Centre for Studies in Family Medicine

Primary Health Care Electronic Medical Records: Gaps in Knowledge and Research in Canada

Report to the Canadian Institutes of Health Research
Institute for Health Services and Policy Research

In response to the:
"Nationally-focused Needs, Gaps and Opportunities Assessments in Health Services and Policy Related to Electronic Health Records" call of Winter 2008

October 2010

Investigators:
Amanda L. Terry PhD, The University of Western Ontario
Moira Stewart PhD, The University of Western Ontario
Amardeep Thind MD PhD, The University of Western Ontario
Fred Burge MD FCFP MSc, Dalhousie University
Richard Birtwhistle MD MSc FCFP, Queen's University
Martin Fortin MD MSc CMFC (F), Université de Sherbrooke
Sabrina Wong PhD, University of British Columbia

Partners:
Maureen Charlebois RN BScN MHSc, Canada Health InfoWay
Inese Grava-Gubins MA, College of Family Physicians of Canada
Jim MacLean MD, Family Physician
Greg Webster MSc, Canadian Institute for Health Information

Research Assistant:
Maureen Kennedy, BA (Hons)

Table of Contents

Acknowledgements

We thank the participants of this study for their contributions.

This study was funded by a grant from the Canadian Institutes of Health Research - Institute of Health Services and Policy Research.

Dr. Stewart is supported by the Dr. Brian W. Gilbert Canada Research Chair in Primary Health Care.

Dr. Thind holds a Canada Research Chair in Health Services Research.

Dr. Terry held a post-doctoral fellowship funded by Canadian Health Services Research Foundation and Canadian Institutes of Health Research (2008-2010).

Summary of Key Points

- While efforts are underway to increase levels of electronic medical record use in primary health care in Canada, overall levels of adoption remain low.
- There are significant gaps in our knowledge and research regarding electronic medical records. Specifically, the gaps that were ranked of the highest priority by participants in this study were: the value of electronic medical records; electronic medical record implementation and adoption; data entry and extraction procedures; and data sharing.
- Relatively few resources are available to inform these gaps in knowledge and research, and Canada has sparse research capacity with which to address the gaps.
- In keeping with these findings, we have identified the following six recommendations designed to assist the Canadian Institutes of Health Research's (CIHR) Institute for Health Services and Policy Research in its planned or future funding priorities:

1. Create a Chair focused on primary health care electronic medical record research.
2. Issue a call for proposals to assess the value of the electronic medical record and/or its components.
3. Issue a call for proposals on the development of demonstration models on knowledge translation specific to electronic medical records, and evaluation of these model interventions to promote change.
4. Engage key stakeholder partners to open a dialogue to identify common ground and avenues for future collaborations regarding: 1) raising the sophistication of electronic medical record products; 2) enhancing the standard of electronic medical record products; 3) encouraging joint funding of research calls that will assist the agenda of electronic medical record vendors, such as the call for studies on electronic medical record value.
5. Develop a partnership among key stakeholders to develop innovation data entry and extraction approaches and to test their usability.
6. Create a policy-oriented initiative on the topic of data sharing. There appears to be a lack of consensus on the ethical and legal issues, and fear of sharing because of potentially doing the wrong thing. Therefore, processes developed by key stakeholders to clarify knowledge, transfer knowledge, and integrate the knowledge more widely are needed.

Executive Summary (3 pages)

Introduction: Although the level of electronic medical record adoption[1] in primary health care across Canada remains low (37%) in comparison to countries such as the Netherlands (99%), and the United Kingdom, (96%), gains have been made in recent years (1;2). In addition, the implementation of electronic medical records in primary health care has received increased emphasis, as evidenced by Canada Health Infoway's recent announcement of a program which aims to have an additional 15,600 physicians in the community using electronic medical records over the next three years (3).

Primary health care electronic medical records represent an important source of information for clinicians and their patients, policy-makers, as well as researchers; nonetheless, there are significant challenges associated with implementing these records(4-8). We can anticipate that these systems will eventually be in wide-spread use within primary health care in Canada. However, there is a gap in our understanding and expertise about how to best utilize electronic medical record information, because Canada is at such an early stage in electronic medical record use (9). In addition, primary health care electronic medical records are designed specifically for patient care; secondary uses of electronic medical record data for research and policy-making are challenging (10;11)

This report presents the results of a study funded by the Canadian Institutes of Health Research (CIHR) - Institute for Health Services and Policy Research, in the "Nationally-focused Needs, Gaps and Opportunities Assessments in Health Services and Policy Related to Electronic Health Records" competition of winter 2008. The purpose of this study was to assess primary health care electronic medical record use for clinical care, policy-making, and research in Canada. Specifically, we set out to identify and prioritize gaps in current knowledge and research capacity regarding primary health care electronic medical record use.

Approach: There were two elements of this study: 1) conducting an environmental scan; and, 2) implementing a collaborative consultation process designed to identify priority areas emerging from the environmental scan and strategies to address these priorities.

Environmental Scan: The purpose of the environmental scan was to describe and assess the current state and capacity of primary health care electronic medical record use for clinical care, policy making, and research in Canada. Using an integrated approach, there were four key data collection strategies to address the objective for the environmental scan. First, we conducted a search of the literature for publications regarding primary health care electronic medical records in Canada and at the international level. Similarly, the grey literature was also searched for key documents regarding primary health care electronic medical records in Canada and internationally. Second, research capacity in Canada was assessed by conducting a search for Canadian researchers working in areas related to primary health care electronic medical records, and by exploring this topic with participants in key stakeholder interviews. Third,

[1] In this study we focus on electronic records used in-office by primary health care providers in the care of their patients, as opposed to the comprehensive, life-long, cross-health sector record commonly known as an electronic health record.

consultations were held with international experts to understand research capacity and secondary uses of primary health care electronic medical records in countries where electronic medical record use is more advanced. Fourth, key informant interviews were held with stakeholders across Canada, including: leaders in primary health care electronic medical use and implementation; primary health care electronic medical record researchers; and representatives of national and provincial organizations involved in implementing primary health care electronic medical records.

Consultation Sessions: Six consultation sessions were held across Canada (in Calgary, Halifax, Montreal, Regina, Toronto, and Vancouver) with stakeholders to discuss and prioritize gaps in knowledge and research regarding electronic medical records in primary health care. Prior to the sessions, we identified twelve gaps in knowledge and research from the interviews conducted during the environmental scan with primary health care electronic medical record stakeholders. Participants were involved in four components of each consultation session: 1) discussion of the twelve gaps; 2) identification of any additional gaps that had not been previously captured; 3) prioritization of all the gaps; and, 4) brainstorming of strategies to address specific gaps, which were selected by participants.

Synthesis of Key Findings: Based on the study findings, we offer a synthesis designed to assist CIHR's Institute for Health Services and Policy Research in its planned or future funding priorities. This includes the following six recommendations:

1. Create a Chair focused on primary health care electronic medical record research. The creation of the Chair would contribute towards addressing the current lack of research capacity, and the lack of cooperation and collaboration for electronic medical record research, identified in this study. This could be a National Chair providing: a) structure to create a national collaborative network; b) funds for salary plus funds for the Chair to allot to PhD students and Post-Doctoral Fellows. These provisions would thereby assist the current generation of researchers but mostly would build future researchers.

2. Issue a call for proposals to assess the value of the electronic medical record and/or its components. This recommendation is based on the findings of this study, which illustrate an imbalance between the number of papers regarding the value of electronic medical records to health care delivery, and participants' ranking of the value proposition as the highest priority. The call could focus on the following types of proposals:
    - Systematic reviews of the value of electronic medical records to a variety of outcomes such as system integration, informational continuity, improvements to the process of care, interprofessional collaboration, as well as provider satisfaction and experiences using the electronic medical record.
    - Comparison of the use of electronic medical record features (e.g. decision support) in relation to system, provider, and patient outcomes.
    - Exploration of the utility of the secondary uses of electronic medical record data.

3. Issue a call for proposals on the development of demonstration models on knowledge translation specific to electronic medical records, and evaluation of these model interventions to promote change. This is based on the study finding that there were a substantial number of papers and reports on implementation and adoption of electronic medical records, but the topic was still considered the second highest priority gap.

4. Engage key stakeholder partners to open a dialogue to identify common ground and avenues for future collaborations regarding: 1) raising the sophistication of electronic medical record products; 2) enhancing the standard of electronic medical record products (e.g. through creation of opportunities to develop electronic medical record projects in a secure environment with input from key stakeholders); 3) encouraging joint funding of research calls that will assist the agenda of electronic medical record vendors, such as the call for studies on electronic medical record value. This links the opportunity that exists in Canada of a political desire to foster the knowledge economy with CIHR's desire for funding partners.

5. Develop a partnership among key stakeholders to develop innovation data entry and extraction approaches and to test their usability.

6. Create a policy-oriented initiative on the topic of data sharing. Given the federal/provincial health system in Canada, as well as the lack of cooperation in research and policy, and the lack of solutions regarding rules and governance of electronic medical records, a policy-oriented initiative is recommended. There appears to be a lack of consensus on the ethical and legal issues, and fear of sharing because of potentially doing the wrong thing. Therefore, processes developed by key stakeholders to clarify knowledge, transfer knowledge, and integrate the knowledge more widely are needed.

Conclusion: This study explored gaps in research and knowledge regarding primary health care electronic medical record use for clinical care, research, and policy making in Canada. While efforts are underway to increase levels of electronic medical record use in primary health care in Canada, overall levels of adoption remain low. Canada is still in the early stages of electronic medical record use in primary health care. There are significant gaps in our knowledge and research regarding electronic medical records. Specifically, those gaps related to the value of electronic medical records, electronic medical record implementation and adoption, data entry and extraction procedures, and data sharing were identified as having the highest priority in this study. Relatively few resources are available to inform these gaps in knowledge and research, and Canada has sparse research capacity with which to ameliorate the gaps. However, addressing these gaps may lead to advances in primary health care electronic medical record use in Canada. In keeping with these findings, we identified six recommended options designed to increase the capacity in electronic medical record research in primary health care, and address the main gaps in knowledge and research identified in this study. We offer these recommendations with a view toward the development of the full potential of primary health care electronic medical record use in Canada.

1.0 Introduction

Although the level of electronic medical record adoption[1] in primary health care across Canada remains low (37%) in comparison to countries such as the Netherlands (99%), and the United Kingdom, (96%), gains have been made in recent years (1;2). In addition, the implementation of electronic medical records in primary health care has received increased emphasis, as evidenced by Canada Health Infoway's recent announcement of a program which aims to have an additional 15,600 physicians in the community using electronic medical records over the next three years (3).

Primary health care electronic medical records represent an important source of information for clinicians and their patients, policy-makers, as well as researchers; nonetheless, there are significant challenges associated with implementing these records (4-8). We can anticipate that these systems will eventually be in wide-spread use within primary health care in Canada. However, there is a gap in our understanding and expertise about how to best utilize electronic medical record information, because Canada is at such an early stage in electronic medical record use (9). In addition, primary health care electronic medical records are designed specifically for patient care; secondary uses of electronic medical record data for research and policy-making are challenging (10;11)

This report presents the results of a study funded by the Canadian Institutes of Health Research - Institute for Health Services and Policy Research, in the "Nationally-focused Needs, Gaps and Opportunities Assessments in Health Services and Policy Related to Electronic Health Records" competition of winter 2008. The purpose of this study was to assess primary health care electronic medical record use for clinical care, policy-making and research in Canada. Specifically, we set out to identify and prioritize gaps in current knowledge and research capacity regarding primary health care electronic medical record use. There were two elements of this study: 1) conducting an environmental scan; and, 2) implementing a collaborative consultation process designed to identify priority areas emerging from the environmental scan and strategies to address these priorities. Within the scan we focused on two prominent clinical elements in primary health care, which are family physicians and primary care nurses. This study received approval by The University of Western Ontario's Review Board for Health Sciences Research Involving Human Subjects

2.0 Environmental Scan

The purpose of the environmental scan was to describe and assess the current state and capacity of primary health care electronic medical record use for clinical care, policy making, and research in Canada. The following sections contain two components: 1) an overview of the process that was used to develop the environmental scan; and 2) the details of the environmental scan.

[1] In this study we focus on electronic records used in-office by primary health care providers in the care of their patients, as opposed to the comprehensive, life-long, cross-health sector record more commonly known as an electronic health record.

2.1 Process of Environmental Scan

Using an integrated approach, there were four key data collection strategies to address the objective for the environmental scan described above. First, we conducted a search of the literature for publications regarding primary health care electronic medical records in Canada and at the international level. Similarly, the grey literature was also searched for key documents regarding primary health care electronic medical records in Canada and internationally. Second, research capacity in Canada was assessed by conducting a search for Canadian researchers working in areas related to primary health care electronic medical records, and by exploring the this topic with participants in key stakeholder interviews. Third, consultations were held with international experts to understand research capacity and secondary uses of primary health care electronic medical records in countries where electronic medical record use is more advanced. Fourth, key informant interviews were held with stakeholders across Canada, including: leaders in primary health care electronic medical use and implementation; primary health care electronic medical record researchers; and representatives of national and provincial organizations involved in implementing primary health care electronic medical records. The interview guide included questions designed to complement and add to the information gathered from the literature review. The details of the environmental scan are presented below in sections 2.2 to 2.6.

2.2 Summary of Published Literature

Methods

The purpose of the search of the published literature was to identify the profile of current studies on primary health care electronic medical records in the international literature. We searched the following databases: Scholars Portal Arts and Humanities; Scholars Portal Social Science; Scopus; PubMed; Cumulative Index to Nursing and Allied Health Literature; EmBase; Medline; and the Cochrane Library using a combination of keywords focused on primary health care and electronic medical records, for the time period 1999-2009. Please see Appendix 1 (pg.18) for additional details of the search. A categorization scheme (contained in Appendix 1) was developed and tested with a subset of publications. The abstracts of publication selected for inclusion were reviewed and categorized according to this scheme. Additionally, we reviewed the selected abstracts to determine the first author's geographic location.

Results

Of the 681 publications selected for inclusion, the top five countries (of first author location) included: USA (353); United Kingdom (90); the Netherlands (81); Australia (30); and Canada (25). Approximately one-third (250) of the 681 publications selected used primary health care electronic medical records as a study data source. Of the remaining 431 publications, 100 (23%) were studies of primary health care electronic medical record implementation and adoption; 97 (23%) examined the impact of primary health care electronic medical records on patient care or their use as a tool in patient care; 50 (12%) related to primary health care electronic medical record research; 65 (15%) were about the development of electronic medical records; 42 (10%) were studies of data quality; 38 (9%) explored providers' use of primary health care electronic medical records (post implementation and adoption); 17 (4%) studied patient views regarding primary health care electronic medical records; 16 (4%) were regarding privacy/confidentiality; and, 6 (1%) were about electronic medical record education.

Additionally, we conducted a supplemental search of the legal literature. Searches were conducted on three law databases: Hein-On-line; Lexus Nexus; and, the Index to Legal Periodical and Books for the years 1999 to 2009. Please see Appendix 1 (pg.18) for additional search details. We examined the 29 papers that were found with this search and identified their main themes. These themes included: patient privacy and secondary uses of patient data (such as research); questions surrounding access to the record; definitions of a medical record within the various types of digital formats (electronic health record, electronic medical record, personal health record); long term data storage and retention; and, the consequences of having the data permanently stored in a digital format without any paper backups.

2.3 Summary of Grey Literature

Methods

The grey literature search strategy was designed to cover Canada as a whole and each province and territory on an individual basis. We conducted a series of Internet searches on the websites of professional organizations relevant to primary health care, government and related organizations, and electronic medical record support programs to identify key resource documents related to primary health care electronic medical records. We excluded newsletters, press releases, commentaries, newspaper and magazine articles, annual reports and materials that did not have a major focus on primary health care electronic medical records. We also conducted a similarly structured search of the international grey literature in five countries with the highest electronic medical record adoption rates identified by Schoen et al. (2) (Australia, the Netherlands, New Zealand, Norway, and the United Kingdom).

Results

We identified a series of key resource documents and websites at the pan-Canadian level and also provincially. We also included well-known resource websites which emerged during this search. In terms of the provinces, key resources were found in Alberta, British Columbia, Manitoba, Newfoundland, Nova Scotia, Ontario, Quebec, and Saskatchewan. Please see Table 2 in Appendix 2 (pg.19) for a detailed summary of the results. On the whole, these resources dealt with: 1) electronic medical record implementation and adoption; 2) data sharing and privacy; 3) case studies of electronic medical record use; and, 4) guidelines and policies regarding electronic medical record use. The search of the international literature yielded a greater number of resources than were found in our Canadian search, likely reflecting the advanced stage of implementation and adoption in these countries. Overall, these resources dealt with: 1) guidelines and policies regarding electronic medical record use: 2) future plans for expansion; and, 3) case studies of implementation and adoption.

2.4 Research Capacity Assessment

The following section discusses primary health care electronic medical record research capacity in Canada. We took two main approaches to assessing this capacity. First, we conducted searches of bibliographic and granting agency funding databases to identify Canadian researchers working in areas relevant to primary health care electronic medical records. Second, we explored the perspectives of participants in our key stakeholder interviews regarding primary health care electronic medical record research capacity in Canada.

Primary Health Care Electronic Medical Record Researchers in Canada

To identify researchers, we conducted searches of: a) PubMed, OvidMedline, and Scopus bibliographic databases for relevant publications of Canadian authors; b) Canadian Institutes of Health Research Funded Research Database, Canadian Research Information System, and other funding databases for recipients of relevant grants. For additional information regarding the search and detailed results, please see Appendix 3. (pg.26) To ensure that material would be captured that might relate to primary health care electronic medical records, we expanded the scope of the search to include papers and grants which had a broader focus than electronic medical records, such as those focusing on health informatics.

Of 84 relevant publications by Canadian authors, 36 (43%) were from Ontario, 23 (27%) from Quebec, 16 (19%) from British Columbia, 5 (6%) from Alberta, and 2 (2%) from Nova Scotia. Two additional papers were written by authors from pan-Canadian organizations. Thirty-eight CIHR research grants were identified, with the following breakdown across Canada: 16 (42%) in Ontario; 12 (32%) in Quebec; 5 (13%) in Alberta; 4 (11%) in British Columbia; and 1 (3%) in Nova Scotia. Additionally, of five identified Canada Research Chairs, 4 were from Ontario, and one from Quebec. There were four relevant Canada Foundation for Innovation grants, 3 from Ontario and 1 from Nova Scotia.

Perspectives of Interview Participants - Research Capacity

There were two main themes that emerged from interviews we conducted with primary health care electronic medical record stakeholders: 1) lack of research capacity across Canada; and, 2) the need for collaborative initiatives. Section 2.6 of this report contains an overview of the main findings of the stakeholder interviews; the findings presented here focus on research capacity.

First, within the theme of lack of research capacity, participants indicated that there were few researchers, and that they were in disparate locations across the country. In addition, participants noted there were few sources of funding with which to conduct relevant research, and a lack of training opportunities in e-health. One participant characterized the situation in the following way:

> *It's a pretty dry field right now, there aren't a whole lot of grants and there aren't a whole lot of skill sets available, and those that are available are scarce and hard to come by.*

Further issues identified within this theme included the lack of capacity to use available information to manage the system better, and little applied research being conducted.

Second, participants described the need for researchers to come together in larger groups to tackle problems collaboratively, led by top experts in the field. As one participant suggested,

> *There needs to be some focus…where we stop…one group fighting against another group but rather put together a national group on some basis in primary*

> *care informatics. That would be relatively easy because it's such a few and such a disperse group of people. That would really make a difference.*

Another participant indicated,

> *..the next step is to actually start networking. It's going to take a larger group to help solve some of these issues.*

This type of collaborative initiative was viewed as one way of addressing some of the research capacity issues present within the primary health care electronic medical record domain in Canada.

Summary

The results of our search for primary health care electronic medical record researchers in Canada illustrates the overall low numbers of researchers in this field, as well as their concentration in a few provinces across Canada - Ontario, Quebec, British Columbia, and Alberta being the foremost. Our findings from the key informant interviews support these results. Based on this, primary health care electronic medical record research capacity in Canada may be described as low, with a few researchers spread across Canada in disparate locations. This poses a challenge to the formation of networks of researchers collaborating on primary health care electronic medical record research. Overall, these results may not be unexpected given the early stages of electronic medical record use in primary health care in Canada.

2.5 Consultation with International Experts

Methods

For this component of the environmental scan, we explored Canada's research capacity in comparison to other countries where primary health care electronic medical record use is more advanced, and the state of best practices for secondary uses of primary health care electronic medical record data in these countries. To do this, we contacted three international experts for discussion of these issues: Dr. Michael Kidd (Professor & Executive Dean, Faculty of Health Sciences, Flinders University, Adelaide, Australia); Dr. Simon de Lusignan (Head of General Practice and Primary Care, Division of Community Health Sciences, St. George's – University of London, England); and Dr. Chris van Weel (Professor of Family Medicine, Chair of Department Family Medicine, University Medical Centre, Nijmegen, the Netherlands). These experts were chosen because they are from among the countries with the highest primary health care electronic medical record adoption rates in the world.

Results

Summary of Discussion with International Experts - Two of the three countries (United Kingdom and the Netherlands) have well established primary health care research networks and large electronic medical record-derived research databases. The context for the use of electronic medical record data for these secondary purposes includes: a "cultural norm" in these countries; the organization of the health care system; the presence of clinical leaders who are part of developing these initiatives; and, the presence of a research infrastructure. In the

United Kingdom for example, there are built-in secondary uses of electronic medical record data associated with the Quality and Outcomes Framework used by the government to link performance to primary health care provider remuneration. On the other hand, while Australia has a very high level of electronic medical record adoption (95% of primary care physicians), there are very few instances where electronic medical record data are brought together for secondary use, and individual researchers working in the area are scattered across the country (2). The main focus in Australia appears to be on the development of personally controlled health records, with resultant implications for sorting out who controls and is able to use these data.

In contrast, electronic medical record data are being brought together in the U.K. and the Netherlands. In terms of enabling research capacity, one expert suggested the importance of synchronizing data needed for clinical practice with that needed for research, whereby "the EMR is a method to link the reality of practice with the reality of research". However, it was also noted that electronic medical record research faces a challenge in raising its profile within the broader domain of medical research, and also that core principles associated with the field need to be defined. Areas of Asia, in particular, Taiwan, Korea and Hong Kong were viewed as likely to emerge as leaders in primary health care electronic medical record as much investment in this area is currently occurring.

In conclusion, there are three aspects which drive secondary uses of electronic medical record data and the development of research capacity in specific countries: 1) level of electronic medical record adoption and use; 2) a history of research infrastructure and network development; 3) a connection between the need to examine what is happening in primary health care practice and the use of electronic medical record data to do this.

2.6 Key Stakeholder Interviews

Methods

Interviews were conducted with primary health care electronic medical record stakeholders across Canada, regarding the use of primary health care electronic medical records for clinical care, policy making, and research. With these interviews we sought to understand factors impacting the use of primary health care electronic medical records, and current strengths, issues, and goals.

Participants were recruited from an initial set of primary health care electronic medical record stakeholders identified by the research team. We then used snowball sampling, wherein we asked each interview participant to identify other key stakeholders. There were 35 respondents, including policy makers (10), clinicians (18), researchers (17), and an electronic medical record software vendor. Some participants had dual roles, such as clinician researchers, and therefore would be counted twice. Please see Appendix 4 (pg.54) for a list of participants. After obtaining informed consent, semi-structured interviews were conducted with the participants, which were audio taped and transcribed verbatim. We took a thematic approach to analyzing the data.

Results

Two contextual themes emerged from the data analysis: the nature of the primary health care milieu; and the electronic medical record environment in primary health care. In addition, our analysis illuminated twelve gaps in knowledge and research, including: ascertain the value of electronic medical records; need to better understand elements of electronic medical record implementation & adoption; need to develop innovative data entry & extraction procedures; lack of agreement and understanding of data sharing; need to better understand and define the roles/views of the patient; lack of consensus and understanding of privacy & confidentiality; lack of an overarching framework for interoperability; lack of national leadership; need to define data elements; develop an ideal electronic medical record design; develop information technology knowledge and resources; and, need to share experiences. These inter-related themes are summarized briefly in the following section. Figure 1 in Appendix 5 (pg.56) illustrates the relationship among the themes. Please note that the 12 gaps listed above appear in order of importance while Figure 1 in Appendix 5 (pg.56) shows them in their inter-relationships conceptually. In addition, please see Appendix 6 (pg.57) for more detail of the themes.

Contextual Themes

Nature of the Primary Health Care Milieu

Within the primary health care milieu theme, there were a number of elements that participants described that had the potential to impact on electronic medical record adoption and use. First, primary health care practice was characterized as very busy; this would likely affect providers' willingness to take on something new, such as electronic medical records into their practice. Second, it was noted that electronic medical records should support the central role primary health care plays within the health care system. Third, providers were focused on the patient-provider relationship and patient care; other considerations such as using electronic medical record data for research or policy making were viewed as less important. Fourth, the potential negative impacts of the electronic medical record on clinical care if the tool itself did not reflect the needs of providers, was described. Fifth, the evolving use of electronic medical records in primary health care was seen a factor in the possible identification of electronic medical records as a standard of practice. Finally, participants suggested that primary health care provider remuneration was a potential influencer of electronic medical record adoption.

Electronic Medical Record Environment in Primary Health Care

There were several inter-related elements that participants outlined within the theme of the electronic medical record environment in primary health care. First, it was acknowledged that Canada was at a beginning stage of electronic medical record implementation and use in primary health care. Recent governmental attention, and the shift in Canada Health Infoway's focus toward electronic medical record implementation in primary health care, were viewed was positive developments. However, there were differing views regarding the benefit and scope of electronic medical record support programs and funding. Second, there were some divergent perspectives on the question of the number of electronic medical record vendors in Canada – while the majority view held that there should be a limit on the number of products, other participants indicated the opposite. Consistent standards for electronic medical records were also raised as important aspects of electronic medical record development. A third element outlined was the need to engage providers more fully, so that systems, and the processes to implement them, could be developed which would better meet their needs. Fourth was the need to use electronic medical record systems to their full capacity – not to mimic paper charts, but to both develop and fully utilize the capabilities of the systems. Part of this use involves managing the practice population – being able to use the data in the electronic medical record for improving care. Finally, the last element outlined by participants was the importance of an electronic medical record that connects with the broader electronic health record.

Summary of Gaps in Knowledge and Research

Gaps in knowledge and research emerging from the interviews were classified into the following twelve specific themes. We have briefly outlined these gaps, along with some definitional examples below. Some gaps relate to knowledge and/or and research, while others have a policy relevant dimension, these are identified within the brackets after each gap heading. Please see Appendix 6 (pg. 57) for additional description of the gaps.

1) Ascertain the value of electronic medical records (Knowledge & Research)

a) Explore the value of the electronic medical record to providers, patients, and the health care system

2) Need to better understand elements of electronic medical record implementation & adoption (Knowledge & Research)

a) Understand why systems are not used to their full capacity
b) Determine the best way to implement
c) Explore what influences uptake the most
e) Investigate why implementation levels are low in Canada

3) Need to develop innovative data entry & extraction procedures (Knowledge)

a) Identify & develop best methods to enter and extract data
b) Define coding procedures and data standards to be used across the country

4) Lack of agreement and understanding of data sharing (Knowledge & Policy)

a) Lack of governance framework
b) No consensus on data sharing & secondary uses of data

5) Need to better understand and define the roles/views of the patient (Knowledge & Research)

a) Determine how patients get involved with electronic records
b) Understand patients' preferences

6) Lack of consensus and understanding of privacy & confidentiality (Knowledge, Policy & Research)

a) Need for discussion on privacy issues with all stakeholders
b) Develop systems that respond to privacy concerns

7) Lack of an overarching framework for interoperability (Knowledge & Policy)

a) Need for connectivity with other providers/rest of system

b) Lack of interoperability among software products
c) Need to focus on interoperability in Canada

8) Lack of national leadership (Policy)
a) Need for national leadership and vision on overall strategy for health information and electronic medical records in Canada
b) Need for forums to discuss broader issues of use

9) Need to define data elements (Knowledge & Research)
a) Identify the data elements that primary health care providers, researchers, and policy makers are looking for to answer questions about primary health care

10) Develop an ideal electronic medical record design (Knowledge & Research)
a) Develop evidence about ideal design/ideal interface that could facilitate use, ameliorate issues of coding vs. free text, support data entry and extraction

11) Develop information technology knowledge and resources (Knowledge & Research)
a) Educate future health care providers in using electronic medical records.
b) Develop human resources with informatics and health care background

12) Need to share experiences (Knowledge)
a) Share successes and failures about electronic medical records among stakeholders

In summary, there are many areas where there is uncertainty or a lack of knowledge, and certainly gaps in research regarding electronic medical records in primary health care. The contextual themes and gaps in research and knowledge form an inter-related and complex web of factors which influence electronic medical record adoption and use in Canada. A conceptual design of these relationships is depicted in Figure 1 (please see Appendix 5 pg. 56).

3.0 Consultation Session - Prioritization of Gaps in Knowledge and Research

The following sub-sections presents an overview of the process taken to prioritize the gaps in knowledge and research which emerged from the stakeholder interviews, the results of the prioritization process, and the strategies to address the gaps developed by participants in the consultation sessions.

3.1 Process of Consultation Sessions to Prioritize Gaps in Knowledge and Research

Six consultation sessions were held across Canada (in Calgary, Halifax, Montreal, Regina, Toronto, and Vancouver) with stakeholders to discuss and prioritize gaps in knowledge and research regarding electronic medical records in primary health care. Participants were identified from the list of names developed for the stakeholder interviews (see section 2.6). Appendix 7 (pg.64) contains the list of the participants in the consultation sessions. Prior to the sessions, we had identified the twelve gaps in knowledge and research from the interviews conducted with stakeholders across Canada (these are the same gaps shown in previous pages - please see section 2.6). These gaps were presented to the participants in the consultation sessions. Participants were involved in four components of each consultation session: 1) discussion of the twelve gaps; 2) identification of any additional gaps that had not been previously captured; 3) prioritization of all the gaps; and, 4) brainstorming of strategies to address specific gaps, which were selected by participants. For the prioritization component of the session, participants were asked to rank the gaps either high or low according to the Canadian Institutes of Health Research (CIHR) criteria of: strategic importance; scientific importance; as well as an additional criterion of urgency. The results of this prioritization process, summarized across all consultation sessions, are presented below in Table 1. A summary of the discussion on the existing and new gaps is summarized in Appendix 8. (pg.66) The strategies participants identified to address the gaps are also outlined below.

3.2 Prioritization of Gaps in Knowledge and Research

Table 1 reflects the prioritization of the gaps in knowledge and research summarized across all six consultation sessions. Gaps were scored either “high”, “low”, or “variable” depending on the ranking the participants assigned according to the three criteria (strategic importance; scientific importance; and urgency). If the majority of participants ranked a gap high across all three criteria then it was scored as “high”. Similarly, if the majority ranked a gap low, it was scored as “low”. If there was variability in the ranking across the three criteria among participants, then the gap was scored as “variable”.

Table 1 Results of Prioritization of Gaps in Knowledge and Research

Gaps in Knowledge/Research (6 sessions)[2]	Scores Assigned in Consultation Sessions*		
	High	Low	Variable
1. Ascertain the value of electronic medical records	5	..	1
2. Need to better understand elements of electronic medical record implementation & adoption	4	..	2
3. Need to develop innovative data entry & extraction procedures	3	1	2
4. Lack of agreement and understanding of data sharing	3	1	2
5. Need to better understand and define the roles/views of the patient	2	..	4
6. Lack of consensus and understanding of privacy & confidentiality	2	1	3
7. Lack of an overarching framework for interoperability	1	..	5

[2] Additional gaps identified by participants within the group consultations sessions included: data quality and usability; how EMRs could support continuity of care and what clinical content would be required to support transitions in care; how to best use EMRs in the teaching process of primary health care providers and how to best utilize EMRs in academic family medicine/primary health care; ascertaining the value and impact of EMRs from a social, economic, patient care and provider relationship perspective; and, determining the problems we are trying to solve by using EMRs.

Gaps in Knowledge/Research (6 sessions)[2]	Scores Assigned in Consultation Sessions*		
	High	Low	Variable
8. Lack of national leadership (not rated in 1 session)	1	..	4
9. Need to define data elements	1	1	4
10. Develop an ideal electronic medical record design	1	3	2
11. Develop information technology knowledge and resources	1	1	4
12. Need to share experiences	..	3	3

* A maximum score could be 6 and a minimum 0. 0-6 is a count of the consultation sessions.

Looking at Table 1, in the majority of sessions (four or more out of six), the gaps of "ascertain the value of electronic medical records" and "need to better understand elements of electronic medical record implementation & adoption" ranked highly. In half of the sessions, the "need to develop innovative data entry & extraction procedures" and "lack of agreement and understanding of data sharing" gaps were highly ranked. In contrast, in the majority of sessions the gaps of "need to better understand and define the roles/views of the patient", "lack of an overarching framework for interoperability", "lack of national leadership", "need to define data elements", and "develop information technology knowledge and resources" had variable rankings. In half of the sessions, "develop an ideal electronic medical record design" and "need to share experiences" gaps were ranked low. Finally, the privacy and confidentiality gap represents a mixed picture in terms of the rankings across the sessions.

Five additional gaps originated from the consultation sessions (see footnote previous page), namely: data quality; continuity of care; electronic medical record in the academic setting; strategic investment; and, purpose of the electronic medical record. These were also ranked highly in individual consultation sessions.

As a final step, we reviewed the top gaps identified in Table 1 against two additional CIHR criteria: cross-sector CIHR relevance; and potential for funding. The top gaps identified by participants are relevant to all three CIHR Institutes (Institutes for Health Services and Policy Research, Aging, and Nutrition, Metabolism and Diabetes) sponsoring the Needs, Gaps and Opportunities Assessment Competition, as well as the majority of the rest of CIHR's Institutes. The top four gaps are applicable to at least three of four CIHR research themes of biomedical research, clinical research, health systems and services, and population and public health. Therefore, our review of the gaps found they were highly relevant across CIHR.

Based on information available to us, we could not apply the criteria related to the potential for funding. That is best done by analyzing CIHR's internal data to determine the actual application pressure in this area. This may further illuminate research potential in the area of primary health electronic medical records. We did examine the results of the latest CIHR targeted Catalyst Grant - Primary and Community-Based Healthcare competition. Of sixteen proposals that were funded in this competition, three (19%) relate to electronic records. This type of targeted call appears to have been somewhat successful in attracting primary health care researchers with an interest in electronic records. In addition, we have made a general assessment of research capacity in Canada (see section 2.4).

3.3 Strategies to Address Gaps in Research and Knowledge

Participants in the group consultation sessions were also involved in brainstorming strategies to address selected gaps in knowledge and research. The gaps to be discussed were selected by the participants in the consultation sessions; therefore not all gaps presented in Table 1 were discussed in the brainstorming session.

Ascertain the Value of Electronic Medical Records

Participants suggested research was needed about the effectiveness and value of electronic medical records, which was the highest ranked gap. Questions were raised which focused on ascertaining the impact of electronic medical records on patient safety, patient outcomes and continuity of care, efficiency, value for patients, and value for the health system versus providers. In addition, it was suggested that the link between the purpose of the systems, their features, and the benefits needed to be explored. Participants also discussed the importance of determining what we want to achieve with electronic medical records, and what "meaningful use" of electronic medical records would be. Participants suggested that a Delphi process could be used with users and non-users of electronic medical records to define the purpose and value of these systems. The purpose and value of the systems was linked to strategic investment. A final point raised was the need to demonstrate the importance of primary health care in the health system by using data derived from electronic medical records.

Need to Better Understand Elements of Electronic Medical Record Implementation and Adoption

Participants discussed what influenced implementation and adoption of electronic medical records by posing a series of questions along two fronts - structural elements in the system, such as physician compensation, and process elements such as learning styles. Structural elements included questions about determining: the optimal environment or milieu for implementation; existing success stories; lessons from other countries, particularly in terms of physician compensation; mandatory implementation of electronic medical records or not; drivers of implementation and adoption e.g. the influence of physician funding and support; the influence of different practice models; and, the effect of generational gaps. Similarly, in terms of process elements, questions were posed regarding: the influence of interface/structure of the electronic medical record; learning styles of the users; impact of strategies used in different practices; identifying the best change management practices, and determining which delivery methods work. Participants also emphasized the need for patient-centred adoption.

Need to Develop Innovative Data Entry & Extraction Procedures

Participants identified various aspects within this theme, including: 1) determining how to produce the best quality data with the least intrusion on clinical work, and how to apply the best evidence in using the electronic medical record; 2) identifying what is available in the electronic medical record, and what extraction tools are needed to get the information that is desired; 3) creating standards to minimize variation; and, 4) identifying the causes of poor data. Further discussion centred on the development of technology to facilitate the extraction of narrative data, so that this type of data could continue to be entered, but would be converted to be interpretable/measureable.

Lack of Agreement and Understanding of Data Sharing

In terms of data sharing, participants suggested developing a framework that would illuminate the data needs of various stakeholders so that the gaps in data sharing, including the purpose for the data, could be more clearly understood. Session participants identified a need for a better understanding of the legal and clinical implications of shared data for patients and providers. In addition, an understanding of legislation across Canada is necessary. Participants indicated a need to decide what data are required, and that these decisions are governed by the legal, ethical and business practices of organizations. A further point was that the context of these data is important. Additionally, learning from other countries regarding data sharing was also suggested, however it was noted that the context is different in other jurisdictions.

Need to Better Understand and Define the Role/Views of the Patient

Participants suggested that exploration was needed regarding the patient/public's involvement in the creation of their health record, their views about viewing or entering data into their record, mechanisms to communicate with health care providers, and their role in relation to the electronic medical record. A further point raised was that potential downsides and/or benefits of an increased patient role have not been explored.

Lack of an Overarching Framework for Interoperability

Discussion for this gap focused on the development of models for system functioning, coordination/continuity of care, agreements between providers, as well as determining what a good electronic medical record is and differentiating this with the electronic health record.

Lack of National Leadership

A strategy suggested by participants for this gap was to implement a "Listening for Direction" approach used by the Canadian Institutes of Health Research/Canadian Health Services Research Foundation to identify priorities. This would need to be a broad-based consultation process with representation from many sectors.

Need to Define Data Elements

Strategies for this theme included determining what data elements are needed for providing care, assessing outcomes, and policy making. In addition, elements that could be reported on, for example in populating the Canadian Institute for Health Information (CIHI) Primary Health Care Indicators need to be identified. Further strategies suggested were to look at what has been useful in other countries, and to ensure that there is evidence for the data elements chosen. Further, consultation session participants indicated that data sharing, interoperability, data elements, data entry, data quality, and continuity of care were inter-related in a "data life cycle", and that there should be a "pragmatic mapping" process between what physicians want to capture in terms of data and what policy makers and researchers want – this would be a process of looking at the "art of the possible".

Develop an Ideal Electronic Medical Record Design

In terms of ideal electronic medical record design, participants focused on strategies such as developing a monograph describing what an ideal electronic medical record would look like, defining the functional components of an electronic medical record, focusing on the user interface, and defining data elements. Ideal electronic medical record design was seen as a facilitator of electronic medical record implementation.

Determine Best Use of an Academic Electronic Medical Record (from list of additional gaps)

Discussion regarding this gap centered around using the electronic medical record as a tool in teaching family medicine, for example in self-assessment and performance of teachers, in tracking student/resident activities, and assessing if this approach improved educational outcomes.

Summary

Participants in the consultation sessions discussed gaps in research and knowledge identified from the key informant interviews, identified new gaps, and engaged in a prioritization process. Strategies to address these gaps were also outlined. The four gaps that emerged from this process as priorities for change in the Canadian primary health care electronic medical record context include: 1) assessing the value proposition of electronic medical records to primary health care providers, patients, the health care system, researchers, and policy makers; 2) exploring key factors in electronic medical record implementation and adoption; 3) determining how best to enter and extract data from electronic medical records; and, 4) identifying the who, what, where, when, how and why of data sharing. Five additional gaps highly ranked in some consultation sessions were: data quality; continuity of care; electronic medical records in the academic setting; strategic investment; and purpose of the electronic medical record.

4.0 Synthesis of Key Findings

Combining the findings of the environmental scan and the consultation sessions with a SWOT (Strengths and Weaknesses, Opportunity and Threats) analysis conducted by the three Principal Investigators, we offer a synthesis designed to assist the CIHR's Institute for Health Services and Policy Research in its planned or future funding priorities. This includes the following six recommendations:

1. Create a Chair focused on primary health care electronic medical record research. The creation of the Chair would contribute towards addressing the current lack of research capacity, and the lack of cooperation and collaboration for electronic medical record research, identified in this study. This could be a National Chair providing: a) structure to create a national collaborative network; b) funds for salary plus funds for the Chair to allot to PhD students and Post-Doctoral Fellows. These provisions would thereby assist the current generation of researchers but mostly would build future researchers.

2. Issue a call for proposals to assess the value of the electronic medical record and/or its components. This recommendation is based on the findings of this study, which illustrate an

imbalance between the number of papers regarding the value of electronic medical records to health care delivery, and participants' ranking of the value proposition as the highest priority. The call could focus on the following types of proposals:

- Systematic reviews of the value of electronic medical records to a variety of outcomes such as system integration, informational continuity, improvements to the process of care, interprofessional collaboration, as well as provider satisfaction and experiences using the electronic medical record.

- Comparison of the use of electronic medical record features (e.g. decision support) in relation to system, provider, and patient outcomes.

- Exploration of the utility of the secondary uses of electronic medical record data.

3. Issue a call for proposals on the development of demonstration models on knowledge translation specific to electronic medical records, and evaluation of these model interventions to promote change. This is based on the study finding that there were a substantial number of papers and reports on implementation and adoption of electronic medical records, but the topic was still considered the second highest priority gap.

4. Engage key stakeholder partners to open a dialogue to identify common ground and avenues for future collaborations regarding: 1) raising the sophistication of electronic medical record products; 2) enhancing the standard of electronic medical record products (e.g. through creation of opportunities to develop electronic medical record projects in a secure environment with input from key stakeholders); 3) encouraging joint funding of research calls that will assist the agenda of electronic medical record vendors, such as the call for studies on electronic medical record value. This links the opportunity that exists in Canada of a political desire to foster the knowledge economy with CIHR's desire for funding partners.

5. Develop a partnership among key stakeholders to develop innovation data entry and extraction approaches and to test their usability.

6. Create a policy-oriented initiative on the topic of data sharing. Given the federal/provincial health system in Canada, as well as the lack of cooperation in research and policy, and the lack of solutions regarding rules and governance of electronic medical records, a policy-oriented initiative is recommended. There appears to be a lack of consensus on the ethical and legal issues, and fear of sharing because of potentially doing the wrong thing. Therefore, processes developed by key stakeholders to clarify knowledge, transfer knowledge, and integrate the knowledge more widely are needed.

5.0 Conclusion

This study explored gaps in research and knowledge regarding primary health care electronic medical record use for clinical care, research, and policy making in Canada. While efforts are underway to increase levels of electronic medical record use in primary health care in Canada, overall levels of adoption remain low. Canada is still in the early stages of electronic medical record use in primary health care. There are significant gaps in our knowledge and research regarding electronic medical records. Specifically, those gaps related to the value of electronic medical records, electronic medical record implementation and adoption, data entry and extraction procedures, and data sharing were identified as having the highest priority in this study. Relatively few resources are available to inform these gaps in knowledge and research, and Canada has sparse research capacity with which to ameliorate the gaps. However, addressing these gaps may lead to advances in primary health care electronic medical record use in Canada. In keeping with these findings, we identified six recommendations designed to increase the capacity in electronic medical record research in primary health care, and address the main gaps in knowledge and research identified in this study. We offer these recommendations with a view toward the development of the full potential of primary health care electronic medical record use in Canada.

6.0 References

(1) Schoen C, Osborn R, Huynh PT, Doty M, Peugh J, Zapert K. On the front lines of care: Primary care doctors' office systems, experiences, and views in seven countries. *Health Affairs* 2006; 25(6):W555-W571.

(2) Schoen C, Osborn R, Doty MM, Squires D, Peugh J, Applebaum S. A survey of primary care physicians in eleven countries, 2009: perspectives on care, costs, and experiences. *Health Affairs (Millwood)* 2009; 28(6):w1171-w1183.

(3) Canada Health Infoway. EHRnews@Infoway: A Newsletter from Canada Health Infoway. Volume 7 - Spring 2009.

(4) Loomis GA, Ries JS, Saywell RM, Thakker NR. If electronic medical records are so great, why aren't family physicians using them? *Journal of Family Practice* 2002; 51(7):636-641.

(5) Valdes I, Kibbe DC, Tolleson G, Kunik ME, Petersen LA. Barriers to proliferation of electronic medical records. *Informatics in Primary Care* 2004; 12(1):3-9.

(6) Miller RH, Sim I. Physicians' use of electronic medical records: barriers and solutions. *Health Affairs (Millwood)* 2004; 23(2):116-126.

(7) Gans D, Kralewski J, Hammons T, Dowd B. Medical groups' adoption of electronic health records and information systems. *Health Affairs* 2005; 24(5):1323-1333.

(8) Simon SR, Kaushal R, Cleary PD, Jenter CA, Volk LA, Poon EG et al. Correlates of electronic health record adoption in office practices: A statewide survey. *Journal of the American Medical Informatics Association* 2007; 14(1):110-117.

(9) Health Council of Canada. Fixing the Foundation: An Update on Primary Health Care and Home Care Renewal in Canada. 1-53. 2008. Toronto, Health Council.

(10) Lobach DF, Detmer DE. Research challenges for electronic health records. *American Journal of Preventive Medicine* 2007; 32(5 Suppl):S104-S111.

(11) de Lusignan S, Hague N, van Vlymen J, Kumarapeli P. Routinely-collected general practice data are complex, but with systematic processing can be used for quality improvement and research. *Informatics in Primary Care* 2006; 14(1):59-66.

Appendix 1

Published Literature - Search Details

We conducted a literature search in the following databases: Scholars Portal Arts and Humanities; Scholars Portal Social Science; Scopus; PubMed; Cummulative Index to Nursing and Allied Health Literature; EmBase; Medline; and, Cochrane Library databases. First, the following search terms were used: general practice, family medicine, primary health care, primary care, ambulatory care, PHC, GP, FP, general practitioner, family practitioner, nurse, nurse practitioner (combined with OR). Second, we searched using the following keywords: electronic medical records; electronic health records; computerized medical record; electronic patient records; computer record; computerized record; information technology; EMR; and, EHR (combined with OR). These two strings were combined with AND. Search limits were: published from 1999 to 2009; English; Human. This yielded 4,258 citations. After excluding duplicates, the publication set included 3,198 citations. We further excluded 2,517 citations based on the following criteria: absence of an abstract, book or book chapter, dissertation, conference proceedings, non academic journal, no focus on primary health care, no focus on electronic medical records. We reviewed each abstract of the 681 publications selected for inclusion and classified the studies into the following categories: data quality; electronic medical record development; electronic medical record tool/impact on patient care; electronic medical record – patient views/access to record; electronic medical record as a data source; privacy and confidentiality, electronic medical record education, electronic medical record implementation and adoption; electronic medical record implementation and adoption (provider focus); electronic medical record implementation and adoption (barriers and facilitators); electronic medical record implementation and adoption (how the electronic medical record has influenced something); electronic medical record use by PHC providers; and research. This categorization scheme was initially tested within a subset of publications and subsequently refined for use with the full set of citations. First author affiliation was used to identify country of origin.

Legal Literature

For the Hein-On-Line and Index to Legal Periodical and Books search we used a keyword searches combining electronic medical records and primary health care. In Lexus Nexus, under the Legal tab, we used a keyword search string: general practice, family medicine, primary health care, primary care, ambulatory care, PHC, GP, FP, general practitioner, family practitioner combined with OR, and a search string of electronic medical records, electronic health records, computerized medical records, electronic patient records, computer records, computerized records, EMR, EHR combined with OR. Both these search strings were combined with AND. The searches resulted in 33 papers; duplicates were removed.

Appendix 2

Table 2 - Summary of Grey Literature Search

Website	Selected Resources
CANADA	
Canadian Medical Association http://www.cma.ca/	• Webpage: http://www.cma.ca/physicians-it Physicians and IT • Status Report: Information technology and health care in Canada: 2010 http://www.cma.ca/multimedia/CMA/Content_Images/Inside_cma/HIT/2010_status_report/IThandbook2010_en.pdf • Case studies: How Canadian Physicians are using EMRs in Clinical Care http://www.cma.ca/index.php/ci_id/88115/la_id/1.htm • Case studies: Experiences for the forefront of EMR use – 20 Canadian physician case studies, 2009 http://www.cma.ca/multimedia/CMA/Content_Images/Inside_cma/Future_Practice/May2009/CasestudiesPubEng.pdf • Status report: EMR case studies research project – a first in Canada (2009) http://www.cma.ca/multimedia/CMA/Content_Images/Inside_cma/HIT/2009_status_report/EMR-cases_en.pdf • Survey: Physician Technology Usage and Attitudes Survey (PPT slides) Presentation October, 2005. http://www.cma.ca/index.php?ci_id=200754&la_id=1 Additional Documents on the CMA website: • Transforming Health Care, Securing Canada's Competitive Advantage, August 14, 2009; A Prescription for Productivity: Toward a more efficient, equitable and effective health system, October, 2005; Budget 2009: Economic Stimulus through Targeted Investments in Health Infrastructure, January 2009; Guiding Principles for Physician Medical Records (EMR) Adoption in Ambulatory Clinical

Website	Selected Resources
	Practice, 2008; Data Sharing Principles for Electronic Medical Record/ Electronic Health Record Agreements, August, 2008; A Handbook for Canadian Physicians, Information technology and health care in Canada: 2007, 2008, and 2009 Status Reports; and Electronic Health Records: A medical liability perspective.
College of Family Physicians of Canada http://www.cfpc.ca/global/splash/default.asp?s=1	• National Physician Survey from 2007 http://www.nationalphysiciansurvey.ca/nps/2007_Survey/2007results-e.asp • Website: **Primary Care Toolkit for Family Physicians** http://toolkit.cfpc.ca/en/introduction/family-physicians-primary-care.php • Vendor Checklist: from Vancouver Coastal Health – "Primary Health Care EMR Education Session, Richmond." http://toolkit.cfpc.ca/en/information-technology/documents/vendor_open_house_checklist1.pdf • Book: "Guiding Facilitation in the Canadian Context: Enhancing Primary Health Care." Chapter 10: Health Information and Communication. Editors: J. Barrett, W. Hogg, V.R. Ramsolen, H. White, eds. Published by Department of Health and Community Services and the Government of Newfoundland and Labrador. http://toolkit.cfpc.ca/en/information-technology/documents/Chapter10.pdf • Presentation: "Electronic Medical Records The Taber Experience," presented to the CFPC/Health Canada Project, November 26, 2006.
Canadian Institute for Health Information http://www.cihi.ca/cihiweb/dispPage.jsp?cw_page=home_e	• Report: Canadian Institute for Health Information Primary Health Care Indicators Electronic Medical Records Content Standards, version 1.1, 2009 http://secure.cihi.ca/cihiweb/en/downloads/CIHI_PHC_Indicators_EMR_Content_Standards_v1%201_EN.pdf
Health Canada – Primary Health Care http://www.hc-sc.gc.ca/	• Report: The EMR Toolkit – Implementing electronic medical records in primary health care settings www.emrtoolkit.ca • Report: Information Management and Technology, March, 2007

Website	Selected Resources
	http://www.hc-sc.gc.ca/hcs-sss/alt_formats/hpb-dgps/pdf/prim/2006-synth-tech-eng.pdf • Survey: Electronic Health Information and Privacy Survey: What Canadians Think – 2007 http://www.hc-sc.gc.ca/ahc-asc/pubs/_atip-aiprp/survey-sondage/index-eng.php
Canada – Resource Websites	
Canadian Medical Association	http://www.cma.ca/
College of Family Physicians of Canada	http://www.cfpc.ca/global/splash/default.asp?s=1
Canada Health Infoway	http://www.infoway-inforoute.ca/lang-en
Canadian EMR	http://www.canadianemr.ca/index.aspx
Office of the Privacy Commissioner of Canada	http://www.priv.gc.ca/index_e.cfm
ALBERTA	
College of Physicians and Surgeons of Alberta http://www.cpsa.ab.ca/	• Policy: Physicians' Office Medical Records Revised 2005 http://www.cpsa.ab.ca/Libraries/Policies_and_Guidelines/Physicians_Office_Medical_Records.sflb.ashx • Guidelines: Transition to Medical Records (EMR) 2004 http://www.cpsa.ab.ca/Libraries/Policies_and_Guidelines/Transition_to_Electronic_Medical_Records.sflb.ashx • Document: Data Stewardship: Secondary Use of Health Information. December 2009 Version1.0 http://www.cpsa.ab.ca/Libraries/Res/Secondary_Use_of_Health_Information_-_Final_December_2009.sflb.ashx • Document: Data Stewardship Framework. December 2006. Version 1.2 http://www.cpsa.ab.ca/Libraries/Res/CPSA_Data_Stewardship_Framework.sflb.ashx

Website	Selected Resources
Government of Alberta: Health and Wellness http://www.health.gov.ab.ca/	• HIA Practice Note 4: Privacy Impact Assessments on Physician Electronic Medical Record Systems. Office of the Information and Privacy Commissioner of Alberta, Office of the Information and Privacy Commissioner of Alberta. April, 2010. http://www.oipc.ab.ca/downloads/documentloader.ashx?id=2560
ALBERTA – Resource Websites	
Alberta NetCare	http://www.albertanetcare.ca
Physician Office System Program	http://www.posp.ab.ca/
BRITISH COLUMBIA	
BC Medical Association https://www.bcma.org/bcma-home-page	• General Guide: BC Physician Privacy Toolkit, 2nd edition. June 15, 2009 https://www.cpsbc.ca/files/u6/BC_Physician_Privacy_Toolkit_2009_update_FINAL_July_8.pdf
BC E-Health initiative http://www.health.gov.bc.ca/ehealth/	• Report: British Columbia's Provincial Health Sector Information Management/ Information Technology Strategy. Developed by the BC eHealth Strategy Council. October 2009. http://www.health.gov.bc.ca/library/publications/year/2009/hsimit_strategy_2009.pdf • Report: eHealth Strategic Framework. British Columbia eHealth Steering Committee. November 2005 http://www.health.gov.bc.ca/library/publications/year/2005/ehealth_framework.pdf
BRITISH COLUMBIA – Resource websites	
BC E-Health initiative	http://www.health.gov.bc.ca/ehealth/
PITO (Physician Information Technology Office)	http://www.pito.bc.ca/
MANITOBA – Resource websites	
Manitoba e-health	http://www.manitoba-ehealth.ca/ehr_CR.html

Website	Selected Resources
NEWFOUNDLAND – Resource website	
Newfoundland Centre for Health Information	http://www.nlchi.nf.ca/
NOVA SCOTIA	
College of Physicians and Surgeons of Nova Scotia http://www.cpsns.ns.ca/	• Guidelines: Guidelines for medical record keeping from The College of Physicians and Surgeons, Nova Scotia. 2008 (Chapter 3:electronic records) www.cpsns.ns.ca/guidelines-policies/2008-medical-record.pdf
NOVA SCOTIA – Resource websites	
Government of Nova Scotia Primary Health Care Information Management (PHIM) Program	http://www.gov.ns.ca/health/primaryhealthcare/PHIM.asp
Government of Nova Scotia e-Health	http://www.gov.ns.ca/health/eResults/default.asp
ONTARIO	
College of Physicians and Surgeons of Ontario http://www.cpso.on.ca/	• Policy: Medical Records http://www.cpso.on.ca/policies/policies/default.aspx?id=1686 • Protocol: Required Electronic Medical Record Components http://www.cpso.on.ca/uploadedFiles/downloads/cpsodocuments/members/peerassessment/Required%20Electronic%20Records.pdf • Website: The Assessment: Medical records : http://www.cpso.on.ca/members/peerassessment/default.aspx?id=1950#TOC0
College of Nurses of Ontario http://www.cno.org/	• Standards: Documentation Practice Standard: Electronic Health Records http://www.cno.org/prac/learn/modules/documentation/slides/eHealthRecords.pdf
Ontario Ministry of Health and Long Term Care http://www.health.gov.on.ca/en/	• Success Story: Sault Ste. Marie Group Health Centre: Big Success in a Small Community http://www.health.gov.on.ca/english/providers/program/cdpm/pdf/ssmarie.pdf

Website	Selected Resources
ONTARIO – Resource Websites	
e-Health Ontario	http://www.ehealthontario.on.ca/
Ontario MD	https://www.ontariomd.ca
QUÉBEC	
College of Physicians of Québec http://www.cmq.org	• La Redaction et la tenue des dossiers par le medicine en cabinet de consultation et en CLSC (September 2006) • http://www.cmq.org/MedecinsMembres/AmeliorationExercice/~/media/AAA96FBF6BDC43B7A65FCF94300012D8.ashx?81014 • Les aspects légaux, déontologiques et organizations de la pratique medicale au Québec http://www.cmq.org/fr/~/media/BFA57996413F49CCA16C35627565BFC7.ashx • Legal, Ethical and Organizational Aspects of Medical Practice in Québec http://www.cmq.org/en/~/media/862BFF31AE2F4F46827090AB10B63A3B.ashx
QUÉBEC – Resource websites	
Québec Electronic Health Record Project Le Dossier de santé du Québec	http://www.dossierdesante.gouv.qc.ca
Dr. Jean-François Rancourt	http://www.gmfquebec.ca
Ministère de la santé et des services sociaux MSSS Ministry of Health and Social Services of Quebec	http://msss.gouv.qc.ca
SASKATCHEWAN	
Saskatchewan Medical Association http://www.sma.sk.ca/	• The Saskatchewan EMR program March 15, 2010 o EMR Champion Guide o Local Workstation Security Guidelines o EMR Vendor Assessment Check List, Software Evaluation https://www.sma.sk.ca/data/1/rec_docs/61_EMR_Program_-

Website	Selected Resources
	_Champion_Guide_-_PDF.pdf
SASKATCHEWAN – Resource websites	
Saskatchewan EMR program	https://www.sma.sk.ca/Default.aspx?cid=4&lang=1

Appendix 3

Research Capacity Assessment – Search Methods & Detailed Results

Canadian Author Search

We conducted a Canadian literature search using three databases: Scopus, PubMed and Medline. The search was conducted in two parts. First, we used the following search terms: general practice, family medicine, primary health care, primary care, ambulatory care, nurse, nurse practitioner, PHC, GP, FP, general practitioner, family practitioner (combined with OR). Second, we searched using the following terms: electronic medical record, electronic medical records, electronic health records, computerized medical record, electronic patient records, computer record, computerized record, health informatics, information technology, electronic medical record, EHR (combined with OR). The results of each search string were combined using AND. Search limits were: published from 1999 to 2010; English; Human; and Canadian first authors. This yielded 159 citations. Fifty-nine duplicates were excluded. The remaining articles were hand searched to ensure the first author was Canadian, and for relevance. This resulted in a final subset of 84 citations. Please see Table 3 (next page) for results.

Table 3 - Primary Health Care – Health Informatics & Electronic Medical Record Researchers in Canada

INSTITUTION	DEPARTMENT	PUBLICATION
Alberta		
University of Alberta	Family Medicine	Nagendran, S., D. Moores, R. Spooner and J. Triscott. 2000. "Is Telemedicine a Subset of Medical Informatics?." *Journal of Telemedicine & Telecare* 6(Suppl 2):S50-1.
University of Alberta	Nursing	Clark, A. M. and I. N. Findlay. 2005. "Attaining Adequate Consent for the use of Electronic Patient Records: An Opt-Out Strategy to Reconcile Individuals' Rights and Public Benefit." *Public Health* 119(11):1003-1010.
University of Alberta	Mechanical Engineering	Ludwick, D., D. Manca and J. Doucette. 2010. "Primary Care Physicians' Experiences with Electronic Medical Records: Implementation Experience in Community, Urban, Hospital, and Academic Family Medicine." *Canadian Family Physician* 56(1).
University of Alberta	Mechanical Engineering	Ludwick, D. A. and J. Doucette. 2009. "Adopting Electronic Medical Records in Primary Care: Lessons Learned from Health Information Systems Implementation Experience in Seven Countries." *International Journal of Medical Informatics* 78(1):22-31.
University of Alberta	Mechanical Engineering	Ludwick, D. A. and J. Doucette. 2009. "Primary Care Physicians' Experience with Electronic Medical Records: Barriers to Implementation in a Fee-for-Service Environment." *International Journal of Telemedicine and Applications*.
British Columbia		
University of British Columbia	Family Practice	Lai, J. K., F. Lau and N. Shaw. 2009. "A Study of Information Technology use and Implementation of Electronic Medical Record Systems in BC Medical Practices." *British Columbia Medical Journal* 51(3):114-121.
University of British Columbia	Nursing	Garrett, B. and G. Klein. 2008. "Value of Wireless Personal Digital Assistants for Practice: Perceptions of Advanced Practice Nurses." *Journal of Clinical Nursing* 17(16):2146-2154.
University of Victoria	Nursing	Petrovskaya, O., M. McIntyre and C. McDonald. 2009. "Dilemmas, Tetralemmas, Reimagining the Electronic Health Record." *Advances in Nursing Science* 32(3):241-251.

INSTITUTION	DEPARTMENT	PUBLICATION
University of Victoria	Computer Science	Gibbs, C. and Y. Coady. 2008. "Dynamic Patient Care with PHACTS: Pervasive Health Adaptive Client Technology System." *Journal on Information Technology in Healthcare* 6(2):150-159.
University of Victoria	Health Informatics	Protti, D. and I. Johansen. 2010. "Widespread Adoption of Information Technology in Primary Care Physician Offices in Denmark: A Case Study." *Issue Brief (Commonwealth Fund)* 80:1-14.
University of Victoria	Health Informatics	Protti, D., I. Johansen and F. Perez-Torres. 2009. "Comparing the Application of Health Information Technology in Primary Care in Denmark and Andalucia, Spain." *International Journal of Medical Informatics* 78(4):270-283
University of Victoria	Health Informatics	Protti, D., T. Bowden and I. Johansen. 2009. "Adoption of Information Technology in Primary Care Physician Offices in New Zealand and Denmark, Part 5: Final Comparisons." *Informatics in Primary Care* 17(1):17-22.
University of Victoria	Health Informatics	Protti, D., T. Bowden and I. Johansen. 2008. "Adoption of Information Technology in Primary Care Physician Offices in New Zealand and Denmark, Part 3: Medical Record Environment Comparisons." *Informatics in Primary Care* 16(4):285-290.
University of Victoria	Health Informatics	Protti, D., G. Wright, S. Treweek and I. Johansen. 2006. "Primary Care Computing in England and Scotland: A Comparison with Denmark." *Informatics in Primary Care* 14(2):93-99.
University of Victoria	School of Health Information Science	Borycki, E. M., L. Lemieux-Charles, L. Nagle and G. Eysenbach. 2009. "Novice Nurse Information Needs in Paper and Hybrid Electronic-Paper Environments: A Qualitative Analysis." *Studies in Health Technology & Informatics* 150:913-917.
University of Victoria	School of Health Information Science	Green, C. J., P. Fortin, M. Maclure, A. Macgregor and S. Robinson. 2006. "Information System Support as a Critical Success Factor for Chronic Disease Management: Necessary but Not Sufficient." *International Journal of Medical Informatics* 75(12):818-828.
University of Victoria	School of Health	Lau, F., J. Yang, J. Pereira, P. Daeninck and M. Aherne. 2006. "A Survey of PDA use by

INSTITUTION	DEPARTMENT	PUBLICATION
	Information Science	Palliative Medicine Practitioners." *Journal of Palliative Care* 22(4):267-274.
University of Victoria	Faculty of Human and Social Development	Schinbein, J., L. Foster, D. Protti, P. Rose and K. Ho. 2008. "The Technology Enabled Physician's Office by 2016." *Journal on Information Technology in Healthcare* 6(2):103-113
BC Research Institute for Children and Women's Health	Centre for Healthcare Innovation	Shaw, N. and G. Hegedus. 2005. "The National Programme for Information Technology: The GP as Gatekeeper - A Bastion Worth Fighting for?" *British Journal of General Practice* 55(511):85-86.
Simon Fraser University and Vancouver Coastal Health		Balka, E., C. Reidl and I. Wagner. 2007. "Using Fieldwork in Analyzing Ethical Issues Related to IT in Health Care." *Studies in Health Technology and Informatics* 129(Pt 1):237-241.
Primary Care Physician		Simkus, R. 2001. "Application of an Intelligent Graphical Interface to Electronic Patient Records." *Studies in Health Technology and Informatics* 84(Pt 1):690-692.
Ontario		
Baycrest Centre for Geriatric Care,	Kunin Lunenfeld Applied Research Unit	Rochon, P. A., T. S. Field, D. W. Bates, M. Lee, L. Gavendo, J. Erramuspe-Mainard, J. Judge and J. H. Gurwitz. 2005. "Computerized Physician Order Entry with Clinical Decision Support in the Long-Term Care Setting: Insights from the Baycrest Centre for Geriatric Care." *Journal of the American Geriatrics Society* 53(10):1780-1789.
Canada Health Infoway		Muttitt, S. C. and R. C. Alvarez. 2007. "Chronic Disease Management: It's Time for Transformational Change!." *HealthcarePapers* 7(4):43-47.
Canadian Medical Association		Scully, H. 1999. "Building on One of the Best Delivery Systems in the World." *HealthcarePapers* 1(1):23-32.
Canadian Nursing Protective Society		McLean, P. 2003. "Professional Liability Risks and Risk Management for Nurses in Telehealth." *Medicine and Law* 22(4):683-691.
Centre for Evaluation of Medicines, St		Shcherbatykh, I., A. Holbrook, L. Thabane and L. Dolovich. 2008. "Methodologic Issues in Health Informatics Trials: The Complexities of Complex Interventions." *Journal of the*

INSTITUTION	DEPARTMENT	PUBLICATION
Joseph's Healthcare Hamilton		*American Medical Informatics Association* 15(5):575-580.
Children's Hospital of Eastern Ontario Research Institute		Garritty, C. and K. El Emam. 2006. "Who's using PDAs? Estimates of PDA use by Health Care Providers: A Systematic Review of Surveys." *Journal of Medical Internet Research* 8(2).
Elisabeth Bruyère Research Institute, Ottawa		Chambers, L. W., J. Kaczorowski, L. Dolovich, T. Karwalajtys, H. L. Hall, B. McDonough, W. Hogg, B. Farrell, A. Hendriks and C. Levitt. 2005. "A Community-Based Program for Cardiovascular Health Awareness." Canadian Journal of Public Health 96(4):294-298.
Guelph Family Health Team	Information Services	St-Maurice, J. D. and R. D. Dony. 2009. "Measuring Change in Primary Healthcare in Ontario: A Measurement Methodology." *TIC-STH'09: 2009 IEEE Toronto International Conference - Science and Technology for Humanity*:124-129.
Hospital for Sick Children University of Toronto	Department of Pediatrics,	Goldman, R. D. 2005. "Community Physicians' Attitudes Toward Electronic Follow-Up After an Emergency Department Visit." *Clinical Pediatrics* 44(4):305-309.
McMaster University	Center for Evaluation of Medicines	Mollon, B., J. J. R. Chong, M. Sung, L. Thabane and G. Foster. 2009. "Features Predicting the Success of Computerized Decision Support for Prescribing: A Systematic Review of Randomized Controlled Trials." *BMC Medical Informatics and Decision Making* 9(1).
McMaster University	Clinical Pharmacology and Therapeutics	Holbrook, A., L. Thabane, K. Keshavjee, L. Dolovich, B. Bernstein, D. Chan, S. Troyan, G. Foster and H. Gerstein. 2009. "Individualized Electronic Decision Support and Reminders to Improve Diabetes Care in the Community: COMPETE II Randomized Trial." *Canadian Medical Association Journal* 181(1-2):37-44.
McMaster University	DeGroote School of Business	Daglish, D. and N. Archer. 2009. "Electronic Personal Health Record Systems: A Brief Review of Privacy, Security, and Architectural Issues." *CONGRESS 2009 - 2009 World Congress on Privacy, Security, Trust and the Management of e-Business*:110-120.
McMaster University	DeGroote School of Business	Pittaway, J. and N. Archer. 2009. "Wrestling with a Paradox: Complexity in Interoperability Standards Making for Healthcare Information Systems." *Lecture Notes in Business Information Processing* 26:113-125.

INSTITUTION	DEPARTMENT	PUBLICATION
McMaster University	Family Medicine	Agarwal, G. and V. A. Crooks. 2008. "The Nature of Informational Continuity of Care in General Practice." *British Journal of General Practice* 58(556):784-789
McMaster University	Family Medicine	Sellors, J., R. Cosby, K. Trim, J. Kaczorowski, M. Howard, L. Hardcastle, C. Sellors, C. Woodward and Seniors Medication Assessment Research Trial (SMART) Group. 2002. "Recruiting Family Physicians and Patients for a Clinical Trial: Lessons Learned." *Family Practice* 19(1):99-104.
McMaster University	Health Information Research Unit	Hunt, D. L., R. B. Haynes and D. Morgan. 2001. "Using Old Technology to Implement Modern Computer-Aided Decision Support for Primary Diabetes Care." *Proceedings / American Medical Informatics Association Annual Symposium:* 274-278.
McMaster University	Health Sciences	Haynes, R. B., J. Holland, C. Cotoi, R. J. McKinlay, N. L. Wilczynski, L. A. Walters, D. Jedras, R. Parrish, K. A. McKibbon, A. Garg and S. D. Walter. 2006. "McMaster PLUS: A Cluster Randomized Clinical Trial of an Intervention to Accelerate Clinical use of Evidence-Based Information from Digital Libraries." *Journal of the American Medical Informatics Association* 13(6):593-600.
McMaster University	McMaster Children's Hospital and Department of Pediatrics	Issenman, R. M. and I. H. Jaffer. 2004. "Use of Voice Recognition Software in an Outpatient Pediatric Specialty Practice." *Pediatrics* 114(3):e290-3.
McMaster University	Medicine	Ioannidis, G., A. Papaioannou, L. Thabane, A. Gafni, A. Hodsman, B. Kvern, A. Walsh, F. Jiwa and J. D. Adachi. 2009. "Family Physicians' Personal and Practice Characteristics that are Associated with Improved Utilization of Bone Mineral Density Testing and Osteoporosis Medication Prescribing." *Population Health Management* 12(3):131-138.
McMaster University	DeGroote School of Business	Archer, N. and M. Cocosila. 2009. "Improving EMR System Adoption in Canadian Medical Practice: A Research Model." *CONGRESS 2009 - 2009 World Congress on Privacy, Security, Trust and the Management of e-Business*:121-132.
McMaster University	MSc. E-Health Program	Kaur, J., M. Leyland, D. Hunter and J. Sparkes. 2009. "The Discharge Summary Divide: A Review of Electronic Solutions, Obstacles and Benefits." *CONGRESS 2009 - 2009 World*

INSTITUTION	DEPARTMENT	PUBLICATION
		Congress on Privacy, Security, Trust and the Management of e-Business:166-173.
North York General Hospital	Family physician	Greiver, M. 2008. "Practice Tips. Improving Hypertension Management in My Practice." *Canadian Family Physician* 54(3):358-359.
Queens University	Family Medicine	Birtwhistle, R., K. Keshavjee, A. Lambert-Lanning, M. Godwin, M. Greiver, D. Manca and C. Lagace. 2009. "Building a Pan-Canadian Primary Care Sentinel Surveillance Network: Initial Development and Moving Forward." *Journal of the American Board of Family Medicine:* 22(4):412-422.
St. Joseph's Healthcare Hamilton	Centre for the Evaluation of Medicines, Father Sean O'Sullivan Research Centre	Sellors, C., J. Sellors, M. Levine, D. Chan, L. Dolovich and M. Howard. 2004. "Computer Networking to Enhance Pharmacist-Physician Communication: A Pilot Demonstration Project in Community Settings." *Canadian Pharmaceutical Journal* 137(8):26-30.
Sunnybrook and Women's College Health Sciences Centre	Primary Care Research Unit	Tracy, C. S., G. C. Dantas and R. E. Upshur. 2004. "Feasibility of a Patient Decision Aid regarding Disclosure of Personal Health Information: Qualitative Evaluation of the Health Care Information Directive." *BMC Medical Informatics and Decision Making* 4:13.
The University of Western Ontario	Family Medicine	Dixon, D. R. and M. Stewart. 2000. "Exploring Information Technology Adoption by Family Physicians: Survey Instrument Valuation." *Proceedings /American Medical Informatics Association Annual Symposium*:185-189.
The University of Western Ontario	Family Medicine	Stewart, M., A. Thind, A. L. Terry, V. Chevendra and J. N. Marshall. 2009. "Implementing and Maintaining a Researchable Database from Electronic Medical Records: A Perspective from an Academic Family Medicine Department." *Healthcare Policy* 5(2):26-39.
The University of Western Ontario	Family Medicine	Terry, A. L., C. F. Thorpe, G. Giles, J. B. Brown, S. B. Harris, G. J. Reid, A. Thind and M. Stewart. 2008. "Implementing Electronic Health Records: Key Factors in Primary Care." *Canadian Family Physician* 54(5):730-736.
The University of Western Ontario	Family Medicine	Terry, A. L., G. Giles, J. B. Brown, A. Thind and M. Stewart. 2009. "Adoption of Electronic Medical Records in Family Practice: The Providers' Perspective." *Family Medicine* 41(7):508-512.

INSTITUTION	DEPARTMENT	PUBLICATION
The University of Western Ontario	Family Medicine	Terry, A. L., V. Chevendra, A. Thind, M. Stewart, J. Neil Marshall and S. Cejic. 2010. "Using Your Electronic Medical Record for Research: A Primer for Avoiding Pitfalls." *Family Practice* 27(1):121-126.
The University of Western Ontario	Nephrology	Garg, A. X., N. K. J. Adhikari, H. McDonald, M. P. Rosas-Arellano, P. J. Devereaux, J. Beyene, J. Sam and R. B. Haynes. 2005. "Effects of Computerized Clinical Decision Support Systems on Practitioner Performance and Patient Outcomes: A Systematic Review." *Journal of the American Medical Association* 293(10):1223-1238.
The University of Western Ontario	Family Medicine	Brown, J. B., L. Lewis, K. Ellis, M. Stewart, T. R. Freeman and M. J. Kasperski. 2009. "Mechanisms for Communicating within Primary Health Care Teams." *Canadian Family Physician* 55(12):1216-1222.
University of Toronto	Centre for Patient Safety	Shojania, K. G., A. Jennings, A. Mayhew, C. R. Ramsay, M. P. Eccles and J. Grimshaw. 2009. "The Effects of on-Screen, Point of Care Computer Reminders on Processes and Outcomes of Care." *Cochrane Database of Systematic Reviews*(3).
University of Toronto	Centre for Patient Safety	Shojania, K. G., A. Jennings, A. Mayhew, C. Ramsay, M. Eccles and J. Grimshaw. 2010. "Effect of Point-of-Care Computer Reminders on Physician Behaviour: A Systematic Review." *Canadian Medical Association Journal* 182(5).
University of Toronto	Medicine	Wu, R. 2006. "Computerized Physician Order Entry and Clinical Decision Support Systems: Early Stages in Demonstrating Improvements in Patient Outcomes." *American Journal of Managed Care* 12(7):365-366.
University of Toronto	Physical Therapy	Salbach, N. M., S. J. T. Guilcher, S. B. Jaglal and D. A. Davis. 2009. "Factors Influencing Information Seeking by Physical Therapists Providing Stroke Management." *Physical Therapy* 89(10):1039-1050.
University of Toronto	Health Policy Management & Evaluation	Winkelman, W. J. and K. J. Leonard. 2004. "Overcoming Structural Constraints to Patient Utilization of Electronic Medical Records: A Critical Review for an Evaluation Framework." *Journal of the American Medical Informatics Association* 11(2):151-161.

INSTITUTION	DEPARTMENT	PUBLICATION
York University	Osgoode Hall Law School	D'Agostino, G., C. Hinds, M. Jirotka, C. Meyer, T. Piper, M. Rahman and D. Vaver. 2008. "On the Importance of Intellectual Property Rights for e-Science and the Integrated Health Record." *Health Informatics Journal* 14(2):95-111.
Quebec		
Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal		Poissant, L., L. Taylor, A. Huang and R. Tamblyn. 2010. "Assessing the Accuracy of an Inter-Institutional Automated Patient-Specific Health Problem List." *BMC Medical Informatics and Decision Making* 10(1).
HEC Montréal	Department of Information Technology in Health Care	Paré, G., C. Sicotte, M. Jaana and D. Girouard. 2008. "Prioritizing the Risk Factors Influencing the Success of Clinical Information System Projects: A Delphi Study in Canada." *Methods of Information in Medicine* 47(3):251-259.
Laval University	Nursing Sciences	Morin, D., A. Tourigny, D. Pelletier, L. Robichaud, L. Mathieu, A. Vézina, L. Bonin and M. Buteau. 2005. "Seniors' Views on the use of Electronic Health Records." *Informatics in Primary Care* 13(2):125-133.
McGill University	Clinical and Health Informatics	Buckeridge, D. L. 2007. "Outbreak Detection through Automated Surveillance: A Review of the Determinants of Detection." *Journal of Biomedical Informatics* 40(4):370-379.
McGill University	Epidemiology, Biostatistics, and Occupational Health,	Eguale, T., R. Tamblyn, N. Winslade and D. Buckeridge. 2008. "Detection of Adverse Drug Events and Other Treatment Outcomes using an Electronic Prescribing System." *Drug Safety* 31(11):1005-1016.
McGill University	Social Studies of Medicine	Pluye, P. and R. M. Grad. 2004. "How Information Retrieval Technology may Impact on Physician Practice: An Organizational Case Study in Family Medicine." *Journal of Evaluation in Clinical Practice* 10(3):413-430.
McGill University	Family Medicine	Tamblyn, R. 2004. "Improving Patient Safety through Computerized Drug Management: The Devil is in the Details." *HealthcarePapers* 5(3):52-68; discussion 82-4.

INSTITUTION	DEPARTMENT	PUBLICATION
McGill University	Family Medicine	Grad, R. M., P. Pluye, Y. Meng, B. Segal and R. Tamblyn. 2005. "Assessing the Impact of Clinical Information-Retrieval Technology in a Family Practice Residency." *Journal of Evaluation in Clinical Practice* 11(6):576-586.
McGill University	Family Medicine	Tamblyn, R., A. Huang, L. Taylor, Y. Kawasumi, G. Bartlett, R. Grad, A. Jacques, M. Dawes, M. Abrahamowicz, R. Perreault, N. Winslade, L. Poissant and A. Pinsonneault. 2008. "A Randomized Trial of the Effectiveness of on-Demand Versus Computer-Triggered Drug Decision Support in Primary Care." *Journal of the American Medical Informatics Association* 15(4):430-438.
McGill University	Family Medicine	Pluye, P., R. M. Grad, L. G. Dunikowski and R. Stephenson. 2005. "Impact of Clinical Information-Retrieval Technology on Physicians: A Literature Review of Quantitative, Qualitative and Mixed Methods Studies." *International Journal of Medical Informatics* 74(9):745-768.
McGill University	Family Medicine	Pluye, P., R. M. Grad, M. Dawes and J. C. Bartlett. 2007. "Seven Reasons Why Health Professionals Search Clinical Information- Retrieval Technology (CIRT): Toward an Organizational Model." *Journal of Evaluation in Clinical Practice* 13(1):39-49.
McGill University	Family Medicine	Pluye, P., R. M. Grad, N. Mysore, L. Knaapen, J. Johnson-Lafleur and M. Dawes. 2007. "Systematically Assessing the Situational Relevance of Electronic Knowledge Resources: A Mixed Methods Study." *Journal of the American Medical Informatics Association* 14(5):616-625.
McGill University, Montreal Children's Hospital		Fombonne, E., L. Heavey, L. Smeeth, L. C. Rodrigues, C. Cook, P. G. Smith, L. Meng and A. J. Hall. 2004. "Validation of the Diagnosis of Autism in General Practitioner Records." *BMC Public Health* 4:5.
McGill University	Clinical and Health Informatics Research Group	Poissant, L., R. Tamblyn and A. Huang. 2005. "Preliminary Validation of an Automated Health Problem List." *Proceedings /American Medical Informatics Association Annual Symposium:* 1084.

INSTITUTION	DEPARTMENT	PUBLICATION
McGill University	Clinical and Health Informatics Research Group	Poissant, L., R. Tamblyn and A. Huang. 2005. "Preliminary Validation of an Automated Health Problem List." *Proceedings /American Medical Informatics Association Annual Symposium* :1084.
McGill University	Clinical and Health Informatics Research Group	Poissant, L., R. Tamblyn, A. Huang, R. M. Grad, P. Pluye, Y. Meng, B. Segal and R. Tamblyn. 2005. "Preliminary Validation of an Automated Health Problem List.; Assessing the Impact of Clinical Information-Retrieval Technology in a Family Practice Residency." *Proceedings /American Medical Informatics Association Annual Symposium:* 1084.
Montreal General Hospital		McClaran, J., L. Snell and E. Duarte-Franco. 2000. "Continuing Educational Needs in Computers and Informatics: McGill Survey of Family Physicians." *Canadian Family Physician* 46(APR.):839-847.
Montreal Hospital		Rinfret, S., M. T. Lussier, A. Peirce, F. Duhamel, S. Cossette, L. Lalonde, C. Tremblay, M. C. Guertin, J. LeLorier, J. Turgeon, P. Hamet and LOYAL Study Investigators. 2009. "The Impact of a Multidisciplinary Information Technology-Supported Program on Blood Pressure Control in Primary Care." *Circulation Cardiovascular Quality and Outcomes* 2(3):170-177.
Montreal University	Nursing	Dubois, S. and C. G. Loiselle. 2009. "Cancer Informational Support and Health Care Service use among Individuals Newly Diagnosed: A Mixed Methods Approach." *Journal of Evaluation in Clinical Practice* 15(2):346-359.
Sir Mortimer B. Davis-Jewish General Hospital	Emergency Multi-Disciplinary Research Unit	Afilalo, M., E. Lang, R. Léger, X. Xue, A. Colacone, N. Soucy, A. Vandal, J. F. Boivin and B. Unger. 2007. "Impact of a Standardized Communication System on Continuity of Care between Family Physicians and the Emergency Department." *Canadian Journal of Emergency Medicine* 9(2):79-86.
Sir Mortimer B. Davis-Jewish General Hospital	Emergency Multi-Disciplinary Research Unit	Lang, E., M. Afilalo, A. C. Vandal, J. F. Boivin, X. Xue, A. Colacone, R. Léger, I. Shrier and S. Rosenthal. 2006. "Impact of an Electronic Link between the Emergency Department and Family Physicians: A Randomized Controlled Trial." *Canadian Medical Association Journal* 174(3):313-318.

INSTITUTION	DEPARTMENT	PUBLICATION
Research Center of the Centre Hospitalier Universitaire de Québec		Gagnon, M. P., M. Ouimet, G. Godin, M. Rousseau, M. Labrecque, Y. Leduc and A. Ben Abdeljelil. 2010. "Multi-Level Analysis of Electronic Health Record Adoption by Health Care Professionals: A Study Protocol." *Implementation Science* 5(1).
Research Center of the Centre Hospitalier Universitaire de Québec		Gagnon, M. P., N. Shaw, C. Sicotte, L. Mathieu, Y. Leduc, J. Duplantie, J. MacLean and F. Légaré. 2009. "Users' Perspectives of Barriers and Facilitators to Implementing EHR in Canada: A Study Protocol." Implementation Science 4(1) .
Nova Scotia		
Dalhousie University	School of Nursing	Murphy, A. L., M. Fleming, R. Martin-Misener, I. S. Sketris, M. MacCara and D. Gass. 2006. "Drug Information Resources used by Nurse Practitioners and Collaborating Physicians at the Point of Care in Nova Scotia, Canada: A Survey and Review of the Literature." *BMC Nursing* 5.
Queen Elizabeth II Health Science Centre	Cardiology	Cox, J. L. 2001. "The Challenge with Tracking Health Outcomes." *Canadian Journal of Clinical Pharmacology* 8(SUPPL. A).

Granting Agency Funding Databases Search

We searched for relevant research grants within the CIHR Funded Research Database, the Canadian Research Information System (CRIS), and Other Funding Databases. The CIHR and CRIS databases are structured the same way. Therefore, searching the CRIS database will include CIHR results; test searches were conducted to confirm this. The agencies included in the CRIS database are: Arthritis Society, Canadian Cancer Society, Canadian Institutes of Health Research, Canadian Prostate Cancer Research Initiative, Canadian Tobacco Control Research Initiative, Heart and Stroke Foundation, Saskatchewan Health Research Foundation, Terry Fox Foundation and the Terry Fox Research Institute.

We conducted two separate searches on the CRIS database for the years 1999 to 2013. First, we conducted a keyword search. Second, we searched using the names of 22 researchers previously identified for participation in our stakeholder interviews. For the first search, we used the following keywords: electronic medical records; electronic health records; primary health care; EMR; EHR; health informatics; health information and electronic; health information technology; computerized medical record; electronic patient record; and personal health record. This yielded a total of 224 results; 36 duplicates were subsequently removed. After review for relevancy, 27 grants were selected for inclusion. Second, the CRIS database was searched on each of the previously identified researcher's names, resulting in 239 grants associated with 18 names. After removing 18 duplicates and reviewing the remainder for relevancy and applicability, we selected 30 grants for inclusion. The results of the two searches were combined, which resulted in a total of 57 grants. Ten duplicates were removed, resulting in a total of 48 grants. After final review for relevancy, we selected 38 grants for inclusion in Table 4.

The other funding databases searched for relevant grants included the Canada Foundation for Innovation database, and the Canada Research Chairs website.

Canada Foundation for Innovation

The Canada Foundation for Innovation website has a downloadable database. The title and keyword columns in this database were searched using the following keywords: electronic medical records; electronic health records; EMR; EHR; health informatics; primary care; primary health care; health information; health information technology; computerized medical record; and, electronic patient record. This search yielded 24 grants, of which 6 were duplicates to the CRIS search. After review for relevancy, we selected 4 grants for inclusion in Table 4.

Canada Research Chair Website

The Canada Research chair website was searched using the keywords: primary care; health information; health information technology; electronic patient record; EMR; and, EHR. This search yielded 11 Canada Research Chairs. These results were reviewed for relevancy, and 5 Canada Research Chairs were included in Table 4.

Table 4 - Research Capacity Assessment – Related Grants to Canadian Researchers

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
ALBERTA							
SHAW, Nicola Tamsin	University of Alberta	Health Informatics	CIHR IHSPR New Investigator		Informatics: Enhancing The Clinical Experience	01-Jul-04	30-Jun-09
SHAW, Nicola Tamsin	University of Alberta	Health Informatics	Operating Grant		Informatics: Enhancing The Clinical Experience?	01-Oct-04	30-Sep-07
GRIMM, Nicole Allison, LEE, Shoo, K.	University of Alberta	Medicine	CIHR Doctoral Research Award	Health Services and Policy Research	Keeping Track Of The Patient In A Resource-Limited Setting: Pilot Implementation Of An Electronic Health Record In Tanzania	01-Jan-08	31-May-10
GUIRGUIS, Lisa M, HUGHES, Christine Anne, COONEY, Dale, SCHINDEL, Theresa, SHAW, Nicola Tamsin	University of Alberta	Pharmacy and Pharmaceutical Sciences	Meetings, Planning and Dissemination Grant: PHSI		Development Meeting: Partnerships To Evaluate Pharmacists' Adoption And Proficiency In Using Laboratory	01-Jan-09	31-Dec-09
WINGET, Marcy Denise, BRYANT, Heather E., FIELDS, Anthony Lindsay, HILSDEN, Robert Jay, MCGREGOR, S. Elizabeth, YASUI, Yutaka	Alberta Health Services (Edmonton)		Synthesis Grant: Timely Access to Quality Health Care	Health Services and Policy Research	Database Linkage To Identify And Quantify Use Of Key Health Services From Pre-Diagnosis To Treatment And Time Between Services For Colorectal Cancer Patients	01-Mar-07	29-Feb-08

Canadian Institutes of Health Research							
Investigators	Research Institution	Department	Program	Institute	Project title	Effective Date	Expiry Date
British Columbia							
LAU, Francis	University of Victoria	Health Information Science	Training Grant		A Collaborative Health Informatics Research Training Program	01-Sep-01	31-Mar-02
LAU, Francis	University of Victoria	Health Information Science	Applied Chair in Health Services and Policy Research		An Ehealth Observatory To Monitor The Effects Of Health Information System Deployment In Canada	01-Oct-08	30-Sep-13
FORLAND, Lindsay R, LAU, Francis	University of Victoria	Health Information Science	Frederick Banting and Charles Best Canada Graduate Scholarships - Master's Award		Evaluating An Electronic Medical Record System Implementation For An Interconnected Group Of Primary Care Community Health Clinics	01-Sep-06	31-Aug-07
BALKA, Ellen, GRENON, Elaine, BLACK, Charlyn, CLARENCE, Irene	Vancouver Coastal Health Research Institute		Operating Grant: Knowledge to Action		Knowledge To Action: Supporting Continuity Of Care And Practice Research Through Secondary Use Of EMR Data	01-Feb-08	31-Jan-10
Ontario							
BOMBARDIER, Claire, EYSENBACH,	University Health Network (Toronto)		Invention - Tools, Techniques and Devices for		A Demonstration Project Of Electronic Patient Generated	01-Nov-03	31-Oct-05

Canadian Institutes of Health Research							
Investigators	Research Institution	Department	Program	Institute	Project title	Effective Date	Expiry Date
Gunther, JADAD, Alejandro(Alex) Ricardo, MILGRAM, Paul			Research and Medicine (IMHA)		Data For Point Of Care Reporting In The Management Of Rheumatoid Arthritis		
URBACH, David Robert, BAXTER, Nancy N, DEL GIUDICE, Lisa M.E., MOINEDDIN, Rahim, SUTRADHAR, Rinku	University Health Network (Toronto)	Surgery	Operating Grant : Priority Announcement (IHSPR)	Cancer Research	The Effect Of Screening Colonoscopy Use By Primary Care Physicians On Colorectal Cancer Incidence And Mortality	01-Jan-09	31-Dec-09
SHACHAK, Aviv, BARNSLEY, Janet, JADAD, Alejandro(Alex) Ricardo, LEMIEUX-CHARLES, Louise, TU, Karen	University of Toronto	Health Policy, Management & Evaluation	Operating Grant	Health Services and Policy Research	End-User Support In The Implementation Of Electronic Health Records In Primary Care: A Case Study Of Early Adopters.	01-Apr-09	31-Mar-11
JAAKKIMAINEN, Ritva Liisa, BARNSLEY, Janet, GLAZIER, Richard Henry, TU, Karen	Institute for Clinical Evaluative Sciences-Toronto		Catalyst Grant: Primary and Community-Based Healthcare		Using An Existing Electronic Medical Record (EMR) To Determine Wait Times From Primary Care	01-Mar-10	28-Feb-11
EL EMAM, Khaled, TU, Karen, BUCKERIDGE, David Llewellyn,	Children's Hospital of Eastern Ontario (Ottawa)	Research Institute	Operating Grant - PA: Ethics		Privacy Preserving Methods For Sharing Longitudinal Electronic Health	01-Mar-10	

Canadian Institutes of Health Research							
Investigators	Research Institution	Department	Program	Institute	Project title	Effective Date	Expiry Date
MALIN, Bradley, MCDONALD, David R, MERCER, Jay Gordon, SOKOLOVA, Marina, WILLISON, Donald J.B.					Records		
EL EMAM, Khaled, GIBSON, Elaine, WILLISON, Donald J.B.,	McMaster University	Clinical Epidemiology and Biostatistics	Operating Grant		Facilitating Access To Health Data For Research And Planning In Light Of Laws And Ethical Norms	01-Oct-09	30-Sep-13
HAYNES, Robert Brian, COVVEY, H. Dominic J., MOEHR, Jochen Robert	McMaster University	Clinical Epidemiology and Biostatistics	CIHR Opportunity Fund Workshops		Healnet Research Informatics Curriculum Development Workshops	01-Oct-99	31-Mar-00
HOLBROOK, Anne Marie, BERNSTEIN, Robert Michael, BIRTWHISTLE, Richard Vernon, CHAN, David H., DOLOVICH, Lisa Rebecca, GODWIN,	McMaster University	Medicine	Catalyst Grant: Post Market Drug Safety and Effectiveness		A National Electronic Network For Rapid Assessment Of Drug Safety And Effectiveness	01-Mar-10	28-Feb-11

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
Marshall Stewart, GREEN, Michael Edward, KACZOROWSKI, Janusz Aleksander, LEVINE, Mitchell Arnold Henry, MACLURE, Malcolm, MANCA, Donna Patricia, PULLE							
HOLBROOK, Anne Marie, BERNSTEIN, Robert Michael, BIRTWHISTLE, Richard Vernon, CHAN, David H., DOLOVICH, Lisa Rebecca, GODWIN, Marshall Stewart, GREEN, Michael Edward, KACZOROWSKI, Janusz Aleksander, KESHAVJEE, Karim, LEVINE, Mitchell Arnold Henry, MANCA, Donna	McMaster University	Medicine	Catalyst Grant: Primary and Community-Based Healthcare		Developing A National Electronic Network In Primary Care To Advance Drug Safety And Effectiveness	01-Mar-10	28-Feb-11

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
Patricia							
ABUSHOMAR, Hani, KELTON, John Greenhow,	McMaster University	Clinical Epidemiology and Biostatistics	CIHR/Rx&D Collaborative Research Program/HRF - Grad.Scholarship in Pharmacology	Not applicable/Specified	The Assessment Of Patient Compliance With Medication Using Electronic Medical Records	01-Jul-06	30-Jun-07
ARCHER, Norman Phillip, MCKIBBON, Kathleen Ann, STRAUS, Sharon Elizabeth, WILLISON, Donald J.B.	McMaster University		Operating Grant: Genetics (Ethics, Law and Society)	Health Services and Policy Research	Environmental Scan And Stakeholder Consultation On Electronic Personal Health Records In Canada	01-Aug-08	31-Jul-09
HOLBROOK, Anne Marie, GOLDSMITH, Charles Harry, LEVINE, Mitchell Arnold Henry, MACLEOD, Stuart Maxwell, SEBALDT, Rolf-Jochem	St. Joseph's Hospital (Hamilton, Ontario)	Medicine	CIHR-PMAC Health Program - Operating Grants		COMPETE: Computerization Of Medical Practice For The Enhancement Of Therapeutic Effect	01-Apr-00	30-Sep-01
MANUEL, Douglas G., STEWART, Moira A., THIND, Amardeep,	University of Western Ontario	Family Medicine	Operating Grant	Health Services and Policy Research	The Equity In Waiting Time To See A Specialist In Southwestern Ontario	01-Apr-06	31-Mar-08

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
BROWN, Judith Belle, HARRIS, Stewart Brian, REID, Graham James					(E-WAITS) Study		
STEWART, Moira A., TERRY, Amanda L., THIND, Amardeep, BURGE, Frederick I, CEJIC, Sonny Sinisa, CHESWORTH, Bert Mackenzie, DE LUSIGNAN, Simon, MARSHALL, John Neil	University of Western Ontario	Family Medicine	Advancing Theoretical and Methodological Innovations in Health Research		Development Of Indicators To Validate EMR Data: The DIVE Study	01-Apr-10	31-Mar-12
STEWART, Moira A., TERRY, Amanda L., THIND, Amardeep, BIRTWHISTLE, Richard Vernon, BURGE, Frederick I, FORTIN, Martin, WONG, Sabrina	University of Western Ontario	Family Medicine	Needs, Gaps and Opportunities Assessments in Health Services and Policy		Primary Health Care Electronic Health Records: A National Study On Needs, Gaps, And Opportunities	01-Nov-08	31-Oct-09
TERRY, Amanda L.	University of Western Ontario	Family Medicine	CHSRF/CIHR Fellowships		Electronic Health Records: Implications For Primary Health	01-Jul-08	30-Jun-10

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
					Care		
Quebec							
AHMED, Sara, BARTLETT, Susan Joan, ERNST, Pierre-Paul, GRAD, Roland Michael, PARÉ, Guy, PERREAULT, Robert, PINSONNEAULT, Alain, TAYLOR, Laurel Kim	McGill University	Occupational and Physical Therapy	Operating Grant		Facilitating Patient Self-Management In Chronic Disease: Integrating Electronic Personal Health Records And Ongoing Communication Into A Web-Based Self-Management Tool	01-Oct-08	31-Mar-11
EGUALE, Tewodros, TAMBLYN, Robyn M.	McGill University	Epidemiology and Biostatistics	Frederick Banting and Charles Best Canada Graduate Scholarships - Doctoral Award		A Novel Method For Pharmacosurveillance: Combining An Electronic Prescribing And Drug Management System And Administrative Database	01-May-08	30-Apr-11
GRAD, Roland Michael, PLUYE, Pierre, REPCHINSKY, Carol Ann, BARTLETT-ESQUILANT, Gillian,	McGill University	Family Medicine	Partnerships for Health System Improvement (PHSI)		Assessing And Improving Electronic Knowledge Resources In Partnership With Information Providers	01-Oct-07	30-Sep-10

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
COHENDET, Patrick Serge, DAWES, Martin G., FARRELL, Barbara Jeanne, LÉGARÉ, France, LOISELLE, Carmen Gisele, MACDONALD, Jane Agnes Thornton, RODRIGUEZ, Rosario							
PATEL, Vaishali, PINSONNEAULT, Alain, TAMBLYN, Robyn M.	McGill University	Epidemiology and Biostatistics	Fellowship Award in the Area of Health Services and Policy Research		A Multi-Level Approach To Health Care Technology Adoption And Implementation: Determinants Of Clinician Response To Computerized Clinical Decision Support Systems Within Primary Care Settings	01-Sep-07	31-Aug-10
TAMBLYN, Robyn M., ABRAHAMOWICZ, Michal M. A., BROPHY, James M., BUCKERIDGE, David Llewellyn,	McGill University	Epidemiology and Biostatistics	Operating Grant		A Novel Method For Pharmacosurveillance: Combining An Electronic Prescribing And Drug Management System And Administrative	01-Apr-09	30-Sep-12

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
EGUALE, Tewodros, HANLEY, James A., HUANG, Allen Richard					Database		
TAMBLYN, Robyn M., ABRAHAMOWICZ, Michal M. A., AHMED, Sara, BARTLETT, Susan Joan, BATES, David W., BROPHY, James M., BUCKERIDGE, David Llewellyn, EL EMAM, Khaled, FORSTER, Alan John, HANLEY, James A., HUANG, Allen Richard, MANUEL, Douglas G., PHILLIPS, Michael Sean, POISS	McGill University	Medicine	Emerging Team Grant: Applied Health Services and Policy Research		Improving Patient Safety And Chronic Disease Management With A New Generation Of Health Information Technologies	01-Dec-08	30-Nov-13
TAMBLYN, Robyn M., ABRAHAMOWICZ, Michal M. A.,	McGill University	Medicine	Randomized Controlled Trials		Providing Comparative Out-Of-Pocket Cost Information For	01-Oct-06	31-Mar-09

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
BARTLETT-ESQUILANT, Gillian, BUCKERIDGE, David Llewellyn, HUANG, Allen Richard, LAROCHELLE, Pierre, TAYLOR, Laurel Kim					Prescription Drugs Through An Integrated Physician Electronic Prescribing System: A Proof Of Concept With Anti-Hypertensive Drugs		
TANNENBAUM, Cara, AHMED, Sara, COLLIN, Johanne, TAMBLYN, Robyn M.	Institut universitaire de gériatrie de Montréal	Centre de recherche	Operating Grant		The EMPOWER Study: 'Electronic Medications & Patient Ownership Of End Results'	01-Oct-09	30-Sep-12
GAGNON, Marie-Pierre, GODIN, Gaston, LABRECQUE, Michel, LEDUC, Yvan, OUIMET, Mathieu, ROUSSEAU, Michel	Université Laval	Nursing	Operating Grant		Multi-Level Analysis Of EHR Adoption By Health Care Professionals	01-Oct-09	30-Sep-12
GAGNON, Marie-Pierre, LÉGARÉ, France, MACLEAN,	Université Laval	Nursing	Knowledge Synthesis Grant		Barriers And Facilitators To Implementing EHR In	01-Oct-08	30-Sep-09

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
Jim, LEDUC, Yvan, MATHIEU, Luc, SHAW, Nicola Tamsin, SICOTTE, Claude					Canada: A Synthesis Of Users' Perspectives		
MAYO, Nancy Elizabeth, BADLEY, Elizabeth Mary, BOURBEAU, Jean, JAGLAL, Susan Brenda, LAROCHELLE, Pierre, POISSANT, Lise, WOOD-DAUPHINEE, Sharon Lee	McGill University	Medicine/Epidemiology and Biostatistics	Advancing Theories, Frameworks, Methods and Measurement in Hlth Svs. & Policy	Population and Public Health	Integration Of The International Classification Of Functioning (ICF) Into Electronic Health Records And Administrative Data Bases: Methodology To Create A Standard, Coded List Of Problem-Indicators Common To Four Disease Groups, Stroke, Respiratory Disease, Heart Disease And Musculoskeletal Disorders	01-Jan-04	31-Dec-06
TAMBLYN, Robyn M., DUBÉ, Laurette, ERNST, Pierre-Paul, MAYO, Nancy Elizabeth, PINSONNEAULT,	McGill University	Epidemiology and Biostatistics	Novel & Integrative Approaches to Assessment, Care & Management of Patients w Diseases	Circulatory and Respiratory Health	E-Integration In The Management Of Respiratory And Circulatory Disease: Elucidating The Multi-Level Mechanisms That Optimize	01-Apr-03	31-Mar-08

Canadian Institutes of Health Research							
Investigators	**Research Institution**	**Department**	**Program**	**Institute**	**Project title**	**Effective Date**	**Expiry Date**
Alain, VERTER, Vedat					Population Outcomes		
NOVA SCOTIA							
SHEPHERD, Michael Alan, AROCHA, Jose Francisco, COVVEY, H. Dominic J., GRANT, Andrew Mcgregor, HEBERT, Marilynne Arlayne, LEONARD, Kevin John, MOEHR, Jochen Robert, PINSONNEAULT, Alain, SEBALDT, Rolf-Jochem, TAMBLYN, Robyn M.	Dalhousie University		Training Grant		A Collaborative Health Informatics Research Training Program	01-Mar-02	31-Mar-09

Canada Research Chairs						
Name	**Tier**	**University**	**Granting Council**	**Research Discipline**	**Title**	**Date**
ONTARIO						
Buckeridge, David	2	McGill University	Health	Population Health - General	The Surveillance Lab	August 1 2005
El Emam, Khaled	2	University of Ottawa	Natural Sciences and Engineering	Information Technology		February 1 2005
McGregor, Carolyn	2	University of Ontario Institute of Technology	Natural Sciences and Engineering	Information		July 1 2007
Stewart, Moira	1	The University of Western Ontario	Health	Health Services Research - General		March 1 2003
Jahad, Alejandro R	1	University of Toronto	Health	Information Technology		January 1 2002

Canada Foundation for Innovation						
Project Leader	**Institution**	**Sector (Research Discipline)**	**Fund**	**Research Discipline**	**Project Title**	**Final Decision**
ONTARIO						
Stewart, Moira	The University of Western Ontario	Health sciences	Canada Research Chairs Infrastructure Fund	Health Services Research - General	A Purpose-Built Research Database for Interdisciplinary Primary Health Care	11-Feb-03
El Emam, Khaled	University of Ottawa	Natural sciences and engineering	Canada Research Chairs Infrastructure Fund	Information Technology	The Electronic Health Record Laboratory	8-Mar-05
McGregor, Carolyn	University of Ontario	Natural sciences and engineering	Leaders Opportunity Fund - Funding for	Information Technology	Health Informatics Laboratory	6-Mar-07

Canada Foundation for Innovation						
Project Leader	**Institution**	**Sector (Research Discipline)**	**Fund**	**Research Discipline**	**Project Title**	**Final Decision**
	Institute of Technology		infrastructure associated with a Canada Research Chair			
NOVA SCOTIA						
MacCaull, Wendy	St. Francis Xavier University	Natural sciences and engineering	Leaders Opportunity Fund - Funding for infrastructure associated with a Canada Research Chair	Information Technology	Center for Logic and Information	23-Oct-07

Appendix 4
Key Stakeholder Interview Participants

Dr. Ewan Affleck
Family Physician
Great Slave Medical House
Yellowknife, Northwest Territories

Mr. Thomas Alteen
Project Manager/EHR Projects
Newfoundland and Labrador Centre for Health Information
St. John's, Newfoundland

Dr. Marie-Dominique Beaulieu
Professor, Department of Family Medicine
Université de Montréal
Montreal, Québec

Dr. Richard Birtwhistle
Professor & Director, Centre for Studies in Primary Care
Queen's University
Kingston, Ontario

Mr. Chris Bookless
Deputy Chief Information Officer, Dept of Health & Social Services
Yukon Health and Social Services
Whitehorse, Yukon

Dr. Alan Brookstone
Executive Director
Canadian EMR
Vancouver, British Columbia

Dr. Gilles Brousseau
Family Physician
Gatineau, Québec

Ms. Maureen Charlebois
Chief Nursing Executive & Group Director, Clinical Adoption
Canada Health Infoway/Inforoute Sante du Canada
Toronto, Ontario

Dr. Steven Edworthy
Associate Professor, Rheumatologist
Department of Medicine & Community Health
University of Calgary
Calgary, Alberta

Dr. Gerard Farrell
Director - eHealth Research Unit, Associate Dean for Undergrad Medical Education
Memorial University
St. John's, Newfoundland

Mr. Thomas Fogg
Director, Strategy & Planning
Manitoba e-Health
Winnipeg, Manitoba

Mr. Brian Forster
Chief Executive Officer
OntarioMD
Toronto, Ontario

Dr. Marie-Pierre Gagnon
Assistant Professor, Faculty of Nursing Sciences
Universitié Laval
Québec City, Québec

Mr. Neil Gardner
Chief Information Officer
Saskatchewan Health Information Network
Regina, Saskatchewan

Dr. Marshall Godwin
Director, Primary Care Research Unit
Memorial University
St. John's, Newfoundland

Mr. Eric Gombrich
Chief Executive Officer
EMIS Inc.
Edmonton, Alberta

Dr. Bill Clifford
Family Physician, Director Clinical Informatics
Northern Health Region
Prince George, British Columbia

Dr. Dominic Covvey
Director, Waterloo Institute for Health Informatics Research
University of Waterloo
Waterloo, Ontario

Dr. Mark Dermer
Family Physician
Ottawa, Ontario

Mr. Murray Doggett
Project Manager
Canadian Patient Safety Institute
Ottawa, Ontario

Dr. Francis Lau,
Professor, School of Health Information Science
University of Victoria
Victoria, British Columbia

Mr. Ken Martin
Central Data Manager, CPCSSN Project
Queen's University (Centre for Studies in Primary Care)
Kingston, Ontario

Dr. Jay Mercer
Family Physician
Medical Director, Practice Solutions Web Services Inc.
Ottawa, Ontario

Mr. Bill Pascal
Chief Technology Officer
Canadian Medical Association
Ottawa, Ontario

Dr. Wayne Putnam
Associate Professor, Department of Family Medicine
Dalhousie University
Halifax, Nova Scotia

Dr. Bill Haver
Family Physician/Managing Partner
Lakeside Medical Clinic
Saskatoon, Saskatchewan

Dr. Anne Holbrook
Professor, Department of Medicine
McMaster University
Hamilton, Ontario

Dr. Alan Katz
Associate Professor, Department of Family Medicine
University of Manitoba
Winnipeg, Manitoba

Dr. Karim Keshavjee
Chief Executive Officer
InfoClin Inc
Toronto, Ontario

Dr. Jean-François Rancourt
Family Physician
Montmagny Family Medicine Group
Montmagny, Québec

Dr. Nicola Shaw
Associate Professor, Department of Family Medicine
University of Alberta
Edmonton, Alberta

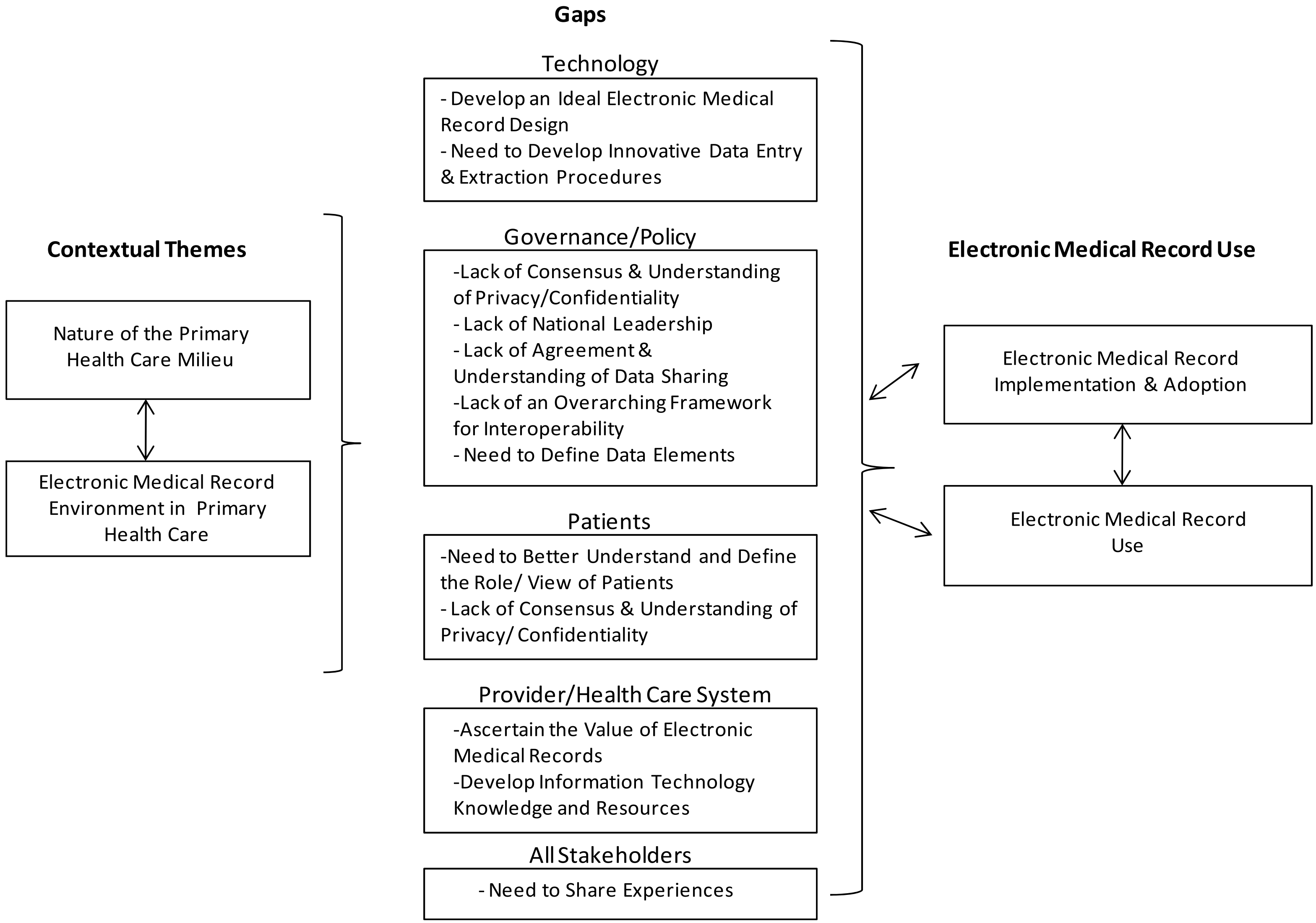
Dr. Robyn Tamblyn
Professor, Departments of Medicine and
Epidemiology, Biostatistics and Occupational Health
McGill University
Montreal, Québec

Dr. Karen Tu
Scientist
Institute for Clinical Evaluative Sciences
Toronto, Ontario

Mr. David Ulis
Program Director
Physician Office System Program
Edmonton, Alberta

Appendix 5

Figure 1 – Inter-relationship of Elements Within the Primary Health Care Electronic Medical Record Environment in Canada



Appendix 6

Key Stakeholder Interviews – Additional Details of Themes

This appendix provides additional detail to the gaps in knowledge and research themes presented in section 2.6. The structure used to present the gaps below reflects inter-relationship of these themes illustrated in Figure 1, Appendix 5. (pg.56)

Gaps in Knowledge and Research

Technology

Develop an Ideal Electronic Medical Record Design

Within this theme, the primary dimension that emerged was evolving currently available electronic medical records to electronic medical records that: are responsive to clinical practice and a focus on patients; evidenced-based; and, facilitate ease and flexibility in data entry while enabling meaningful data to be extracted. As one participant reflected:

> "So I think we need an ability to analyze the data to figure out how do we refine these systems? How do we modify them? How do we make them work much more efficiently for physicians, work to provide important evidence based information to guide clinical decision making, as well as an ability to monitor and develop reporting mechanisms to monitor primary care at a provincial and population level."

And another participant suggested:

> "We need to develop evidence that tells us what an ideal system looks like, understanding that that will evolve over time."

In terms of data entry, participants described the need for electronic medical record design to support this, as this participant indicated:

> "For the physician to have to search through a search engine of SNOMED CT, which is arguably what 300,000-350,000 concepts and a million codes and growing, it's just not going to happen. The physicians don't have time for that. What it means is that the EMRs need to change, vastly. They need to be the user interface into that code structure, need the coding, behind the scenes. And in essence that's what you see when you to go other countries."

Need to Develop Innovative Data Entry & Extraction Procedures

Participants described a tension between entering data in the electronic medical record in text form and entering the data in a codified way; underlying this is a concern about losing the "art of medicine" – partly the nuances or context of the patient encounter. As this participant indicated:

> "That whole interaction that free text allows us is not yet a particularly useful tool for research and evaluation or policy development for EMRs. So from that perspective the more data that occurs in specifically designed and standardized fields, the more power your EMR provides for you but the more you create those standardized fields the more you're pigeon holing clinicians into putting data down in certain ways and there's a distinct tension between those two".

Governance/Policy

Lack of Consensus and Understanding of Privacy/Confidentiality

Two dimension of this theme emerged from the stakeholder interviews. The first was the need for clarity, debate, and discussion on multiple aspects of privacy and confidentiality including secondary uses of electronic medical record data, such as for policy making and research, as well as patient consent requirements for the use of the information. One participant reflected on this in the following way:

> "On the research and from the policy making perspective, I don't think that we really have got very much further. You know, the debate over privacy is something that has not been had in any meaningful way, either with the patient or the consumer of care or with health care providers in a very meaningful way. So even though the governments are treading carefully in this particular area, we need more open debate about it, and say you know what's good, what's bad, what works, what doesn't? And not have predetermined ideas about how we should be managing health information."

A second dimension was the need to develop systems that respond to privacy concerns of stakeholders, as this participant suggested:

> "We really need to focus on the privacy area, and make sure, and nobody pointing any fingers at anybody else, because you don't know these things in advance going in, but make sure that we understand the issues and that we develop our systems according to principles that protect patient privacy".

Lack of National Leadership

The first element under national leadership was the lack of a vision and mission in Canada for health information and electronic medical record use. As a participant expressed:

> "I think there's not really been a good thinking around what the vision is and what the strategic steps would need to be in order to improve adoption of EMRs in primary care. So I'd have to say that we all have vision, I don't think we have a coherent policy platform and I sure don't think we have a good business plan for EMR in primary care. And it's one of the biggest weaknesses in Canada today".

Second, participants identified the need for forums for stakeholders to come together to discuss and resolve issues around broader uses of primary health care electronic medical record data.

> "There's an opportunity where the information management capabilities can really shine and see if we can improve patient care. And I think what we need to do is we need to get all our stakeholders engaged to do that. And I think that rather than trying to take in on a big scale, what I think we need to be doing is saying, "How do we improve this model?" Bring all the key players together, the vendors, the colleges, the associations, the government, clinicians, patients. "Hey, look! What is it that we're trying to do here?" And let's work together to make it happen."

Lack of Agreement and Understanding of Data Sharing

Participants described the current lack of frameworks to guide data sharing, which extended beyond data sharing among providers to sharing for secondary purpose as well. One participant reflected on this in the following way:

> *"..* it's not so bad to exchange it with a specialist I know but when we get into the broader environment, now we're sending it out there, we get into these data sharing agreements, I think there's going to be a lot of time spent in ironing out those, how we share data. And that really... has not been well appreciated and I think it's going to stop things and we're going to suffer a bit until we do straighten that out".

Lack of an Overarching Framework for Interoperability

There were two elements within this theme: 1) data flow; and, 2) and interoperability among software products.

Primary health care providers need to be connected with the rest of the health care system, and data need to be structured to allow flow among providers. As this participant indicated:

> "Well, I think the biggest gap - issue is the fact that we do not have the interoperable EMR systems from point to point. So that's a huge gap because without that, we're not able to get the full utility out of it, and hence it's going to impede clinical adoption of that system because there's not going to be the value add."

Participants also described the need to focus on interoperability. One participant reflected on this in the following way:

> "Well, you know interoperability has a lot to do with standardized messaging and to my knowledge, none of the provinces have a really strong investment program for health information exchange yet, and yet if you look at say Denmark was the earliest example, they developed interoperability standards back in the early 90s and it's been a huge strength for them. New Zealand is also another good example where they also had standards and moved ahead very rapidly. So that, I want to make sure that message gets across that that's where we need to spend time".

The second element of interoperability relates to the lack of interoperability among software products. This makes transferring data among products a challenge if a provider chooses to use a new product in their practice.

> "I think a lot of providers are, in effect, locked into the EMR vendor they have because of the difficulties of moving their data from one to another…Typically, it is not very good I think as it stands now and I think a lot of that, part of it is due to the different database schema in different EMR systems".

Need to Define Data Elements

The main aspect of this theme as expressed by participants was focused on secondary uses of electronic medical record data, and the need for discussion among stakeholders groups. As one participant indicated:

> "I think what would be good is an assessment on "doability". If you could get a clear definition of what type of information the researcher, the health care planners, policy makers, and the clinicians need, you would immediately see that there's probably some differences and therefore gaps between where these groups are. That in itself would be very useful as an understanding of where the potential differences, conflicts are going to come up. You can then do an analysis on to what extent can IT support the collection of data in a way that doesn't push issues into the point of care operations. Because if you don't minimize that you're not going to get good data".

Patients

Need to Better Understand and Define the Role/View of Patients

Participants indicated that Canada was in the early stages of patient involvement in electronic records. Two aspects of this theme emerged from the interviews. The first centered on patient involvement in accessing and inputting information in the electronic medical record, as this participant indicated:

> "There's still an important role for the patient, as an empowered consumer of health care, much more aware of their own information to ultimately be tracking their own health care and understand their treatment options. So one of the things we have to think about with primary health care records, in particular, of the EHR more broadly is, so how and when are we going to provide patients with access to their record, and not only access to data that's in their record, but the ability to provide data into the record itself".

Second was the need to respond to patient preferences in creating electronic systems. One participant reflected on this in the following way:

> "…given I've read this morning we know that 84% of Canadians consistently respond in favour of being able to access their own health information summary. Do we even know what we want in that?"

Provider & Health Care System

Ascertain the Value of Electronic Medical Records

Multiple factors including challenges with data entry and extraction as well as data sharing, along with a lack of certainty of the impact of EMRs on patient care, could influence the perceived value of the EMR, as this participant indicated:

> "Well, having worked with some of the clinicians who are in general practice in primary care...I think you know the main issue for them is that is all this worth it? Is it really improving patient care? That's the bottom line".

Another participant described the contrast in perspectives regarding the value of electronic medical records in the following way:

> "I think we've done a pretty good job in medicine of getting people to think, that evidence-based medicine is the way forward for everything. Now we come along and say, "hey, you've got to use these systems and by the way we've got no evidence that they actually do improve care." That may be the fundamental issue

> why we're not seeing take up in the same way. In that we've kind of created a culture of evidence and then, we don't really have any. And it's a very odd situation where people can recognize there's no evidence but still think it's the right thing to do."

Develop Information Technology Knowledge and Resources

The first element within this theme identified by participants was the need to have people working in information technology in health care who have a health care background. As this participant described:

> "I believe that the best health information systems worker are health professionals who've developed information systems expertise not information systems people who learn health. It is much easier to teach information systems particularly the soft parts related to implementation to a health care person than it is to teach the soft parts of health care to a person who is in information systems. I can't say that strenuously enough".

Secondly, participants emphasized the need to teach individuals how to use computers effectively in their practice. As one participant stated:

> "…how do we teach people to use this as a tool and still retain clinical judgement and the art of medicine."

All Stakeholders

Need to Share Experiences

There were acknowledged areas of strength in electronic medical record use in the Canada, and this participant described the need to broadly learn from each other based on these strengths and to not to just focus on a few acknowledged experts in this learning:

> "..there is this cohort of clinics that have done it and have gone through a lot of the issues and the problems and have found solutions and ways to make it work. And so I think if we could draw upon those much more than we do, and not always the same people. I mean we tend to have an issue where we always just go to the same two or three key people, and the problem is they kind of get ignored by the masses because that kind of stops at "so and so, he's a geek"… So I think we need to be a little bit more broad in who we look at in terms of where that expertise is but I think we do have quite a large expertise and strengths that we can draw upon if we do try to."

In addition, participants described the lack of a perfect solution to adapt to Canada, and the need to understand both positives and negatives of electronic medical record adoption well. As this participant indicated:

> "Publications, journals, health authorities do not like to be seen to have gotten it wrong, a lot of lessons that we're not learning because we never even talk about it or publish it. So it's how do I change the culture and environment so we can learn from where we've gone wrong as much as where we've gone right".

Electronic Medical Record Use

Need to Better Understand Elements of Electronic Medical Record Implementation & Adoption

The contextual themes described in section 2.6, as well as the gaps in knowledge and research, are potential influencers of EMR implementation and adoption and EMR use in practice. One aspect of this that participants noted was the need to better understand influences on EMR uptake overall, as this quote suggests:

> "..there's a huge issue around why is Canada different? What is it that's causing the take up to be so different?"

Taken together, the elements that emerged within the contextual themes, as well as the gaps in research and knowledge have an impact on electronic medical records use for clinical care, policy making and research in primary health care.

Appendix 7

Consultation Session Participants

Ms. Maureen Charlebois
Chief Nursing Executive & Group Director,
Clinical Adoption
Canada Health Infoway/Inforoute Sante du Canada
Toronto, Ontario

Ms. Kayla Collins
Director of Research
Newfoundland Department of Health
St. John's, Newfoundland

Dr. Martin Dawes
Chair, Department of Family Medicine
McGill University
Montreal, Québec

Dr. Mark Dermer
Family Physician
Ottawa, Ontario

Dr. Steven Edworthy
Associate Professor, Rheumatologist
Department of Medicine & Community Health
University of Calgary
Calgary, Alberta

Mr. Thomas Fogg
Director, Strategy & Planning
Manitoba e-Health
Winnipeg, Manitoba

Mr. Brian Forster
Chief Executive Officer
OntarioMD
Toronto, Ontario

Dr. Marie-Pierre Gagnon
Assistant Professor, Faculty of Nursing Sciences
Universitié Laval
Québec City, Québec

Ms. Naomi Nice-Kyriakakis
Nova Scotia Department of Health
Halifax, Nova Scotia

Mr. Bill Pascal,
Chief Technology Officer
Canadian Medical Association
Ottawa, Ontario

Dr. Wayne Putnam
Associate Professor, Department of Family Medicine
Dalhousie University
Halifax, Nova Scotia

Mr. Roy Robb
Director, IT
Saskatchewan Medical Association
Saskatoon, Saskatchewan

Ms. Audrey Seehagen
Senior Research Projects Coordinator –
Communications
University of Alberta
Edmonton, Alberta

Dr. Greg Sherman
Assistant Professor, Family Medicine
Memorial University
St. John's, Newfoundland

Dr. Ray Simkus
Family Physician
Langley, British Columbia

Mr. Mark Spidel
Primary Care Coordinator, Primary Care Division
Prince Edward Island Dept of Health
Charlottetown, Prince Edward Island

Mr. Neil Gardner
Chief Information Officer
Saskatchewan Health Information Network
Regina, Saskatchewan

Ms. Mary Gibson
Management Consultant
Mary Gibson Consulting
Edmonton, Alberta

Dr. Roseanne Goodine
Family Physician
Woodstock, New Brunswick

Ms. Anita Lambert-Lanning
Manager, Canadian Primary Care Sentinel Surveillance Network
Toronto, Ontario

Mr. J. David Mitchell
Director, Administration and Informatics
Newfoundland and Labrador Centre for Health Information
St. John's, Newfoundland

Mr. John Swiniarski
Assistant Registrar, Staff, Operations, Finance
College of Physicians and Surgeons of Alberta
Edmonton, Ontario

Dr. Robyn Tamblyn
Professor, Departments of Medicine and
Epidemiology, Biostatistics and Occupational Health
McGill University
Montreal, Québec

Dr. Karen Tu
Scientist
Institute for Clinical Evaluative Sciences
Toronto, Ontario

Dr. Keith Wilson
Family Physician/Regional Health Authority
Regional Health Authority A
Bathurst, New Brunswick

Appendix 8

Consultation Session – Summary of Discussion of Gaps in Knowledge and Research

Discussion of Twelve Gaps in Knowledge and Research

Building on the original twelve gaps, participants identified additional elements within each gap, which adds to the description presented in Section 3.

Ascertain the Value of Electronic Medical Records

- Value to patients, providers, payer
- Compensation of providers
- Validity and comprehensiveness
- Effect of electronic medical record on relationships (team, providers and patients)
- Impact on patient outcomes, safety, care
- Tool for managing business process of practice, element of value to practice
- Impact on lifestyle
- What is "meaningful use", what is the goal we are trying to achieve?
- Levers to encourage use, what works?

Better Understand Elements of Electronic Medical Record Implementation and Adoption

- What are effective strategies for implementation and adoption
- Need for effective change management
- Look at optimal use in other sectors
- Issues of transitioning from paper and from electronic medical record to electronic medical record
- Workflow functioning issues
- Improvements in software
- Building knowledge and capacity

Develop Innovative Data Entry & Extraction Procedures

- Data quality (ensuring & defining by all user groups)
- Data linkage
- Physician/providers preferences about data entry (e.g. templates, free text, structured)
- "How to" of complex data extracts

Lack of Agreement and Understanding of Data Sharing

- Governance issues re: data sharing, legislation, rules, retaining context, responsibilities, cleaning, using safely
- What data need to be shared
- How data can be shared among providers, electronic medical record use in teams
- Provincial focus for electronic medical records – shared health records across jurisdictions

Better Understand and Define the Role/Views of the Patient

- Patient focused system
- Continuity of care with secondary, tertiary care
- Patient and broader consumers views re: electronic medical records
- Patient role re: electronic medical record, e.g. data entry
- Effect of electronic medical record on relationships between team members, providers and patients
- Value of electronic medical records to patients

Lack of Consensus and Understanding of Privacy & Confidentiality

- Policy issue that needs to be defined and agreed upon

Lack of an Overarching Framework for Interoperability

- Longevity of record-keeping, transfer of records among electronic medical records
- Business processes to support whole person care, information exchange among sectors
- Structure of system – agreed upon functions – what should electronic medical records do, what should other systems do, relationships of electronic health records and electronic medical record, patient access
- Framework for electronic medical record function and interoperability

Lack of National Leadership

- Need for forum for people to come together
- Some issues require sharing information, others require national strategy
- More effective coordination/leadership
- Look at examples of what has been done elsewhere
- Governance model comparison
- Best model for information exchange and defining leadership
- How national/provincial implementation can occur most effectively

Define Data Elements

- Work exists, needs to be pulled together
- Data quality and linkage

Develop an Ideal electronic medical record Design

- What is effective in terms of electronic medical record design?
- Providers need to identify what an ideal electronic medical record could look like
- Capacity/expertise of vendors
- Common set of electronic medical record components across Canada?

Develop Information Technology Knowledge and Resources

- Need for people with health background working in IT/electronic medical record

- Development of Canada-wide resource

Share Experiences

- How to best communicate – e.g. identifying and sharing best practices
- What impact on care and uptake would this sharing have?