/2001/2/e20/ Gunther Eysenbach, MD, MPH, is a leading researcher in eHealth, and is Senior Scientist at the Centre for Global eHealth Innovation at the University Health Network in Toronto, Canada, and Associate Professor in the Department of Health Policy, Management and Evaluation at the University of Toronto.

2. Berry Prize Winner: Donald Lindberg: Trailblazing with Medical Informatics. www.usmedicine.com/article.cfm?articleID=1139&issueID=78


6. Ibid.

7. Ibid.

8. Ibid.

9. Ibid.
Over a nineteen-year period from 1968 to 1987, the focus in the area of health informatics shifted from the development of new models and simulations to database development and statistical methods.\textsuperscript{10} Acceptance of the discipline is also seen in where students go following graduation—the number of graduates remaining in academic institutions has dropped as the opportunities in industry and hospitals continue to grow.\textsuperscript{11}

The past twenty years has seen a significant move forward in the area of health informatics in Canada and abroad. In Canada, during this period, academic institutions have developed, implemented and graduated trained health informatics professionals who have gone on to become CIOs at large hospitals.\textsuperscript{12} Canada has an internationally recognized national Electronic Health Record (EHR) strategy under the leadership of Canada Health Infoway and has made a significant investment in funding ICT projects to advance the implementation of an interoperable EHR. The adoption and utilization of technology across the continuum of care continues to advance, and the field of health informatics will continue to play a significant role in transforming our health system and in using information for improved clinical decisions and health system planning.

Health Information Management

Around 1900, the hospital became the focal point of the American health care system. In an effort to create a more regularized medical profession, the American College of Surgeons worked diligently to develop and implement standards of practice. As part of this work, surgeons and hospitals were asked to submit detailed medical records on all patients who had undergone surgical procedures.\textsuperscript{13} Neither the hospitals nor the surgeons were able to comply. At this time, medical records were the responsibility of physicians and were merely clinical notations, incomplete and sorely lacking in standardized medical vocabulary and devoid of diagnostic testing results.\textsuperscript{14} In 1918, the Hospital Standardization Program was launched by the American College of Surgeons. A major component of the program was the recognition of the importance of a complete and accurate patient medical record and the need for medical record processes and structures for filing, indexing and retrieving medical record information.\textsuperscript{15}

The work from this program led to the birth of a new discipline—medical records librarian—and in 1928, the Association of Record Librarians of North America (with both American and Canadian members) was launched. The association was successful in promoting and advancing standardized curricula to support the development of a profession for medical records librarians and by 1941, there were 10 accredited academic institutions.\textsuperscript{16} In 1942 a Canadian association was founded and is today represented by the Canadian Health Information Management Association (CHIMA).

Since 1928, the roles and functions of the health information management profession have changed from the management of medical records to the management of health information.\textsuperscript{17} The HIM professional's role evolved to include establishing standards for data recorded in the complete record for its efficient storage and retrieval and, as relevant legislation was enacted, to ensure that clinical documentation complied with legal requirements.\textsuperscript{18} In the 1970s the HIM professional’s role expanded to include interpretation of the record and translation into standardized codes for diseases/diagnoses and procedures using the International Classification of Diseases (ICD). This information continues to be collected in Canadian health care facilities and is submitted to the Canadian Institute for Health Information (CIHI) for use in case costing, population health analysis, research and policy. Within individual facilities this information assists in the measurement, monitoring and evaluation of care. Further evolution of the profession has occurred with the introduction of ICT to support electronic information capture, storage and retrieval.\textsuperscript{19}

\textsuperscript{11} Ibid.
\textsuperscript{15} Ibid.
\textsuperscript{16} Ibid.
\textsuperscript{17} Ibid.
\textsuperscript{18} Fundamentals of Health Information Management, CHIMA, CHA Press, 2009, p. 10.
\textsuperscript{19} Ibid.
Within its three domains of practice—data quality, privacy of health information and electronic health information management—HIM professionals provide leadership and expertise on a range of topics including: data collection and coding; interpretation and analysis of health data; record content and the use of information; access to health information; security and confidentiality of health information; and the release, retention and destruction of health information.20

In today’s health care environment, health information crosses departmental boundaries and focuses on “data manipulation and information management tasks, and on the provision of an extensive range of information services.”21 As the health care sector continues to mature in its utilization of computer-based technologies for health records, the focus on data analysis and interpretation to improve decision making, to advance greater efficiencies, and to drive improved system performance will continue to grow.

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21 Ibid., Source: Johns 1991, p. 59.
The eHealth Industry

The eHealth industry is a crucial element in building the foundation for a robust health system infrastructure and infostructure. eHealth will play a critical role in the development and application of systems and processes that support quality patient care through evidence-based clinical decisions and in the provision of the right information to the right person at the right time.

Those involved in eHealth need to understand both the information and communications technology (ICT) world and the health system: its context, vocabularies and ontologies, and how to use these to improve information and knowledge management. eHealth builds health infostructure capabilities by:

1. Improving access to health care services, information, and connecting clinicians;
2. Improving clinical practice through improved knowledge management; and
3. Improving health information for the care givers, patient, and public with the outcome of promoting improved.

As the health system becomes more fully e-enabled, the roles of the various players within eHealth will become even more crucial. The rate of discovery of new medical information on diseases and clinical interventions makes it very difficult for clinicians to keep up to date. This is coupled with the massive amount of information that will reside in patient health records. The three groups working within eHealth—health informatics professionals, health information management professionals and technical specialists—will play a crucial function in providing context and tools to organize all of this information and in integrating this information into health system tools that allow clinicians to use this information. We now turn to more detailed discussions of each of these groups.

Health Informatics

There are numerous definitions of the health informatics (HI) profession, including the following three:

**COACH (Canadian Organization for Advancement of Computers in Health):**

“Health informatics (HI) is the intersection of clinical, IM/IT and management practices to achieve better health...Health Informatics Professionals develop and deploy information and systems solutions, drawing on expert knowledge from fields such as computer science, information management, cognitive science, communications, epidemiology, management sciences and health sciences.”

**Waterloo Institute for Health Informatics Research:**

“HI is the discipline that explores how information management, and information and communications technologies (ICT) can support and advance health and the health system. HI is intrinsically trans-disciplinary, intersecting areas such as medicine, computer science, engineering, and the physical and social sciences.”

**University of Minnesota:**

“Health informatics is an interdisciplinary field of scholarship and activity that applies computer, information, and cognitive sciences to enhance the delivery of healthcare, support biomedical research, and foster education of health professionals and the public. It is at the crossroads where data, information, and knowledge meet be they focused on a gene, cell, organ, individual or group.”

The common theme among these and other definitions is the interdisciplinary nature of the profession; the consistency between the numerous definitions also demonstrates the extent to which the profession has matured and is now well understood by all who are involved.

Health informatics professionals participate in a range of activities around health information concepts, methods, and tools that support clinical care delivery, research, administration and education. As the preceding definitions support, this group possess an array of competencies from clinical, IM/IT and management practice to support positive health outcomes.

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24 www.coachorg.com/health_informatics/about_health_informatics.htm
25 (http://hi.uwaterloo.ca/hi/Hiinfo.htm)
26 http://www.hinf.umn.edu/
Health Information Management

As with health informatics, there are a number of definitions describing the health information management profession, as follows:

**Canadian Health Information Management Association (CHIMA):**
“Health information management professionals provide leadership in all aspects of clinical information management at both the micro and macro levels. At the micro (or individual record level) HIM professionals support the collection, use, access and disclosure, to the retention and destruction of health information regardless of format. At the macro (or aggregate data level), HIM professionals deal with the information through the health system, analyze statistics, manage complex information systems including registries and work with public, private and key stakeholders in understanding and using health data to improve the health of Canadians.” 27

**American Health Information Management Association:**
“Health information management professionals manage healthcare data and information resources. The profession encompasses services in planning, collecting, aggregating, analyzing, and disseminating individual patient and aggregate clinical data. It serves the healthcare industry including: patient care organizations, payers, research and policy agencies, and other healthcare-related industries.” 28

As with the definitions for health informatics, the preceding two definitions for health information management professionals highlight the broad scope of competencies required in managing all aspects of health information from an individual patient record up to a health system view.

Some of the competencies of health information management professionals would include such functions as health records management, coding and abstracting, ensuring data quality, privacy and release of health information, access and authorization for use of health information, aggregating and analyzing the health data and information contained in patient records and health databases.

**Technical Specialists**

Technical specialists require strong information and communication technology competencies, and should also have some knowledge of the health care industry. These professionals are responsible for managing the healthcare organization’s ICT systems and for ensuring that these systems are available, used, maintained and upgraded as required. Some of the roles fulfilled by this group include database administration, application development and network and communications infrastructure.

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27 www.echima.ca/about-us
28 www.ahima.org/infocenter/definitions/him_professional_definition.asp
Key Stakeholder Relationships

There are numerous stakeholders in the eHealth industry, and each one plays an important role in advancing the eHealth agenda. They are as follows:

- Academic institutions;
- Health care provider institutions;
- Public health agencies;
- Industry associations;
- Clinicians;
- Consumers;
- Technology vendors;
- Canada Health Infoway;
- Canadian Institute for Health Information (CIHI).

Academic Institutions

Universities and community colleges provide the formal education and training programs for health informatics and health information management professionals, as well as for the other technical specialists like database administrators and application programmers. In terms of advancing the eHealth agenda, academic institutions play a key role in helping to define curricula that support the evolution of the knowledge and skills required in the health care market.

The educational system needs to continually engage with end users and key influencers to ensure that the programs offered today will meet the skills and knowledge demands of tomorrow. Additionally, academia plays a significant function in research and development (R & D) for all areas of the eHealth profession. Key areas of R & D in health informatics include:

1. Signal processing—focused on the understanding and interpretation of diagnostic signals from such instruments as electroencephalograms (EEG), electrocardiograms (ECG), and ultrasound (US) devices.

2. Database development—both from the perspective of patient information and literature databases. For patient databases, the information is highly structured and work needs to continue on building expert systems that can utilize this patient information for improved clinical decision making and for population outcome studies.

3. Clinical decision support. A challenge in building expert knowledge systems is to "capture the expertise of someone who performs an intellectual task well in the form of a model that can be executed by a computer system." This type of tool needs to be available for educational purposes, to assist in knowledge enhancement in decision making, and to support the monitoring of quality.

4. Modeling and simulation—to continue to develop and test and quantitatively interpret the clinical systems and disease processes in order to continue to advance the clinical knowledge base and understanding of appropriate and effective clinical interventions.

Health Care Provider Organizations

Health care provider organizations play a dual role in the advancement of eHealth. They are a source of information on the types of competencies required as they implement more advanced clinical systems to realize the potential of an interoperable Electronic Health Record (HER). While most hospitals in Canada have implemented core clinical applications (e.g. ADT, RIS, LIS, etc), the advanced clinical applications like CPOE and eMAR systems are in the early stages of implementation. Some of the competencies required include data definitions, data integration, and interoperability between the various components of an EHR.

Health care provider organizations also play a role in informal training of health informatics and health information management professionals. Prior to the creation of formal academic programs for health information management in the 1970s, HIM professionals developed their competencies through on-the-job training. As programs and training initiatives were developed in classroom and clinical settings within CHIMA-accredited health care facilities, these individuals could enhance and refine their skills to assist in staying current with their position requirements. There are as yet no accredited programs for health informatics professionals.

As part of the research for this paper, hospitals were contacted with respect to some of the HR initiatives established to attract and retain qualified personnel. The organizations acknowledged a general lack of qualified HIT and HIM professionals and have implemented a number of initiatives to improve their HR capacity. Some of these include:

30 Ibid.
31 eHealth in Canada: Building Momentum. Branham Group Inc. 2007.
• Mentoring and coaching programs for knowledge transfer;
• Formalized talent management programs;
• Internships with local academic institutions;
• New-hire “buddy” system.

These types of initiatives create a body of knowledge that augments and supports the more formalized academic programs.

Public Health Agencies

Public health agencies in Canada deliver a wide variety of health promotion programs, and monitor chronic disease and infectious disease outbreaks. In addition, these agencies respond to public emergencies and work with their constituencies to provide system planning for the support of a strong health system. A 2003 CIHR report on the future of a public health system noted that “Public health is the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society.”32 The report specified that the functions of this system should include:

• Population health assessment;
• Health surveillance;
• Health promotion;
• Disease and injury prevention;
• Health protection.33

Experts in public health systems can contribute to the overall understanding of our health system and how it is changing. In order to carry out this mandate, they need a large amount of aggregate data on the health system. The competencies required to supply this data include, but are not limited to, statistical analysis, data modeling and aggregation, biomedical sciences, and health information sciences.

Industry and Professional Associations

Industry and professional associations play a strong advocacy role in advancing their profession. In Canada, COACH and CHIMA represent the health informatics professionals and the health information management professionals respectively. Both of these organizations have and continue to be the unifying voices for their members in educating and promoting the ongoing development of their respective professions.

There are numerous organizations in other countries with similar mandates. Developing working partnerships and engaging in joint activities with these international organizations will support the development of competencies and standards of practice that are cohesive and unified.

Various eHealth associations and technology associations such as Ontario Hospital Association (OHA) and ITAC Health also have a vested interest in advancing the eHealth agenda in Canada. These organizations need to be part of the development of a national eHealth strategic direction to ensure that there is full representation of all interested stakeholders.

Industry associations provide venues to advance the knowledge of health informatics, health information management, technology specialists and the health system in general. Additionally, given their roles as industry representatives, these associations can contribute to the overall body of knowledge and the direction for formal educational programs.

Clinicians

The term clinician includes physicians, nurses, and other health professionals who are involved with the delivery of health services. Within this varied group are individuals who have a good understanding of technology and use technology to improve their overall clinical practice. As the health informatics industry has matured, specialized sub-segments such as clinical informatics and nursing informatics have been developed to respond to discipline-specific information needs.

Consumers

Today’s health consumers are more knowledgeable about their health, and many use the Internet as a research tool. Pew Internet, in its 2009 report noted that 75% of all adults use the Internet to obtain health information.34 The questions that arise are: how trustworthy are these health information sites to provide accurate health information, and how well organized and easy to use are the search engines? Health informatics and health information management professionals have the competencies to support and develop robust search tools to support the health

33 Ibid.
They can also act as consumer advocates with respect to Personal Health Records (PHRs) by ensuring the privacy and confidentiality of health information.

**Technology Vendors**

The technology vendor community contributes to the eHealth profession through its knowledge and application of ICT systems. A key issue in realizing the promise of an interoperable EHR is the lack of consistency and interpretation in the implementation of health care technology standards like HL7 and SNOMED. Technology vendors need to work closely with the HI and HIM professionals and clinical personnel to develop application and information systems that address the specific needs of the organization and of the health system in general. The history of health informatics offers a valuable lesson: the success of the MUMPS programming system was due to the collaboration throughout the project between the system designers and the end users. ICT system development for health care cannot be done in isolation.

**Canada Health Infoway**

Since its inception in 2000, Canada Health Infoway (Infoway) has had the mandate to invest in and support the development of a pan-Canadian EHR infrastructure to accelerate the use of electronic health records in Canada. The internationally recognized EHR blueprint architecture establishes the framework for the development and deployment of ICT to support an EHR system. Infoway works with various industry stakeholders—technology vendors, provincial eHealth agencies, industry associations and health care organizations—to provide leadership and investment in eHealth projects that support its objective.

**Canadian Institute for Health Information (CIHI)**

CIHI is the national organization that collects, analyzes and disseminates information on Canada’s health care system. The data and reports from CIHI contribute to the development of strong health policies and programs, raise the level of awareness of the factors that promote health, and provide information on the delivery of health services in Canada.

CIHI promotes the development of health information management standards such as coding classification, MIS standards, data dictionary and infrastructure standards. This is a crucial role in ensuring that comparisons between and/or within health jurisdictions are consistent and meaningful for such activities as health system planning and program development.

**Key areas where eHealth professionals support the health care industry in achieving improved efficiencies and effectiveness are**:

1. **Electronic health records/Electronic patient records/electronic medical records (EHR/EPR/EMR)** – ensuring these systems have effective and adequate knowledge resources, decision support, and are accessible anytime by health care providers. Some of the elements in EHRs include consistent and structured approach for storing health information and data, order entry/management, electronic communication and connectivity, and administrative support and reporting. What about drug/medication information, labs, diagnostic imaging and all sorts of other information which documents the patient’s care at both a clinical and hospital setting.

2. **Personal health records (PHR)** – to support patient self management and active participation in one’s health care. Features in a PHR that support this aim include access to one’s EHR, ability to record information into a PHR, secure email communication with providers, and access to reliable health information. I do agree that this should be a component of the role- but to date has certainly not been a “key area” PHR – SUBCATEGORY OF EHR

Health information infrastructure to support health services, consumer health, quality, research, and education through secure information networks that support information exchange at individual and population levels. Is this the decision support components?

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35 Health Informatics: Challenges and Opportunities for Health Policy. Judy Ozbolt. Institute of Medicine of the National Academies.
The Future of eHealth in Canada

In 2005, Branham Group Inc. asked leading eHealth thought leaders and key decision makers to dust off their “crystal ball” and offer their perspective on how eHealth would be used to deliver health care services in 2015. By combining these various predictions, a composite picture emerges in which:

- The existing “silos” of information and expertise no longer exist.
- “Patients” have become “consumers” of health care services and are taking a more active role in their care. “Patient self-service” emerges as a viable option for routine tasks such as booking appointments or monitoring certain aspects of a chronic condition.
- eHealth technologies are in use across the continuum of care and are an integral, largely “invisible” component in the delivery of nearly all health care services.
- Health care providers make extensive use of mobile devices to access the information they need, when they need it, wherever they might be located.
- Clinicians are shifting from a mindset of having to remember everything to routinely consulting handheld devices and on-line applications to order tests, review test results, refine a diagnosis, select the most appropriate care plan, schedule therapy and prescribe medication.
- Health care providers no longer need to be in the same room as the person they are treating in order to make a diagnosis or even deliver many aspects of care.

The year in which these predictions were made held obvious challenges, such as funding shortages, slow adoption of eHealth applications by clinicians, and a lack of skilled human resources. With these challenges still present in the Canadian health care environment today, it has been difficult to achieve the promise of health system reform. To realize true cost savings and improved clinical outcomes, clinicians must be able to leverage these tools independently, with the knowledge, training, and resources to be effective.

IT Installations in Acute Care

Today, each province is working toward the implementation of a number of technologies and applications designed to improve patient care, access to information, and clinical outcomes. While IT personnel, including database administrators, application developers, and other technical professionals can facilitate the operation and functionality of the systems, it is clinical personnel who will ultimately be responsible for their appropriate use and direct outcomes. Relevant technologies, specifically intended for physician use include:

- Clinical and Related Administrative Systems. More than 579 Canadian hospitals have digitized most aspects of the core clinical and administrative processes. Core clinical systems include Laboratory and Pharmacy systems, PACS, Radiology Information Systems, and Order Communications.
- Laboratory. In 2009, over 600 Canadian hospitals claim to have some type of Laboratory Information System installed.
- Diagnostic Imaging (DI). Nearly all hospitals with over 100 beds across the country have an installation of Radiology Information System and many also have PACS.

IT Installations in Regional Care

Starting in 1989 in Québec, provinces across Canada regionalized health care services delivery and, through this process, many of them have created Regional Health Authorities. Since that time, every province has developed a regionalization strategy, though each one has taken a somewhat different approach to this task. Projects common among regions and provinces include:

- The implementation of a secure provincial EHR;
- Supporting the use of EMRs by physicians;
- Expanding telehealth services to improve access to care in rural areas; and
- Expanding public access to health information and health services through web-based applications.

The eHealth situation in individual provinces is as follows.
British Columbia
BC eHealth initiatives are governed by the Health Sector IM/IT division of the Ministry of Health Services. Each year, the HSMIT releases the BC Information Resource Management Plan, which highlights the initiatives for eHealth for that year, as well as the division’s operating budget for eHealth projects. In 2008/09 the HSIMT division, including the Vital Statistics Agency, has an approximate operating budget of $95.58 million and a projected staff of 224 FTEs.

Alberta
Alberta is one of the most advanced provinces in terms of its progress toward a complete provincial EHR. It is anticipated that by March 2009 Alberta will have reached deployed 100 per cent of its client registry, provider registry, diagnostic imaging, drug and lab systems. The final component, the interoperable EHR (iEHR) is expected to be in its final deployment stages at that time. A public health surveillance solution is currently being implemented in the province, which will enable the province to monitor the participation rates for vaccination programs, view vaccine inventories, and minimize the spread of disease should an outbreak be detected. Alberta has positioned itself to become the first province to offer its citizens access to a limited personal health record (PHR).

Saskatchewan
Saskatchewan has taken a bottom-up approach to the EHR system, beginning with the EPR in hospitals that share common standards. From there, the interoperable components work together to create the larger regional EHR systems, and so forth. The province has completed the Shared Client Index, also known as the client registry, as well as the provider registry which is connected with regional systems.

Current eHealth Initiatives include the development of the iEHR/Lab Results Repository and the Pharmaceutical Information Program (PIP). Additional emphasis is being placed on EHR systems, such as Radiology Information Systems, Picture Archiving and Communications Systems, and all areas of Diagnostic Imaging. Finally, the province is working toward finalizing the Public Health Surveillance component of the interoperable EHR.

Manitoba
Manitoba is working on a number of current projects, including the Emergency Department Information System (EDIS), Hospital Information System Project (HISP), Provincial HISP/Long Term Care Planning, Interoperable Electronic Health Record (iEHR), Provincial Client Registry, Provincial Lab Information System, Provincial Radiology Information System/Picture Archiving and Communications Systems (RIS/PACS), Utilization Management System (UM System). The province has recently completed work on the following projects:

- Clinical Supply Chain Information System (CSCIS);
- Lab Information System (LIS) – Winnipeg Region;
- Primary Data Centre (PDC);
- Security Planning;
- Sterile Instrument Tracking System (SITS);
- Surgical Information Management System (SIMS).

Ontario
eHealth Ontario is an agency formed by merging the Smart Systems for Health Agency (SSHA) and the eHealth Program of the Ontario Ministry of Health. The agency has been approved funding to deliver the strategy over the next three years to a total of $2.133 billion.

Ontario has adopted the Canada Health Infoway reference blueprint, with multiple repositories for the fundamental core EHR infrastructure. Ontario is looking to leverage, where applicable, existing eHealth solutions and successes across local health integration networks (LHINs) for province-wide implementation. The province has recently issued a Request for Expressions of Interest for the provincial Diabetes Registry.

The EMPI deployed in support of the WTIS/EMPI project will serve a Provincial Client Registry and support a wide variety of applications over time. Work has started on deploying the Provincial Client Registry. In addition, a consortium, led by Capgemini and including HP, Microsoft, Courtyard Group and others, has worked on implementing the Ontario Laboratory Information System (OLIS). Ontario is lagging behind other provinces in terms of implementing EHR and EMR systems. In 2008, many were still in planning phases.

Quebec
In June 2008, part of the population in the ASSS du Capitale-Nationale (National Capital Health and Social Services Agency) became the first group to implement the Québec Electronic Health Record (EHR) as part of a pilot project. The Québec EHR enables physicians, nurses and pharmacists to share relevant information about their

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38 Canada Health Infoway Business Plan 2008-09.
39 Ontario’s eHealth Strategy. eHealth Ontario.
patients’ health. Beginning in the winter of 2009, additional patients and clinicians in the region will join the pilot project. The project is forecasted to be rolled out provincially in 2011.

Québec is on track to have most of the components of the provincial EHR completed slightly past the deadline of early 2010. The province will require additional time, with the lab and iEHR components being the least developed. Currently, there are 23 projects in progress contributing to Québec’s network of EHR systems for which Canada Health Infoway has contributed investments.

**New Brunswick**

“One Patient, One Record” is New Brunswick’s simple yet effective summary of its vision for building an Electronic Health Record system that supports the concept of a health system that is truly centred on the patient. When this vision is realized, clinically relevant data will be consolidated as needed to create a health record that can be presented and viewed on demand by health care providers across the continuum of care. The One Patient, One Record system will be implemented over three years, with a budget of $35.9M, of which New Brunswick will contribute $17.7M and Infoway $18.2M. Nearly all components of the provincial EHR are nearing completion.

**Nova Scotia**

Nova Scotia’s eHealth vision has not changed substantially since it was first articulated several years ago. This vision is based on the fundamental premise that patient-focused, community-based integrated services delivery requires information that follows the patient and includes three core components:

1. Establish a person-based, portable Electronic Health Record.
2. Create a health information management system that will provide live input and extraction of standardized and complete health information across the spectrum of health and wellness services and indicators.
3. Protect individual privacy and confidentiality within the context of a well-managed health care system.

While the province has completed the Diagnostic Imaging components, development of the remaining EHR components is lagging behind some provinces.

**Prince Edward Island**

The PEI Common Client Registry (CCR) is a fully implemented system that houses a central registry of identification, contact, demographic, eligibility, and encounter information for the clients/patients of the health system. Starting with deployment of a province-wide RIS in early 2002, the former Department of Health and Social Services implemented a province-wide diagnostic imaging system that supports all modalities (except mammography) over a two-year period. Notably, the province has also established a province-wide PACS implementation, and a Drug Repository.

**Newfoundland and Labrador**

With relatively little fanfare, Newfoundland and Labrador (NL) has long used technology to overcome barriers and challenges. From its early use of telehealth, to the implementation of Canada’s first provincial client registry in 2001, NL is embracing eHealth and is putting in place the core elements of a provincial electronic health record system. With strong leadership from the NL Centre for Health Information (NLCHI), a provincial agenda for eHealth has been developed and all stakeholders are working together to achieve this common vision. The result is fewer independent local and regional initiatives.

The following chart from Canada Health Infoway depicts the progress of EHR adoption in each province.
Regional Installations over Time

In 2005, many of the clinical and departmental systems in nearly all provinces were in the very early stages of development. A physician in 2005 would have needed to be aware of the following core systems to varying levels of competency:

Care Management and Clinical Decision Support. Most provinces were in the process of procuring charting, order entry, and results reporting applications. British Columbia was the exception, with nearly all modules in place.

Finance & Administration. This category covers a wide variety of tools including HR, Payroll, Accounts Receivable, Accounts Payable and Patient registration (ADT), and includes a large number of vendors for each unique module. Ontario in 2005 had thirty unique vendors with systems implemented in this category. Staff would have needed to be able to navigate each of those systems. Today, the number of vendors has been reduced as a result of a number of factors—typically financial. As this class of systems was one of the earliest to be introduced, every hospital has some version of these products in use, with a number of back-office systems integrated with the clinical systems.

Diagnostic Imaging (DI). Tremendous progress has been achieved in terms of widespread usage of Diagnostic Imaging tools in the last five years. Many hospitals were working with PACS, and some had developed provincial standards. Some provinces had established preferred vendor agreements, such as GE in Newfoundland and Labrador, AGFA in Nova Scotia and PEI. The Prairie Provinces were still in the planning phases for Diagnostic Imaging, while BC had a great number of PACS and RIS installations. Today, nearly all hospitals over 100 beds boast some form of PACS and Radiology Information System. There are also nine additional radiology systems, including angiography, ultrasound, and tomography, among others; these are modalities which may well be on the same RIS as the others. The combination of systems installed is unique to each hospital and the services it offers.

Laboratory and Pharmacy. With the exception of Manitoba, many RHAs and LHINs have reported using Laboratory and Pharmacy Software for many years. Vendors in 2005 were fairly limited to Meditech, MediSolution, and MediLab. These systems are still prevalent today.

Surgery and Emergency Room Department Systems. For most provinces in 2005, there was insufficient data to offer insight into the products used to automate some aspect of surgery or emergency room administration. PEI was the only province at the time working on deploying these modules using Cerner’s system, and this would not be realized for two more years. There are now five departmental systems, with additions such as cardiology, respiratory and intensive care. Training will no longer need to be broadly based. Specialists can be trained in only the applications that pertain to their specific needs, and on a basic level in those systems that support their work. Today, nearly all hospitals have independent emergency department tracking boards, and operating room management systems.

Unique Identity, Registry & Directories. Planning for a provider registry in the Prairie Provinces began in 2001 with the Western EHR Collaborative in Alberta. Implementation of the provincial provider registry was set for 2003. All western provinces now boast fully implemented provider registry systems. Atlantic Provinces had developed active Client Registries, and were leveraging Enterprise Master Patient Index (EMPI) software. Today provinces are working to develop interactive client registries for diabetes, cancer, and chronic disease, and are developing provider registries for a number of unique services.

Portals. No portal initiatives were identified in 2005 in any provinces. Many provinces are working to develop patient portals for scheduling, prescription management, and self-care; Alberta has already implemented such a portal. There will be a need for significant training in dealing with informed and actively involved patients. In addition, eHealth professionals will need to be trained to leverage these tools to provide improved patient care and access to information.

Integration. In 2005, most hospitals had integrated clinical with administrative systems on a fundamental level. Today, nearly all systems within an institution work together to provide a complete patient profile.

There has been a shift in Ontario, as in most provinces, to reduce the number of preferred vendors for a single system. As with the EMR vendor certification programs in primary care, hospitals and regions now tend to go with a single vendor for pilot projects, rolling successful projects out to other areas. RFPs are often released with multiple sites in mind. This makes user training more efficient, as there will be increased consistency across applications as fewer

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41 WHIC Provider Registry Final Report, Health Canada.
vendors are selected. In addition, training can be conducted on a larger scale as more institutions are using the same vendors.

Furthermore, systems have become more specialized, with the emergence of advanced clinical systems to support the provincial EHR. There are significantly more applications available today than were on the 2005 list of widely adopted applications. (See Appendix 1)

Regional Installations of Tomorrow

Just as the application of IT in specialty areas has increased tremendously over the past four years, emerging technologies will continue to be implemented across the country well into the future. Already the use of portable devices has become a best practice in some hospitals as well as in Emergency Medical Services (EMS) in the field. In addition to understanding the types of information required, those involved in eHealth will need to be able to leverage the various media through which technology is being implemented, online, desktop, laptop, mobile devices, and digital video, among others.

With the introduction of new technologies, it is now possible to view patient information remotely and on mobile devices. Paramedics are able to retrieve the information from within the ambulance, and doctors are able to offer input on current cases while away from the hospital. While the technology is there, it is equally important to ensure that security is established such that no footprint is left on the device, and that all relevant information comes off the device when the viewing is complete.

Security on EMR systems is fairly granular. System administrators are able to define access and privileges according to the varying roles of office staff. Individual sign-on processes should be established.

Infoway conducted a privacy impact assessment (PIA) on the conceptual EHRS Blueprint in an effort to ensure privacy is taken into consideration in the development of the pan-Canadian iEHR. The PIA had four main objectives:

1. Describe the high-level types and flows of personal health information in the EHR;
2. Analyze the EHRs blueprint against the principles of the CSA model code;
3. Identify privacy risks; and
4. Identify mechanisms for enhancing privacy protection.

Sharing of personally identifiable, de-identified, anonymous or aggregate health information is governed by each contact point of the Canadian legal landscape:

- Charter of Rights and Freedoms, Sections 7, 8 and 15.
- General Private Sector Privacy Legislation—Quebec, Alberta, British Columbia
- Health Information Legislation—Manitoba, Saskatchewan, Alberta, Ontario
- Federal: Statistics Act, Privacy Act, Emergencies Act, Quarantine Act, Department of Health Act, Personal Information Protection and Electronic Documents Act (PIPEDA)

It is not just a matter of leveraging the technology to read charts and images, or to use the technology to perform a task. Health care IT of tomorrow will require those involved in eHealth to go beyond simply using the information generated by the technology, to share it between institutions and across the continuum of care. This will require an understanding of the complete health care landscape and the availability of tools and processes at their disposal, as well as the legalities in place to protect an individual’s right to privacy. Public Health Surveillance systems and Green IT are just two of the new ideas and projects on the horizon. Flexibility and openness to new methods will be increasingly important characteristics for eHealth personnel.

IT Installations in Primary Care Settings

In primary care settings, the term Electronic Medical Record (EMR) is used to depict the localized and provider-centric store of patient data. There are two groups of products that address the Canadian EMR market:

Practice Management software. These are solutions that automate the administrative functions of a physician’s office/clinic/practice. This software typically automates

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43 Legal Issues in Public Health Surveillance and Information Sharing, Elaine Gibson, Health Law Institute, Dalhousie University.
various administrative tasks including task lists, messaging, doctor/patient scheduling, patient registration, reference letter template, billing, accounts receivable and medical supplies inventory control. Practice Management software also handles the claims submitted to public provincial medical plans such as Ontario Health Insurance Plan (OHIP), and to private insurance plans.

**EMR clinical software.** These are products used to create a patient-specific electronic medical record and automate the clinical functions of a physician office/clinic/practice. Product features typically include a data repository, an electronic chart, clinical note taking, cumulative patient profile, electronic prescription writing with/without a drug database, integrated lab results and reporting, electronic diagnostic imaging requisitions, clinical patient alerts and recall management, a clinical reporting tool, attaching/scanning images or documents, and HL7 interfaces for exchanging clinical data with third-party applications. Some EMR products include a patient portal for user self-service in terms of scheduling, medical record viewing or current lab test results retrieval.

According to CanadianEMR, the top ten highest rated physician EMR systems are:

- Accuro EMR by Optimed
- JonokeMed
- MOIS
- CLINICARE EliteCare
- P&P Clinic Information System
- PS Suite
- HSpactice
- Wolf Medical Suite
- OSLER Practice Manager
- Healthquest

The Canadian EMR market is moving beyond the early adopter stage and is now ready for broad adoption of EMR systems. Estimates on EMR market penetration vary widely in the Canadian marketplace. The Commonwealth Fund International estimates that EMR usage, at 23%, puts Canada at the lowest level of EMR adoption amongst the countries surveyed. Branham Group Inc. estimates that less than 20% of Canadian physicians have implemented both Practice Management and EMR clinical functionality, and hence there is considerable market opportunity.

Several provinces, notably Alberta (POSP), Ontario (OntarioMD), Nova Scotia (PHIM), and most recently British Columbia (PITO), have established programs to provide financial assistance to physicians to encourage the implementation of certified EMR products. The process for EMR certification varies from province to province.

**The EMR and Clinical Informatics**

Approximately 49% of Canadian physicians are specialists. Despite this fact, very little effort has been devoted to understanding the information requirements of specialists in relation to Electronic Medical Records. When evaluating EMR systems for specialist use, there has been a tendency to focus on a number of functional requirements, including management of the referral process, generation of referral letters and consult reports, tools to create forms and templates for clinical documentation and drawing and image management tools to attach and annotate images within clinical documents. There is a need for software application developers to address additional issues such as the relationship to university and teaching roles, relationship with the hospital or regional health authority and the need to capture data in an EMR that is generated by medical devices or instruments.

Physicians will also need training in IT to make proper use of these technologies, and to work together with hospitals to retrieve results and transcribe notes, among other needs.

**Trends and Their Impact**

**eHealth is No Longer a Question of “Why?” but of “How?”**

This broadly based trend is based on the recognition that every province is and has been engaged in eHealth activities, having established measurable objectives and outcomes. This trend is perhaps the most significant as it signals that eHealth has reached a tipping point. Although there are certainly many challenges to overcome and risks to be addressed, there is a growing consensus that eHealth can facilitate the transformation of health care services delivery in ways not previously possible. It is imperative that we have adequately trained and competent personnel to

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44 Canadian EMR. [www.canadianEMR.ca](http://www.canadianEMR.ca)

45 2006 Commonwealth Fund International Health Policy Survey of Primary Care Physicians.
support this transformation. Given the current staffing shortages, and the rate of adoption of these systems, training will need to be targeted to application specialty areas and the types of information required for system performance and clinical effectiveness.

**Consolidation of eHealth Services.**

Regionalization is effectively reducing the number of organizations making eHealth spending decisions. Canadian demographics are such that many Regional Health Authorities are still too small to tackle major eHealth initiatives. The smaller regional authorities have been either voluntarily working together or will have centralized services provided by provincial ministries of health. Prior to the creation of the Alberta Health Services Board, the seven “rural” Regional Health Authorities worked together as the Regional Shared Health Information Program (RSHIP, since disbanded). The centralized services approach has resulted in the creation of bodies such as Manitoba eHealth, HICS in Saskatchewan, NShIS in Nova Scotia, and eHealth Ontario.

The major impact of this trend is that policy makers have to deal with fewer but larger and more complex governance structures that are making decisions about eHealth plans and priorities. Clinicians can no longer be solely aware of the functions within their own entity or organization, but need to be trained in eHealth across Canada.

**Horizontal Integration.**

Within any given health jurisdiction, there are many disparate health information systems. An integrated and interoperable EHR will require a consistent approach to interpretation and implementation standards. Canada Health Infoway has supported and advanced a common logical information model that is independent of individual EHR systems (EMR, EPR, etc.). This means that regardless of the vendor or individual system in place at the various points of service, the various systems should be able to exchange information in a seamless fashion.

The Health Level 7 (HL7) EHR System Functional Model and Standard is a protocol for supporting the exchange of structured and encoded health care information within an EHR system while maintaining the integrity of the data and its meaning.

France, Sweden, the Netherlands and other countries are attempting to standardize EHRs either through their own national standards or by using a variation of the HL7 standard so that interoperability can also occur between their countries. Denmark, Norway and Sweden already collaborate in the exchange of health information between hospitals, physicians, pharmacies and laboratories.

The impact of this trend is a vastly increased focus on the continuum of care and on integrating information across the continuum of care. Care providers will be expected to offer solutions that transcend the artificial boundaries imposed by the old “silos.”

**Alignment of Provincial eHealth Agendas.**

Closely related to the two previously mentioned Canadian eHealth market trends, the most significant impact of this trend is a potential overall reduction in the number of different solutions that will be deployed to address the same requirement. By funding projects that can be reused in multiple jurisdictions, Infoway is creating an opportunity in which provinces and regional health authorities can opt to directly procure a solution proven to work in another jurisdiction.

An example of how alignment has been implemented is in Wales. Through the NHS Wales (National Health Service Wales), funding is highly leveraged through the nationally agreed concept of “common by design.” This enables incremental development of national EHR capabilities and encourages local investments for the national benefit. By design, the separate components will converge into a national solution that will be deployed nationally.

The impact here is that training and resources become portable, creating an opening for champions to pass on best practices. This should be leveraged wherever possible to improve the training and resources rather than recreate what already exists. Health Informatics personnel and others involved in eHealth will be required to understand these resources, and translate them for usability within a unique environment.

**Increased Health Care Provider Demand for eHealth Applications.**

Although a positive trend in many regards, increased health care provider demand will put a strain on already scarce financial and human resources. Any large-scale transformational IT project, like an interoperable EHR, has a significant change management component. Even with modelling workflows after clinical processes, the way work is completed fundamentally changes. The shift from a paper world to an electronic documentation environment is huge. From the outset, any organization needs to develop change management solutions that are aligned with the needs of the organization and the patients they serve.
management strategies to complement and align with the information technology implementation.

Canada Health Infoway, as part of its mandate, works with provincial ministries of health, regional health authorities and LHINs, health care organizations, and vendors to facilitate, through funding and strategic initiatives, the implementation of electronic health records. Executive buy-in and nation-wide cooperation with the Infoway team ensures the trickle down effect will take place to hasten adoption across Canada.

It is also critical to have support at the top so that an overall direction and vision can be established. Finally, there is symbolic value in having the support of senior executives. Employees look to management to act in the best interest of the organization and provide guidance.47

As many hospitals are adopting new technologies without the resources to manage them, there will be a significant need for personnel to identify transition requirements and processes to effectively manage change.

**Patient at the Centre of Care.**

With health care services increasingly delivered by multiple organizations across the continuum of care, the need to re-orient the health system around the patient has become a priority in many jurisdictions. This shift from provider-focus to patient-focus is driving many eHealth agendas and will be facilitated by regional and provincial electronic health records.

New Brunswick has taken steps towards realizing its vision of “One Person, One Record.” With core administrative, financial and clinical systems in place and a forum for coordinating the work of the various stakeholders (the eHealth Steering Committee), New Brunswick is leveraging the work of other jurisdictions to create a provincial Electronic Health Record system.

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New Brunswick’s vision for building an Electronic Health Record system that supports the concept of a health system that is truly centred on the patient is depicted in the graphic on the left. When this vision is realized, clinically relevant data will be consolidated as needed to create a health record that can be presented and viewed on demand by health care providers across the continuum of care.

Providers will not only need to learn to leverage the technologies available to them in hospital, but will also need to learn to work with patients who have been managing their own health electronically and be familiar with those tools and resources. Patient self-care will ease the burden on the health care system.

**Consumerism.**

While consumers have been using the Internet for years to research health care options and to seek second opinions on physician advice, it is only relatively recently that health care organizations have begun to explore how the Internet can be used to engage patients. Consumer eHealth trends include both consumer empowerment and patient engagement.

Consumer empowerment trends include: 48

- Consumers are becoming increasingly empowered and responsible for their health care decisions;
- Consumers are exercising this power by going online for additional information in droves, and in many cases challenging their physician;
- In the past two years, consumers have become much more satisfied with the health information they find online, while becoming less satisfied with the information they get from their physician;
- Consumers are becoming very comfortable with researching health information online—perhaps too comfortable. Nearly half of the consumers researching health information online are almost exclusively reliant on search engines to find that information.

Furthermore, in assessing the plans and priorities of Canadian health care organizations for the 2006 eHealth in Canada study, Branham Group Inc. found that patient engagement had become a strategic priority for an increasing number of Canadian health care organizations. More than half (9 of 14) of Ontario’s new LHINs, for example, have identified patient engagement as a strategic priority in their eHealth plans, either at the LHIN level or at a major health care institution within the LHIN.

Gunther Eysenbach has proposed the inevitable emergence of a new branch of health informatics resulting from the emergence of consumerism in eHealth:

“Consumer health informatics is the branch of medical informatics that analyses consumers’ needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumers’ preferences into medical information systems.” 49

**Canada Health Infoway Investments in EHRs**

Canada Health Infoway has made significant contributions to eHealth initiatives across the country, through collaboration, funding and leadership. Infoway has developed an EHR systems architecture, which forms the basis for significant advancement in technology use across the country. According to the Canada Health Infoway 3 of 13 provincial and territorial jurisdictions will have the required fully interoperable EHR infrastructure in place by the end of 201050. Alberta, Prince Edward Island, and the Northwest Territories are anticipated to have all the required elements of the EHR infrastructure in place by 2010. Implementation in British Columbia and Quebec is forecast to extend into 2010. By this time, in these jurisdictions, a provider should be able to retrieve a patient’s health record within the region. The complete record contains historical drug, laboratory, diagnostic imaging, some hospital clinical reports, and immunization data regardless of where it originated51. Combined, these five jurisdictions represent 47 per cent of the Canadian population.

Ontario, Newfoundland, Manitoba, and Saskatchewan require more time and funding to complete implementation of the infrastructure. By 2010, these provinces should have a number of core systems, including registries and diagnostic imaging, in place. New Brunswick, Nova Scotia, the Yukon, and Nunavut require a significant allotment of time and resources to develop and implement the infrastructure 52.

Health Informatics professionals will need to understand the Infoway approach to Electronic Health Records and work with Infoway to develop processes and efficient systems into the future.

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48 2007 Annual Cybercitizen® Health Report, Manhattan Research
49 Consumer health informatics, Gunther Eysenbach, University of Heidelberg, Germany
51 Ibid.
52 Ibid.
Secondary Data Use, Planning and Administration

The ability to conduct health research to improve health and health care may largely depend on significant volumes of readily accessible, existing health data. This data set could include information derived from personal interviews, results of laboratory tests, physician, hospital and laboratory records, birth and death certificates, billing claims, vital statistics, age, and socio-economic status. These data points were originally collected for a different purpose, such as medical testing or annual physical examinations, and are thus called secondary use data. Possible secondary uses of data are not always anticipated during initial collection (at the hospital or physician’s office) so specific consent may not have been obtained at the time of collection. In such cases, the patient must again be contacted for consent to the secondary uses. Health care data is particularly relevant for planning and analysis of delivery programs and initiatives, as well as for national reporting purposes.

With the prevalence of electronic data capture and increased ease of accessibility, anonymization, and aggregation, health care data is increasingly desirable for secondary use by health care planners and managers. The Canadian Institute for Health Informatics (CIHI) and others (CIHR, NSERC, SSHRC—see the Tri-Council Policy Statement; ethical Conduct for Research Involving Humans) have been working to ensure that appropriate safeguards are taken to protect the data against unauthorized disclosure. CIHI has done extensive work to develop international standards for the use and disclosure of health-related information, including ISO DTR 22221, which extends the secondary use of EHR-sourced data. CIHI also develops best practices for organizations involved in the secondary use and disclosure of data.

Those involved in the eHealth industry should be knowledgeable in all health data-related standards, best practices, and legislation.

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53 Case Studies Involving Secondary Use of Personal Information in Health Research, CIHR
54 Partnership for Health Information Standards, Issue 26—Winter 2006, CIHI
Health informatics (HI) and health information management (HIM) offer a variety of employment opportunities and as the health system continues to undergo reform, the role and functions will continue to evolve. COACH and its partners are in the process of completing a Career Framework which will provide a construct for career progression and detail for the occupations in eHealth in Canada. The COACH framework includes HI, HIM, and technical occupations. For both of these professions, the types of employment opportunities cross many industries and include the hospital sector (acute care and continuing care), public health agencies, physician practices, health ministries, research agencies (e.g. CIHI, CIHR), pharmaceutical companies, educational facilities, ICT technology vendors, etc.

Health Informatics Occupations

Within the realm of health informatics, the occupations can be best categorized based on the level of education. Individuals graduating from college diploma programs in health informatics can be eligible for the following types of positions:

- IT Help Desk Support;
- Database Developer Assistant;
- Assistant Technical Writer;
- Business Analyst Assistant;
- User Training Assistant.

Individuals who graduate with a baccalaureate from a health informatics program (and those with a diploma and work experience/additional education) can find employment in the following types of positions:

- Application Developer;
- Database Developer/Administrator;
- Systems Implementation Specialist;
- Research Assistant;
- Technical Writer;
- Junior Business/System Analyst;
- Junior IT Consultant.

Health informatics professionals with post-graduate training at the masters and doctoral levels can expect to find senior positions such as:

- Chief Medical Information Officer/Chief Nursing Information Officer;
- CIO;
- CTO;
- Senior Researcher;
- Senior Analyst;
- System Developer;
- Medical Informatics Manager.

Health Information Management Occupations

The positions available to health information management professionals are based on the level of education. HIM professionals who have earned a diploma from a community college can find entry-level positions as:

- Health Data Analyst;
- Data/Information Manager;
- Records Technician Specialist;
- Release of Information Specialist;
- Clinical Coding Specialist;
- Clinical Research Associate;
- Physician Practice Manager;
- Patient Information Coordinator;
- Optical Imaging Coordinator;

With a baccalaureate or graduate degree in health information management (and for those with a diploma and work experience/additional education), individuals can gain employment as:

- HIM Department Director;
- HIM System Manager;
- Data Quality Manager;
- Compliance Officer;

55 2008 Salary Study. www.ahima.org/salarystudy/
57 Ibid.
58 Ibid.
59 www.jnhima.or/CareersColleges.htm#Job%20Opportunities
• Risk Management Specialist;
• Information Security Officer or Privacy Officer;
• Clinical Analyst;
• Clinical Applications Coordinator;
• Senior Project Manager;
• Clinical Vocabulary/Terminology Asset Manager;
• Enterprise Applications Specialist;
• Integration Architect (Implementation);
• Process Improvement Engineer;
• Senior Documentation Coordinator for Adverse Events;
• Solutions Analyst;
• Systems Analyst;
• HIM College/University Instructor;
• HIM Consultant.

eHealth Trends and Impact on Employment

A key shift is the movement of patient care out of the hospitals and into the patient’s home, and into ambulatory and community care settings. These new settings are less structured than hospitals and will require new processes to integrate the capture of information across the continuum of care.61

As the health care system increases its use of technology to capture data and information, the role of HI and HIM professionals is also changing. The health record now goes beyond just a clinical tool for physicians and other health professionals. The patient record, as a single entity and as an aggregation of information has importance in understanding “trajectories of care and for improving both individual and public health outcomes.”62 For HI and HIM professionals, this will mean having advanced competencies in building systems and processes to access, analyze and manage greater amounts of data and information to support and meet the clinical and business objectives of the health care organizations.

As more and more information gets stored in electronic format, the attention to system design and security protocols and policies is crucial. The exponential increase in the volume of data and information stored across interconnected health care organizations will require new technologies to manage this information and to preserve the content in a way that can be easily indexed and accessed.63

While technology adoption in health care has been slow, the pace of change is at a tipping point and the next decade will see a significant increase in the utilization of technology for improved efficiencies and clinical outcomes.64 Advanced ICT systems will play a pivotal role in the integration and interoperability of clinical systems across the full spectrum of care, and HI and HIM professionals will need additional competencies to support the development, implementation and maintenance of these integrated information networks.

62 Ibid
63 Ibid
64 Ibid
Barriers to Building eHealth Human Resources Capacity

eHealth capacity building refers to the creation of an environment that fosters technology-enabled improvements to health care systems and delivery, including organizational, policy and technical interventions.

Health Informatics & eHealth Capacity Building – An Overview

One of the biggest issues facing health care organizations is the ability to attract and retain eHealth and IT professionals. Branham Group Inc. interviewed a select group of health care organizations (see Appendix 3), which noted that there is a general shortage in both HI and HIM categories and that budgetary constraints pose a significant problem in being able to provide competitive financial remuneration vis-à-vis the private sector. However, given the current economic climate and the uncertainty in the job market, some of the organizations noted that the public sector tends to be seen as providing greater job stability. This could help in attracting a greater number of applicants.

With respect to health informatics professionals, the organizations that Branham spoke with observed that it is difficult to attract individuals who have the right balance of information technology, information management and clinical information competencies. The organizations believe that it is easier to train individuals that have a health care system background the skills needed to develop into eHealth professionals than to train IT professionals the skills needed in the area of clinical information management. It was also noted that it is difficult to find the “right” resource due to the fact that there is a limited resource pool and they are all currently employed.

In an effort to manage their current requirements for professionals associated with eHealth, health care organizations have used the services of outside consultants. The cost to use outside professionals has cut into the human resources budgets, resulting in an inability to adequately staff for these positions.

The responding organizations felt that they generally had competency gaps in most areas they consider to be within the realm of health informatics. However, the organizations believe their greatest gaps are in the following three areas:

1. Project management;
2. Technical analysts; and
3. Clinical informatics analysts.

At present, Canadian post-secondary institutions offer a variety of academic programs in health informatics and health information management disciplines. To support capacity building strategies, academic programs and certifications must address the needed competencies now and for the future. At a national level, the HI and HIM professions need to support the development of a standardized approach to curricula that is tied to standards of practice and competencies.

Some of the key barriers to building a sustainable Health Informatics capacity in the UK that were cited in the NHS Informatics Workforce survey included:

1. The lack of a national informatics workforce strategy;
2. The health informatics environment is rapidly changing and it is difficult to keep abreast of these changes due to a shortage of human resources; and
3. The lack of a credible, national professional health informatics leadership for workforce development and planning.

It is noted that in the UK, health informatics is an umbrella term that includes HIM, ICT and HI professions. However, based on research into the state of health informatics in other countries like Canada, Australia and the United States, one could argue that these barriers are common around the world. While work is being done to address these barriers, it would appear that there continues to be a lack of cohesion among the various stakeholders. Various academic facilities in Canada have programs to address health informatics competencies but they have not adopted a standardized approach to curricula.

In contrast, there is a rigorous model for the recognition and accreditation of HIM curricula at college and university programs across Canada, and a national certification exam. These programs prepare graduates to work in the areas of coding classification and terminology asset management, records management, data and information analysis, decision support, privacy and confidentiality, ensuring data quality, standards, and electronic health information management (eHIM™). It is believed that there is an insufficient number of HIM graduates to meet the increasing demand for the eHealth workforce. It is acknowledged that there is a need for HIM training at the advanced graduate level for research and education.

It is encouraging to see the steady increase in the number of programs being offered, from certificate programs

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66 Learning Outcomes in Health Information Management. CHIMA 2006.
through to post graduate studies, but gaining a better insight into types of skills required and the current skills gap will provide a stronger context for greater standardization for academic programs.

In attempting to understand the competency gaps, it is useful to understand some of the underlying issues that have contributed and continue to contribute to this ongoing challenge: 67

1. Insufficient or inappropriate IT training;
2. Rigid training methods that did not fit with individual learning needs;
3. Inadequate staffing complement to ‘back-fill’ in the clinical areas;
4. Lack of well-trained clinical informaticians;
5. General lack of knowledge about computers by health care professionals; and
6. General loss of jobs across the IT sector, which is an impediment to the development of IT leaders and skill sets. In particular, as Moya Conrick notes, there is a lack of IT project managers and IT staff with the requisite business and industry sector knowledge and IT integration skills. 68

This information points to some very basic skill sets that are required in order to gain some momentum in pressing forward the eHealth agenda. Acceptance of the use of technology and the ability to effectively use information technology in everyday clinical practice will help to drive the push for building eHealth capacity.

COACH, Canada’s Health Informatics Association, has been very active in promoting a structured framework approach to identifying the necessary competencies for recognition as a Health Informatics Professional (HIP). 69

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68 Ibid.
The diagram shows the key knowledge areas upon which Health Informatics core competencies are built. The framework document acknowledges the multidisciplinary nature of the Health Informatics professional and how the profession has evolved through the consolidation of competencies from health sciences, information and computer sciences, and management sciences.

Turning to Health Information Management, the following CHIMA diagram “offers a visual representation of how skills and education overlap to make HIM professionals uniquely qualified to assume careers in the world of e-HIM. HIM professionals must challenge themselves to continuously evaluate and upgrade their skills and expertise to keep pace and be successful in the world of virtual HIM practice. HIM careers today employ expertise in clinical skills, leadership and management skills, and knowledge of information technology”. 70

Health informatics and health information management are integral to the sustainability of our health system as these disciplines enable the coordination of complex activities, quality improvement, collaboration and the sharing of a growing body of health care knowledge71. ICT and health care are inextricably linked “to deliver care, pursue research, educate students, treat patients and monitor public health.” 72 To build sustainable capacity, we must build on the collective experience and knowledge of clinicians, business management and IT personnel.

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72 Ibid. p.6
International Comparisons

The adoption and utilization of electronic health records around the world is varied and inconsistent. Despite the emergence of the European Union, it would appear that there have been no discussions to develop a pan-European integrated health information system.

Based on research conducted by Branham Group Inc., Britain, Norway and Denmark seem to be farther along the EHR journey than some of their neighbours. Britain has made a substantial investment in information technology as part of the country’s health care reform. The financial investment estimates in IT range from £12.5 billion to a high of £20 billion. Britain’s commitment is that every citizen will have an electronic health record by 2010 and the country is in the early stage of work on an interoperable EHR.

France’s national program to support EMR adoption ceased to exist due to chronic underfunding, and it has the lowest EHR adoption rate among EU countries. Other sources point to a lack of coordinated planning as a significant barrier to EMR adoption. Both Norway and Denmark have made significant strides in establishing a network infrastructure to facilitate the exchange of health information between hospitals, physicians, pharmacies and laboratories. Denmark invests about 7% of its health budget for IT initiatives and has targeted 2010 for the rollout of a full EHR infrastructure for all hospitals. Norway on the other hand has achieved a very high adoption rate—97% of hospitals have an EPR and 99% of physicians use and EMR in their practice.

Germany has been slow to adopt electronic health records in hospitals and physicians practices and several projects that have been identified are not to begin until 2010. The German health system is a privately funded system and hospitals compete against one another for the shrinking insurance reimbursement funds. A national ehealth card is to be the foundation for a pan-Germany EHR with the first application for the insurance sector to complete coverage checks. The overarching EHR architecture is to be a service oriented architecture (SOA) similar to Infoway’s blueprint.

The Netherlands is one of the few countries with no plans to implement a federated model for electronic health record but will continue to store patient health information locally. While the majority of physicians and hospitals have electronic reporting systems these are primarily administrative focused. One of the lowest adoption rates among EU countries is in France where EHR adoption is minimal and the national program to support EMR adoption ceased to exist due to chronic underfunding and a lack of coordinated planning as a significant barrier to adopt EMRs.

The Netherlands is one of the few countries with no plans to implement a federated model for electronic health record but will continue to store patient health information locally. While the majority of physicians and hospitals have electronic reporting systems these are primarily administrative focused. One of the lowest adoption rates among EU countries is in France where EHR adoption is minimal and the national program to support EMR adoption ceased to exist due to chronic underfunding and a lack of coordinated planning as a significant barrier to adopt EMRs.

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74 Ibid
75 Ibid
New Zealand and Australia have adopted a distributed approach to the implementation of an EHR system. In New Zealand for example, there is not a national EHR system but an interconnected secure broadband network through shared services agreements with all 21 District Health Boards (DHB). In 1993, New Zealand implemented a National Master Patient Index system with the result that today, 98% of the population has an EHR.

The United States spends more on health care than any other country but its health care system performance ranks 37th in the world. With multiple private insurance payers, there are still 47 million uninsured Americans. The U. S. also lags the world in the adoption of technology standards to support EHR interoperability and this appears to have a connection with the lack of a national EHR strategy like Canada, Australia and Britain.

Compared to some of the European countries, Canada sits in the lower 25% in our adoption and utilization of electronic health records in primary care settings. However, Canada needs to continue to accelerate the adoption among physicians if we are to realize the true value of an interoperable EHR. According to a report by the Canadian Medical Association, the adoption and utilization of an electronic medical record (EMR) by physicians in Canada is only about 10%. The low adoption rate among physicians is a significant impediment to the eHealth agenda.

In the acute care hospital sector, the adoption of core clinical applications such as patient information systems, laboratory information systems, pharmacy information systems and coding and abstracting systems is well over 85%. The implementation of advanced clinical systems such as CPOE, eMAR and ePrescribing is only now beginning to gain momentum, but we are beginning to see success stories:

- In PEI and Ontario, emergency room personnel can access a senior’s complete medication profile;
- Manitoba and New Brunswick have expanded their telehealth networks to increase the number of patients accessing specialists, thus reducing delays, costs and stress;
- Alberta’s provincial EHR allows a diverse group of clinicians to provide health services to chronically ill patients through a complete patient record accessible by all care providers.

Canada Health Infoway’s EHR blueprint has been internationally recognized. This top-down, government-mandated approach, which has also been followed by Britain, Australia and Denmark, would appear to have been more successful at accelerating the use of electronic records than the bottom-up, grass roots strategy taken by the U.S.

Many countries have made great progress in advancing an eHealth agenda as part of an overall health system reform initiative. There are many lessons to be learned and it is important that there is a shared learning of best practices and an avoidance of what has not worked well. The national global health care systems can learn a lot from the past and the financial services industry is now a global electronic network.

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79 Ibid.
82 eHealth in Canada: Building Momentum. Branham Group Inc. 2007.
83 Ibid.
The Next Phase – Developing a Human Resource Strategy

As noted above, the preliminary research conducted for this paper indicates a current supply shortage in HI and HIM professionals, with competency gaps in a number of specific areas. These findings demonstrate the need for further research that will allow the development of a comprehensive eHealth human resource strategy. Such research should be nationwide in scope, given the mobility of people working in this field, and the results will provide a clearer picture of the current eHealth labour supply situation. It is paramount that we understand the occupations that are in demand at the current time and assess which occupations are projected to have increased demand in the near future (i.e. the next 3–5 years). The analysis of this supply and demand information will allow those with a vested interest in ensuring an efficient and effective health care system, and the vendor companies that provide services to the system, to develop a complete human resource strategy that addresses the most pressing needs.

Are we indeed facing a labour and/or skills shortage in eHealth in Canada? What investment will yield the best return with regards to training? How do we best address the issues? What partnerships are required to meet the needs? What priority occupations should be dealt with first? These questions and many other will need to be answered if we are to develop a cohesive, integrated human resource strategy for eHealth in Canada.

While awaiting the development of such a comprehensive strategy, we have a number of observations about steps that can be taken now to address the current competency gaps identified by our preliminary research, as follows.

First, the educational programs for both HI and HIM professionals need to address the increased and changing roles currently being fulfilled within health care organizations. HI and HIM professionals are taking on greater technical, management, and leadership roles and to ensure that they can competently fulfill these new roles, curricula need to provide adequate training in:

- Project management;
- Process management;
- ICT systems;
- Communication and presentation skills; and
- Leadership.

As the health care system evolves into an integrated, seamless service delivery model across the continuum of care, eHealth professionals will need to have knowledge of this system of care and to understand the technical vocabulary of ICT systems, their underlying architecture and how these systems are interconnected. This includes understanding such technologies as relational databases and data warehouses, their structure and how information is stored and retrieved, and the various tools to use to manage and utilize the vast amounts of patient information. With health care service delivery moving out of hospitals and into the community, the understanding of telehealth technologies as an integral part of the health service delivery model needs to be a component of the education of HI and HIM professionals.

To help meet the current demand for HI and HIM professionals, there has been a trend to offer alternative programs outside of the traditional education forums including but not limited to:

- Advanced Certificate programs;
- Professional masters’ programs; and
- Shortened courses like AMIA’s 10 x 10 program.

Another venue for providing core and advanced training for HI and HIM professionals currently employed is through eLearning programs. As the base of medical knowledge increases and as the site for health service delivery changes, the venue for adding new curricula and training programs makes eLearning an attractive alternative. eLearning has a role as part of a blended learning strategy and research has shown that not only is it cost effective, but learner satisfaction is positive.

86 Ibid
90 Ibid
Professional associations like COACH and CHIMA have played a strong role in supporting the professional development of their respective profession and will be looked upon to continue to play this role as well as an advocacy role to ensure that the education and training requirements to meet the future demands are met.

The HI and HIM professions have an opportunity to educate the market on the role of eHealth professionals and to dispel any of the misunderstandings which currently exist. Additionally, this would be a good opportunity to gather an inventory of some of the practices that health care organizations have implemented to address some of the skills and knowledge gaps and to identify best practices that can be replicated. Engaging health organizations at both a strategic and tactical level will help to spread the current level of knowledge and keep the dialogue alive for continued momentum and movement forward.
# Appendix 1 – Applications

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADMINISTRATIVE &amp; FINANCIAL SYSTEMS</strong></td>
<td></td>
</tr>
<tr>
<td>Financial Decision Support</td>
<td>• Gather, store, analyze, and provide access to data to help enterprise users make better business decisions.</td>
</tr>
<tr>
<td></td>
<td>• Includes the activities of decision support, query and reporting, online analytical processing (OLAP), statistical analysis, forecasting, and data mining.</td>
</tr>
<tr>
<td>Financial Management</td>
<td>• Includes G/L, A/R, A/P, and budgeting.</td>
</tr>
<tr>
<td>Human Resource Information Systems</td>
<td>• An integrated system designed to track, monitor, analyze and report on all employee information.</td>
</tr>
<tr>
<td></td>
<td>• Used for the management and reporting of employee, payroll and budget data.</td>
</tr>
<tr>
<td></td>
<td>• May offer employee self-service functions.</td>
</tr>
<tr>
<td>Patient Information Systems</td>
<td>• Record and report administrative details of a patient’s encounter in a healthcare facility.</td>
</tr>
<tr>
<td></td>
<td>• Typically includes modules for:</td>
</tr>
<tr>
<td></td>
<td>- ADT</td>
</tr>
<tr>
<td></td>
<td>- Patient master index (PMI)</td>
</tr>
<tr>
<td></td>
<td>- Inpatient management</td>
</tr>
<tr>
<td></td>
<td>- Outpatient management</td>
</tr>
<tr>
<td></td>
<td>- Medical records tracking</td>
</tr>
<tr>
<td>Workload Management</td>
<td>• On-demand resource allocation, productivity, and prospective planning.</td>
</tr>
<tr>
<td></td>
<td>• Review delivery requirements, record activity and communicate across services.</td>
</tr>
<tr>
<td><strong>CLINICAL SYSTEMS</strong></td>
<td></td>
</tr>
<tr>
<td>Laboratory Information System</td>
<td>• Either automate laboratory test processes themselves through links to test instruments (such as chemical autoanalyzers) or independently process, store and report lab test results.</td>
</tr>
<tr>
<td>Picture Archiving &amp; Communication Systems (PACS)</td>
<td>• Acquires, transmits, stores, retrieves, and displays digital images and related patient information from a variety of imaging sources and communicates the information over a network.</td>
</tr>
<tr>
<td>Pharmacy Information System</td>
<td>• Designed primarily for maintenance of pharmacy records, drug ordering and inventory control, control of drug and drug product distribution to patients, storage and retrieval of drug information, recording of patient drug profiles and generation of pharmacy charges for patient billing.</td>
</tr>
<tr>
<td>Radiology Information System</td>
<td>• Records test requisitions, schedules procedures, records and reports test results.</td>
</tr>
<tr>
<td>EHR Systems: Order Communications</td>
<td>• Systems for the entry of orders for diagnostic tests, procedures and patient treatments and subsequent reporting of test results back to caregivers throughout the various service areas of a health services organization.</td>
</tr>
<tr>
<td>EHR Systems: CPOE</td>
<td>• A computer application that allows a physician’s orders for diagnostic and treatment services (such as medications, laboratory and other tests) to be entered electronically instead of being recorded on order sheets or prescription pads. The computer compares the order against standards for dosing, checks for allergies or interactions with other medications, and warns the physician about potential problems.</td>
</tr>
<tr>
<td>EHR Systems: Clinical Data Repository</td>
<td>• Real-time database that consolidates data from a variety of clinical sources to present a unified view of a single patient.</td>
</tr>
<tr>
<td></td>
<td>• Forms the basis of a clinical information system and contains most of the data required by clinicians to care for patients.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| EHR Systems: Clinical Documentation    | • Provides for the documentation of patient care using computers.  
• Records vital signs directly from medical devices while other documentation, such as nursing assessments are entered by the clinician. |
| EHR Systems: eMAR                       | • Records all medications administered so the information is accessible to all clinical personnel who may need to see it.                        |

**HEALTH INFORMATION MANAGEMENT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstracting Systems</td>
<td>• Support the coding of significant facts from complex patient records to include pertinent medical history, procedures performed, diagnosis and treatment applied.</td>
</tr>
<tr>
<td>Dictation and Transcription Systems</td>
<td>• Conversion of a spoken language source into written, typewritten or printed form.</td>
</tr>
</tbody>
</table>
| Document Imaging & Scanning Tools       | • Online storage, retrieval, and management of electronic images of documents.  
• Main method of capturing images is by scanning paper documents.                        |

**DEPARTMENTAL SYSTEMS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
</table>
| Cardiology Information System           | • Provides access to all relevant cardiology information from a single point.  
• Comprehensive information and tools streamline workflow in the cardiac care environment.  
• Single interface for clinical results, image information, electrocardiography and waveform data. |
| Emergency Department Information System | • Automates each step of the patient management and patient documentation process including triage, tracking, nursing & physician charting, disposition, charge capture, management reporting and syndromic surveillance.  
• Electronic white board                                                              |
| Critical Care /ICU Information System   | • Automates clinical documentation in the ICU.  
• Records and supports care management throughout the ICU.  
• Offers seamless data flow from medical devices and other hospital computing systems. |
| Respiriology Information System         | • Automates functions specific to respiratory care, including assessing work demand, assigning and tracking resources, charting, reporting results, and can include mobile and point-of-care charting. |
| Surgery Information System              | • Ensures that the right care is delivered at the right time and right place.  
• Data collected online at the point-of-care is used to create a chart for the entire operative process.  
• Functionality includes case scheduling, supply management, equipment, perioperative chart, anaesthesia, and staff scheduling. |
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFRASTRUCTURE</strong></td>
<td></td>
</tr>
<tr>
<td>EMPI</td>
<td>• Creates and maintains an authoritative central repository of patient demographic information and identifiers.</td>
</tr>
<tr>
<td></td>
<td>• Authoritative central reference point for standardized patient demographic data.</td>
</tr>
<tr>
<td>Single Sign On (SSO) System</td>
<td>• Specialized form of software authentication that enables a user to authenticate once and gain access to the resources of multiple software systems.</td>
</tr>
<tr>
<td>Database Technology</td>
<td>• The software used to manage and query a database.</td>
</tr>
<tr>
<td>Server Technology</td>
<td>• Computer hardware that delivers information and software to other computers linked by a network.</td>
</tr>
<tr>
<td>Storage Infrastructure</td>
<td>• Hardware devices used to hold data and software that are shared among multiple servers and software applications.</td>
</tr>
<tr>
<td></td>
<td>• For the purposes of this study, storage infrastructure is distinct from individual disks in a server or PC and is generally external to these devices and accessible over a network.</td>
</tr>
<tr>
<td></td>
<td>• Data back-up.</td>
</tr>
<tr>
<td>Electronic Messaging</td>
<td>• The software used to support the sending and processing of e-mail by computer.</td>
</tr>
<tr>
<td>Integration Engine</td>
<td>• Typically provide functionality such as:</td>
</tr>
<tr>
<td></td>
<td>- Guaranteed store and forward of messages</td>
</tr>
<tr>
<td></td>
<td>- “out of the box” support for the HL7 standard</td>
</tr>
<tr>
<td></td>
<td>- Message translation</td>
</tr>
<tr>
<td></td>
<td>- Message routing</td>
</tr>
<tr>
<td></td>
<td>- Alerts and monitoring</td>
</tr>
</tbody>
</table>
Appendix 2 – Snapshot of the Vendor Market Share

Radiology
636 Hospitals

Clinical Decision Support
381 Hospitals

HR & Financial Decision Support
675 Hospitals
## 2008 Vendor Market Share

### Canadian Market Share (all provinces except Quebec)

<table>
<thead>
<tr>
<th>Category</th>
<th>Vendors</th>
<th>Market Share (% hospitals)</th>
<th>Vendors</th>
<th>Market Share (% beds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care Management &amp; Clinical Decision Support</td>
<td>Meditech 67%</td>
<td></td>
<td>Meditech 45%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 10%</td>
<td></td>
<td>Eclipsys 14%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eclipsys 10%</td>
<td></td>
<td>McKesson 13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>McKesson 5%</td>
<td></td>
<td>Cerner 12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orion International 4%</td>
<td></td>
<td>Orion International 6%</td>
<td></td>
</tr>
<tr>
<td>Finance &amp; Administration</td>
<td>Meditech 44%</td>
<td></td>
<td>Meditech 36%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Med2020 21%</td>
<td></td>
<td>Med2020 23%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QHR Technologies 18%</td>
<td></td>
<td>3M 16%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oracle 9%</td>
<td></td>
<td>Oracle 14%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Momentum Healthcare 9%</td>
<td></td>
<td>McKesson 12%</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Imaging *</td>
<td>Meditech 53%</td>
<td></td>
<td>Agfa 39%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agfa 27%</td>
<td></td>
<td>Meditech 34%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 17%</td>
<td></td>
<td>Cerner 22%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>McKesson 14%</td>
<td></td>
<td>GE Healthcare 17%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE Healthcare 10%</td>
<td></td>
<td>McKesson 15%</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>Meditech 52%</td>
<td></td>
<td>Meditech 41%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE Healthcare 19%</td>
<td></td>
<td>Cerner 24%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 13%</td>
<td></td>
<td>Misys 10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SCC Softcomputer 6%</td>
<td></td>
<td>SCC Softcomputer 9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Misys 4%</td>
<td></td>
<td>GE Healthcare 8%</td>
<td></td>
</tr>
<tr>
<td>Pharmacy</td>
<td>Meditech 52%</td>
<td></td>
<td>Meditech 41%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 13%</td>
<td></td>
<td>Cerner 20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interactive Business Systems 13%</td>
<td></td>
<td>GE Healthcare 17%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE Healthcare 10%</td>
<td></td>
<td>McKesson 7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MediSolution 3%</td>
<td></td>
<td>IDX 4%</td>
<td></td>
</tr>
<tr>
<td>Emergency</td>
<td>iSOFT 32%</td>
<td></td>
<td>iSOFT 32%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meditech 26%</td>
<td></td>
<td>Meditech 28%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 19%</td>
<td></td>
<td>Cerner 22%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eclipsys 12%</td>
<td></td>
<td>McKesson 13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>McKesson 9%</td>
<td></td>
<td>Eclipsys 3%</td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>McKesson 35%</td>
<td></td>
<td>McKesson 42%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PICIS 31%</td>
<td></td>
<td>PICIS 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cerner 20%</td>
<td></td>
<td>Meditech 13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meditech 14%</td>
<td></td>
<td>GE Healthcare 11%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE Healthcare 9%</td>
<td></td>
<td>Cerner 10%</td>
<td></td>
</tr>
</tbody>
</table>

* - includes both RIS and PACS. Some vendors offer both while others offer one or the other.
**Quebec Market Share**

<table>
<thead>
<tr>
<th>Category</th>
<th>Vendors</th>
<th>Installed Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance &amp; Administration</td>
<td>Logibec</td>
<td>In full use across 2 agencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In partial use across 3 agencies</td>
</tr>
<tr>
<td></td>
<td>MediSolution</td>
<td>In full use across 11 agencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In partial use across 4 agencies</td>
</tr>
<tr>
<td></td>
<td>Misys</td>
<td>ADRLSSSS de l’Estrie</td>
</tr>
<tr>
<td></td>
<td>Omni-Med, IBM</td>
<td>ADRLSSSS de Lava</td>
</tr>
<tr>
<td>Diagnostic Imaging **</td>
<td>Artefact</td>
<td>70% of remaining agencies</td>
</tr>
<tr>
<td></td>
<td>MediSolution</td>
<td>30% of remaining agencies</td>
</tr>
<tr>
<td></td>
<td>MiSys</td>
<td>ADRLSSSS de l’Estrie</td>
</tr>
<tr>
<td>Laboratory</td>
<td>Cerner</td>
<td>MUHC</td>
</tr>
<tr>
<td></td>
<td>MediSolution</td>
<td>52 installations in remaining agencies</td>
</tr>
<tr>
<td></td>
<td>Misys</td>
<td>ADRLSSSS de l’Estrie</td>
</tr>
<tr>
<td></td>
<td>Omnitech</td>
<td>30 installations in remaining agencies</td>
</tr>
<tr>
<td></td>
<td>SCC Softcomputer</td>
<td>17 installations in remaining agencies</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>Artefact</td>
<td>Portion of remaining agencies</td>
</tr>
<tr>
<td></td>
<td>CGSI</td>
<td>Portion of remaining agencies</td>
</tr>
<tr>
<td></td>
<td>GE Healthcare (BDM)</td>
<td>MUHC</td>
</tr>
<tr>
<td></td>
<td>MediSolution</td>
<td>Portion of remaining agencies</td>
</tr>
<tr>
<td></td>
<td>Misys</td>
<td>ADRLSSSS de l’Estrie</td>
</tr>
<tr>
<td>Surgery</td>
<td>CHCA (Opera)</td>
<td>Majority of agencies</td>
</tr>
<tr>
<td>Emergency</td>
<td>SIURGE</td>
<td>Provincial system funded by MSSS and developed/supported by Logibec</td>
</tr>
</tbody>
</table>

** - includes only Radiology Information Systems (RIS)
Appendix 3 – Primary Research

ICTC: eHealth in Canada Survey

Respondents
Malcolm Griffin   Interior Health   250-864-0787
Nadeem Ahmed   xwave    905-696-3680
Valerie Gamache-O’Leary  Ottawa Hospital   613-737-8446
Roger Girard   Manitoba eHealth  204-926-9003
Brenda Campbell   PEI Health   bccampbell@ihis.org
Randy Knapp   Regina Qu’Appelle RHA  306-766-7792
Madeleine Clare   Capital DHA   902-473-5628

Questions
1) Could you describe your plans to deploy new IT projects or maintain existing IT projects?

2) How many IT staff and HIP (not FTEs) do you have within your organization, by area?

3) Describe your Health Information Management positions and their hierarchy.

4) COACH defines Health Informatics as “the intersection of clinical, IM/IT and management practices to achieve better health.”

5) What proportion of your Health Information Management positions would be perceived as Health Informaticians?

6) Can you provide a breakdown of the Health Informaticians by:
   a) Clinical Health Informaticians
   b) Administrative/Management Health Informaticians

7) What are your HR competency requirements?
   For example,
   • Systems analyst
   • Programming
   • Exposure to hospital systems
   • Network/infrastructure planning

8) What are the HR IT Challenges faced by your region/hospital/province?
   • employee attraction
   • recruitment
   • retention
   • training
   • succession
   • funding
   • knowledge of health care sector

9) What are the current initiatives in place at your organization regarding HR?
   • employee attraction
   • recruitment
   • retention
   • mentoring programs
   • training
   • succession

10) How do you see your IT HR issues changing in:
    a) the short term (next 1-3 years)?
    b) Long-term (next 5-10 years)?
Aggregate Anonymous Responses

**Could you describe your plans to deploy new IT projects or maintain existing IT projects?**

- Embarking on an upgrade of IS and Clinical Applications – to Meditech 6.1
- The goal is process standardization and optimization through analysis of the intersections of clinical and IT processes
- It will be 3 years before the new system is introduced to staff
- The cost is about $30 million to Interior Health, a couple million for each of hardware and software licensing, but the bulk of the expense is change management, development and adoption of new processes, and clinician engagement strategy
- They are also doing Telehealth, acute care, and rural strategy reviews
- With the oldest population and workforce in BC, the goal is to leverage IT to help deliver service to the patients
- Recently completed strategic plan for Information Services (3 months)
- Last strategic plan was 5 years ago
- Unifying reporting of information into enterprise warehouse
- Two groups: Knowledge Management (information and performance management strategy, introducing business intelligence tools in the next 3 months), and Core Business (clinicians, introduce technology to automate their space)

**Strategic Plan:**

- Automate: Physician order entry, closed loop medication delivery, clinical documentation, critical care, etc.
- Patient experience: services excellence, experience with hospital, ease of interaction – leverage EHR for patient portal, self registration, integrated voice technology
- Business and auxiliary departments: replacing IT to keep up to date, replace aging lab system, supplementing DI
- Ministry of Health and LHIN dictated: clinical research leaders (mandated with $ or not), implementation of diagnostic imaging repository in Champlain, EMPI, leadership – regional supply chain, WTIS expansion
- Infrastructure, Investment
- EMR Application for physicians in Ontario
- Releases around that for CDM coming up in Feb/March 2009
- New releases in July 2009
- Would be willing to share win information – on successful RFP bids. They track their win % internally, as well as pursuit costs.

**How many IT staff and HIP (not FTEs) do you have within your organization, by area?**

- A lot less than they’d like
- Estimates 10 people are mature Health Informatics Personnel
- They are building capacity in other positions
- These people are within clinical IS portfolio and the lab & DI areas
- Typically work with clinical professionals to equip them with IT skills, finds there isn’t the aptitude to work it in reverse – it’s easier to train clinicians in IT that IT to clinical side
- About 165 people
- Intersection of 3 circles – health policy (business), clinical, IT
- All 3 are required in all areas
- Typically start knowing one area, but make sure they’re all well rounded
- 60 – pure technical employees
- 150 – Business Analysts (technical and clinical)
- Remainder – pure clinical (doctors, nurses, etc)

**Describe your Health Information Management positions and their hierarchy.**

- There are a few positions within the clinical IS portfolio – which deals with acute, residential, community, mental health, public health... Mostly these positions fall within the advanced clinical portfolio – CPOE, etc. which is the highest priority.
- Lab and DI are more specialized personnel
- The hierarchy is available online http://www.interior-health.ca/information.aspx?id=574
- No Health Information Management positions. Strictly project positions.
• CIO reports to CEO and then 4 Senior Managers (CIO new in August)
• They have everything in all levels from desktop support to decision support, junior program analyst, senior systems analyst, clinical and business analysts, database architects and administrators

Org. Chart:
• CEO – CIO – 4 Managers
  1) Physician, Performance Management, Clinical Analysts, Data Modelers
  2) Chief Clinical Information Officer (physician) – Champion for programs and ongoing training to core business folks
  3) Knowledge management – PMO delivery of programs, decision support
  4) IT – technology deliver, desktop, AV, data centre

**COACH defines Health Informatics as “the intersection of clinical, IM/IT and management practices to achieve better health.”**
• Excellent definition which covers the full spectrum
• Absolutely agrees with this definition
• Core focus is health business

**What proportion of your Health Information Managements positions would be perceived as Health Informaticians?**
• 10/35 IT people roughly
• Just under 25%
• Definite component in decision support – 100% of their time = 30-40 people
• Less in IT space, just IT provision = 70 people
• Application and project delivery = 60 people
• 80% of all staff have broad health care knowledge
• No Health Information Management positions. Strictly project positions.

**Can you provide a breakdown of the Health Informaticians by:**
   a) Clinical Health Informaticians
   b) Administrative/Management Health Informaticians
      – Administration Side – 60% of personnel
      – Health Information – Health Records, Coding, Abstracting
      – Information Support – Analysts, Modelling, Interpretation, Conclusions and Decision-making
• Clinical Side – 40% of personnel
   – Interface with Clinicians
   – Help solve clinical problems
• In the process of transforming IM/IT
• IS people cover both without analysis
• Some argue all hospital information is clinical – sensitivity in decision support group they’re clinical too – not just admin
• Internal requirements for reporting – information produced

**What are your HR competency requirements?**
• Takes a long time to learn clinical side from IT, so clinical folks have a leg up
• Systems Analyst
• Business Analyst
• Knowledge: applications, data structures, systems, collection, dissemination
• Also need higher level of understanding of data
  – Meet ministry requirements, not just traditional skills required
• Leadership, business acumen, developmental capability
  – considered a 4th dimension to the HI definition
• Area of specialty is varied by geography – 80% of employee time is spent in their core area, and there’s a requirement that the other 20% be spent in developing one of the less familiar areas.
• Areas are: claims management, IHR, HL7, technology, clinical business processes, clinical change management
• Bias for younger employees is to be a health informatics grad, emphasis on practical experience for older hires

**What are the HR IT Challenges faced by your region/hospital/province?**
• Low Turnaround – retention is not a problem
• Hard to recruit people with clinical background and takes a long time to teach this
• Finding qualified people – very few out there without jobs
• BC doesn’t pay as well as other provinces for similar positions, but does have a reputation for getting things done
• Hard to recruit seasoned individuals – things may change with economy
• Recruitment
• Salary scales are an issue
• Turnover rate is very low – work is interesting and varied with a lot of opportunity to grow
• Applicants are used to consulting rates – so it’s tough to compete
• Shortage on health care side
• Need to go outside health care to find people and train them in health care
• Health care is not top of mind to grads

What are the current initiatives in place at your organization regarding HR?
• “Room to Grow” initiative – recruitment site, working with HR, on Facebook, etc
• Robust performance evaluations for all union and non-union employees
• Promote and transfer from within
• Mentoring, coaching, succession plan, talent management, internships, new hire buddy system
• Building skill sets – teaching corporate side to clinicians and vise versa (role reversal)
• Within IM/IT there is a well developed orientation program – specific to role
• Co-op
• Masters of health Administration students
• Started to hire people into full time positions at young age for assessment
• Sourcing model – creative ways to attract
• Marketing in health care IT magazines
• Networking
• No mentoring or succession programs
• The process is:
  – Stream into competency groups, where they’re trained and report to a capability leader (the most capable in that competency)
  – This individual defines training
  – Boss is a project manager when working on a project, otherwise it’s the competency leader

How do you see your IT HR issues changing in the short term (next 1-3 years)? Long-term (next 5-10 years)?

Short Term
• Economy will help with retention (public sector is cushioned from downturn) – sense of stability
• Layoffs in the private sector are causing people to look for stability
• Need health informatics background – hard to attract them and back office people
• Have to be prepared to make an investment into HIP
• Can’t train IT people – need to specifically staff HIP
• Bankruptcy of local IT businesses (Nortel) helps
• 3 trends:
  – HealthCare 1.0 – acute care focus is operational for the most part
  – HealthCare 2.0 – iEHR and managing patient health is moving towards operational
  – HealthCare 3.0 – population health (e.g. managing all patients with Diabetes) is Analytics and BI focused.

Long Term
• Develop programs to grow folks into HIP role – reshaping the delivery of education to get more grads out of HI
• Hopes that HI will get more popular – so far younger people are not interested in informatics (need bachelors and masters degrees)
• The younger generation wants to make a difference with their work – health is becoming less business focused
• Baby boomers (retirees) are going back to work with enticing new opportunities
• Switch from managing patients to populations
• Better make health policy decisions
• Data-centric decision making – will become more objective and less subjective
• Change is economy related
A not-for-profit sector council, the Information and Communications Technology Council (ICTC), strives to create a prepared, diverse and highly educated Canadian ICT industry and workforce. ICTC is a catalyst for change, pushing for innovations that will provide skills definitions, labour market intelligence, career awareness and professional development for the Canadian ICT industry, educators and governments. We forge partnerships that will help develop the quantity and quality of ICT professionals needed to maintain and improve Canada’s position as a leader in the global marketplace.

To achieve these goals, ICTC focuses on five main areas that are proven building blocks for a healthy, successful and forward-looking sector:

**Standards**
ICTC Standards offer effective human resource reference tools. This is vital information whether you are an ICT manager hiring and developing staff, an ICT professional thinking about a career move, a statistician concerned with supply and demand for workers, an educator planning curriculum that incorporates career skills, or a student looking for a career in ICT.

**Labour Market Intelligence**
ICTC is a recognized leader in providing accurate data, analysis and forecasting on labour market intelligence for ICT human resource issues.

LMI researches and reports on labour market issues facing the ICT industry to build a deeper understanding of Canada’s ICT sector, which will help develop future human resource strategies and Canadian careers in ICT occupations.

**Career Pathways**
ICTC Career Pathways provides programs and tools to explore the career possibilities in Canada’s ICT sector, and we are dedicated to presenting an accurate picture of the sector’s exciting and diverse work environment. ICTC believes in developing a highly educated and motivated workforce that will drive the future of the industry and ensure that Canada remains competitive in tomorrow’s global ICT sector.

**Immigration Initiatives**
ICTC promotes a strong and ongoing supply of highly skilled ICT workers. If Canada wishes to maintain or exceed its current level of competition in the global ICT market, it needs to improve the market’s access to all available labour sources in the most efficient way possible.

ICTC’s Immigration Initiatives achieves its goals through the improved integration of internationally educated professionals (IEPs) into the Canadian ICT sector.

**Partnership**
Our partners’ participation provides ICTC with input, guidance and direction to help solve the HR supply challenge facing the ICT sector in Canada.