The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems

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By

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Abstract

Information technology (IT) has been applied in every aspect in common everyday experience. Most industries have changed from paper based to digitally supported processes. The implementation of IT has resulted in lower costs, faster operations, and faster response to consumer demands, thus achieving economies of scale and major advancements in the quality of products introduced to the consumer.

In healthcare, IT has led to extensive advances in many different aspects of medicine. IT has enhanced diagnostic equipment, laboratory result accuracy, research methodologies and analysis advancements, and has resulted in more effective prescription of medications. These advances have increased the overall quality of life for patients.

Despite the fact that the adoption rate of Electronic Medical Record systems (EMRs) in European countries has reached more than 90%, the adoption of EMRs by primary care physicians in Canada lags far behind at a rate closer to 30%. Much of this low adoption rate can be attributed to barriers due to resistance to change. Many adoption projects in IT fail, even after change has occurred. These failures have occurred in many different industries, including healthcare. EMR adoption in primary care requires a focus on change management and sustainability for primary care physicians, the target audience of change.

This thesis research investigates the reasons for the low rate of adoption of EMRs in the primary care environment in Canada. A change management model dedicated to the Canadian primary healthcare environment for the management and sustainability of change is created and discussed in detail. This study is based on a thorough literature review of change management models; a qualitative analysis of interviews with industry leaders from different backgrounds such as consultancy, government, and vendors; and a quantitative analysis of data through an online primary care physician questionnaire.

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List of Abbreviations

CDSS	Clinical Decision Support Systems
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CIHI	Canadian Institute for Health Information
CIO	Chief Information Officer
CPOE	Computerized Physician Order Entry
CT	Computed Tomography
CTO	Chief Technology Officer
EHR	Electronic Health Record
EMR	Electronic Medical Record
GDP	Growth Domestic Product
HFMA	Healthcare Financial Management Association
HIMSS	Healthcare Information and Management Systems Society
HMO	Health Maintenance Organization
IT	Information Technology
MARS	Medical Automated Record System
MRI	Magnetic Resonance Imaging
OECD	Organization for Economic Co-operation and Development
PHR	Personal Health Record
PPP	Purchasing Power Parity
ROI	Return on Investment
WHO	World Health Organization

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I would like to thank the board of directors of the Master of Science eHealth program at *McMaster University* for giving me the opportunity to study at *McMaster University*, one of the most reputable and prestigious universities in the world. It has been a marvelous experience that will never be forgotten.

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I would like to thank everyone one working at *McMaster University* for their devotion and professionalism which have created a level of support that will never be forgotten.

I, truly, have been blessed by being a student at *McMaster University*…

Dedication

To my mother, my wife, my son

&

To the soul of my father

Chapter One: Introduction

As we enter the second decade of the twenty first century, the world does not look exactly as it did just ten years ago. The amount of information that can be accessed currently is enormous compared to the amount available in the previous decade. This is a logical result of the advances in IT and the increased number of channels of communication.

IT is currently being applied in all aspects of life and in almost every industry such as manufacturing, transportation, media, education, health, etc. (Thorp, 2007). The benefits that have resulted from the application of IT in these industries include increased efficiency, exploration of new ideas, reduced costs, increased revenues, expansion to new markets, and major advancements in the quality of products.

The application of IT in health has led to major advances in different aspects of health such as imaging, diagnosis, analysis, and medication management. One major advantage of IT in healthcare is its ability to handle large volumes of data. Currently, the amount of data accessed is enormous compared to previous eras. The extraction and processing of data in different fields have led to increased knowledge which can eventually lead to increase quality, increased revenues and cost reductions. This process is known as data mining (Hand, 2001).

In the healthcare industry, the application of IT (eHealth) is the future of this industry. IT has the potential for enhancing medication associated research, pandemic disease analysis, decreasing the hazards resulting from prescribing incorrect medication that leads to adverse drug reactions (Fortescue, 2003), and ensuring a better quality of life for patients (Balas, 2004).

Many other benefits can arise from the implementation of IT in healthcare. Electronic billing can reduce administration costs (Collins, 1991). Electronic prescribing can reduce the hazards resulting from drug-to-drug interactions (Fortescue, 2003). Computerized laboratories can increase the accuracy of results (Da Rin, 2009). Data sharing can increase the accuracy of patient information as it will be gathered from different healthcare providers, resulting in better quality of care. (Rantz, 2011) Systems that gather patient medical information are known in Canada as Electronic Medical Record systems (EMRs). This research will focus on the EMRs that are used by primary care physicians, particularly in small practices that employ no more than a few physicians.

A typical EMR can contain patient information that is provided from different sources, including hospitals, laboratories, and pharmacies. Thus most patient information can potentially be available to a primary care physician when a patient goes for a regular checkup or any other reason. An EMR can make the exchange of patient information between different healthcare providers much easier and even if the patient has to move or change location, the patient's new physician may have access to the information entered by his/her peers. Hence, healthcare providers should have a more detailed understanding of the patient's medical history and condition and be able to provide a better quality of care.

Examples of the potential benefits that EMRs introduce to primary care practices in the healthcare system are summarized as follows:

1. Reducing medical errors. (Fortescue, 2003)
2. Delivering better healthcare to rural areas (Mills, 2010)
3. Introducing a more effective and efficient healthcare system (Hillestad, 2005)
4. Healthcare system cost reduction. (Hillestad, 2005)
5. Decrease in waiting times (LeBaron, 2010)
6. Delivering better quality of care (Rantz, 2011)
7. Increasing quality of life for patients with chronic diseases (Balas, 2004)
8. Better knowledge management (Wickramasinghe, 2002)
9. Physician performance enhancement (Wickramasinghe, 2002)

EMRs in Europe have been adopted by different healthcare providers such as hospitals, primary care physicians, and specialists. The adoption rate of EMRs in Europe has already surpassed 90% on average. In the Netherlands, Norway, United Kingdom, and Sweden the percentage of physicians reported to be using EMRs is 99%, 97%, 96%, and 94% respectively. In Germany and France the percentages are 72% and 68% respectively. In New Zealand the percentage is 97%, and in Australia, the percentage is 96 percent (C. O. Schoen, Robin 2009).

Despite the high adoption rates of EMRs in Europe and the reported benefits of EMRs, the EMR adoption rate of primary care physicians in the USA and Canada, is still relatively low at 46% and 37% respectively (Schoen, 2009).

To increase the percentage of primary care physicians adopting EMRs in Canada, which is the focus of this research, requires consideration of the multiple known barriers to adoption. One of the major barriers to adoption is human resistance to change (El Emam, 2008). This

can be addressed by change management, the methodology of changing the clinical operations of primary care physician offices from their current paper based state to the desired digitally supported EMR system.

Change management is a process that can assist an organization in getting from its current state to its future state through a structured approach, bearing in mind the psychological, financial, and time risks. Projects associated with changing the process of conducting a business, are risky and a large percentage of these projects fail, especially when IT is involved. The reasons for such failures are numerous including risks of a decrease in business performance (Southon, 1999), lack of financial support (Eaton, 2010), unclear vision of the end result of change (Eaton, 2010), Return On Investment (ROI) uncertainty (Southon, 1999), inadequate training (Southon, 1999), poor planning (Eaton, 2010), the normal human fear of change (Coburn, 2006).

To manage a change project successfully requires a structured approach. A number of change management models have been designed to help manage change successfully. Change management models that will be discussed in more detail below, include the McKensy 7-S Model, Nadler and Tushman Organizational Congruence Model, Burke-Litwin Model, STARS Model, Kurt-Lewin model, Kubler-Ross model, Sean-Covey's seven habits, Prochaska's model of change, Kotter’s eight step model, and the ADKAR (awareness, desire, knowledge, ability, reinforcement) model. If applied carefully, these approaches can help to manage change in organizations.

The previously mentioned change models may work well when applied on an organizational level. However, when it comes to a small business, the process of change has many other special considerations. For example, managers of small businesses are more focused on short term survival than on long term strategic implications, and business process changes can result in critical losses in both productivity and revenue.

Most small primary healthcare organizations in Canada are normally operated as small private businesses. Change to their operations is sensitive to ROI. Any change in the methodology of conducting a small primary care business can lead to a negative fluctuation in revenue; hence making the business less profitable in the short term. In addition to the characteristics of a small business, the uniqueness of a small primary care practice itself makes any process of change a very critical matter. However, a primary care practice such as a walk-in

clinic or a family practice cannot provide the best possible quality of care for its patients if patient information cannot be retrieved readily. This may put patient health at risk.

The business model of a small business usually requires that the Chief Executive Officer (CEO) is at the same time the chief technology officer (CTO), the chief financial officer (CFO), and the project manager. A small primary care practice is exactly the same, where physicians play all the previous roles. They are responsible for running the business, looking after financial and technology aspects, while at the same time caring for their patients. Even if physicians are convinced that it is a good idea to change the methodology for conducting their businesses, the risks associated with this change might lead to a failure of the change project itself.

The licensing and reimbursement model for primary care physicians in Canada can also hinder the adoption of EMRs. Family physicians are licensed by the College of Family Physicians of Canada, and many are reimbursed by the respective provincial or territorial government on a fee-for-service model. Therefore, business productivity in terms of the number of services provided is very important to the prosperity of physician-operated businesses.

Because of the unique nature of primary care practice in Canada, as each practice – walk-in clinic or a family doctor – could be represented by a small business that deals with their customers – patients – however, payment is made through the government or the insurer, a unique change management model is needed to help physicians undertake the changes required to adopt EMRs in their practices. The goal of this research is to develop a change management model that is dedicated to practitioners in small primary healthcare organizations. The methodology undertaken in this research is threefold, involving a comparison of available change management models, a quantitative analysis of a survey targeting physicians, and a qualitative analysis of the input provided by industry leaders.

The research question addressed in this research is What is a suitable framework for managing change during the adoption of an EMR in a small primary healthcare practice? The methodology undertaken in this research is summarized as follows:

1. Change Management Model Comparison
    - The most effective change management models are investigated to design a change management model primarily dedicated to the small Canadian primary care organization.

2. Qualitative Analysis
    - A series of interviews were held with industry leaders from different backgrounds, including provincial government, federal government, subject matter expert consultants, IT consultants, change management consultants, and EMR vendors, to investigate what is needed in the working environment of primary care physicians to facilitate change in the adoption of EMRs.

3. Quantitative Analysis
    - An online survey of concerning IT and EMR requirements were completed by physicians working in several small primary care practices.

The remainder of this thesis is comprised of first, a review of the relevant literature. This is followed by a discussion of the research methodology, an in-depth review of existing change management models, an analysis of qualitative data gathered from industry experts, an analysis of quantitative data gathered from practicing physicians, formulation of the proposed change management model, and finally conclusions and recommendations.

The thesis is designed to build a change management model that will help physicians in their adoption of EMRs which is suitable for small businesses operating in primary care in Canada, from the perspective of a change manager.

Chapter Two: Literature Review

2.1 Sources of Literature

A search of the available literature gathered information available from different sources on the web and different databases that covered the current healthcare situation and EMR usage in Canada, the potential benefits that EMR might introduce to the Canadian healthcare system, IT projects, barriers to EMR adoption, the nature of small business, change management, models for change management, and the failure and success factors of change initiatives.

The web sources used were Statistics Canada, the Organization for Economic Co-operation and Development (OECD), and the World Health Organization (WHO).

The databases searched were from different specializations, in order to cover all aspects of the adoption process and the available literature related to EMRs. The different specializations were business, engineering, health sciences, and psychology. Table 2.1 shows the sources of information for each search specialization.

Table 2.1 Databases used throughout the research and their specialization

Name of Database	Specialization
Business Source Complete	Business
IEEE Xplore	Engineering (Electrical and Computer Engineering)
MD Consult	Health Science
Medline	Health Science
Global Health	Health Science
PsycINFO	Psychology

The following search terms were used in searching relevant academic papers, journals, books, and reports on change management:

- *"Change Management"*
- *"Change Management"* & *"Models"*
- *"Change Management"* & *"Healthcare"*
- *"Change Management" & "Sustainability"*
- *"Sustainability" & "Change"*
- *"Change Management" & "Information Technology"*
- *"Information Technology" & "Adoption"*
- *"Implementation"* & *"Information Technology"* & *"Success factors"*
- *"Implementation"* & *"Information Technology"* & *"Failure factors"*
- *"Health Information Technology"*
- *"Health Information Technology" & "Components"*
- *"Resistance to Change"*
- *"Resistance to Change"* & *"Healthcare"*
- *"Beyond Implementation"*

2.2 Healthcare in Canada

Healthcare expenditures in Canada have been increasing at almost an exponential rate (see Figure 2.1). According to the World Health Organization statistics for the year 2011; the total expenditure on health as a percentage of the gross domestic product (GDP) in the year 2008 was 9.8%, an increase from 8.8% in the year 2000 (World Health Organization, 2011). This resulted in a total Canadian expenditure on healthcare of $148 Billion US (equivalent to C$148 Billion). It is instructive to compare Canadian healthcare expenditures as a percentage of GDP over the period from 1960 to the present. Figure 2.2 shows an approximately linear rate of growth over this period. Normalized Canadian per capita expenditures in comparison with certain other OECD countries are shown in Figure 2.3 for the period 2006 to 2009.

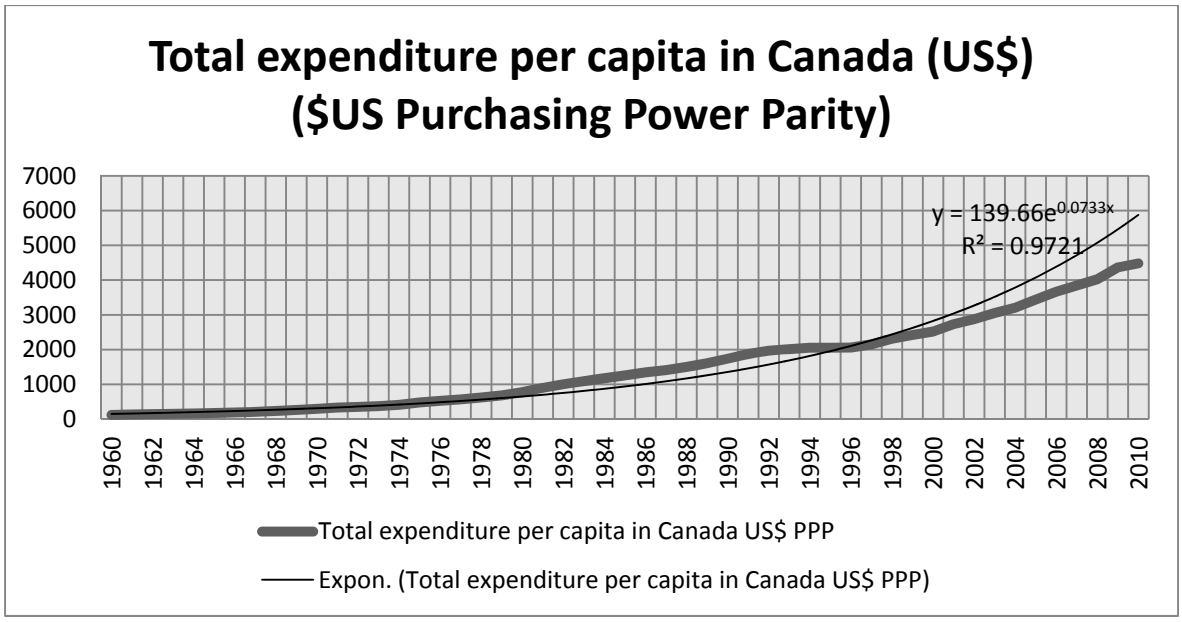

Figure 2.1 Total expenditure per capita in Canada (US$) PPP (Purchasing Power Parity)

Source: *the Organization for Economic Co-operation and Development (OECD)*
URL: *www.oecd.org/dataoecd/52/42/48304068.xls*
Graph developed by the researcher

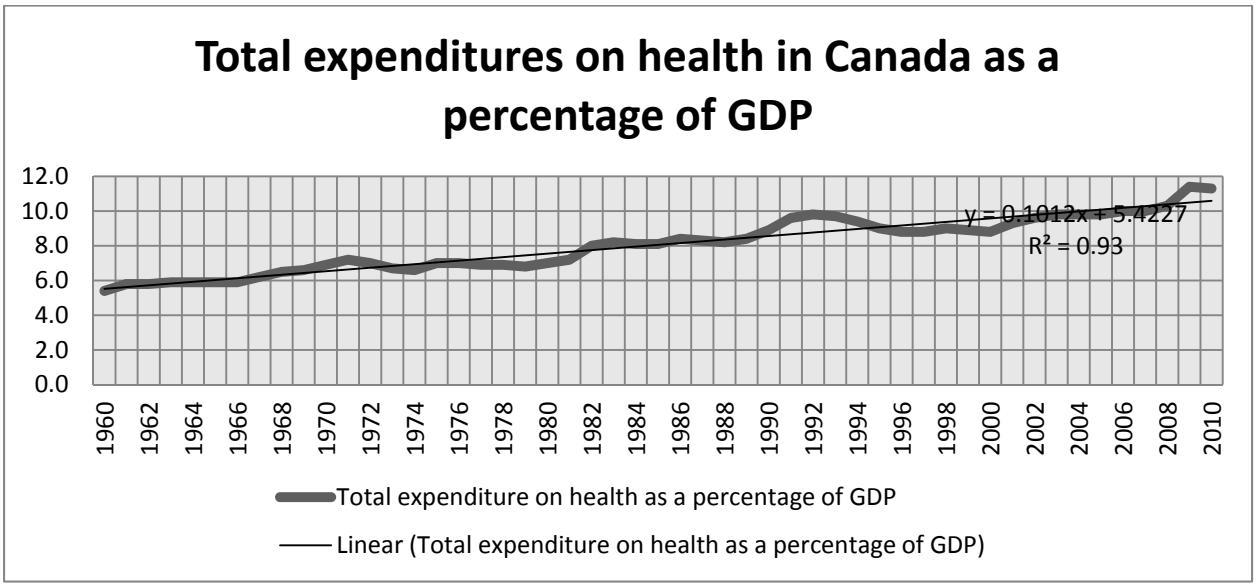

Figure 2.2 Total expenditure on health as a percentage of GDP

Source: *the Organization for Economic Co-operation and Development (OECD)*
URL: *www.oecd.org/dataoecd/52/42/48304068.xls*
Graph developed by the researcher

In terms of current per capita expenditures on health, Canada ranks third after the United States of America and the Netherlands.

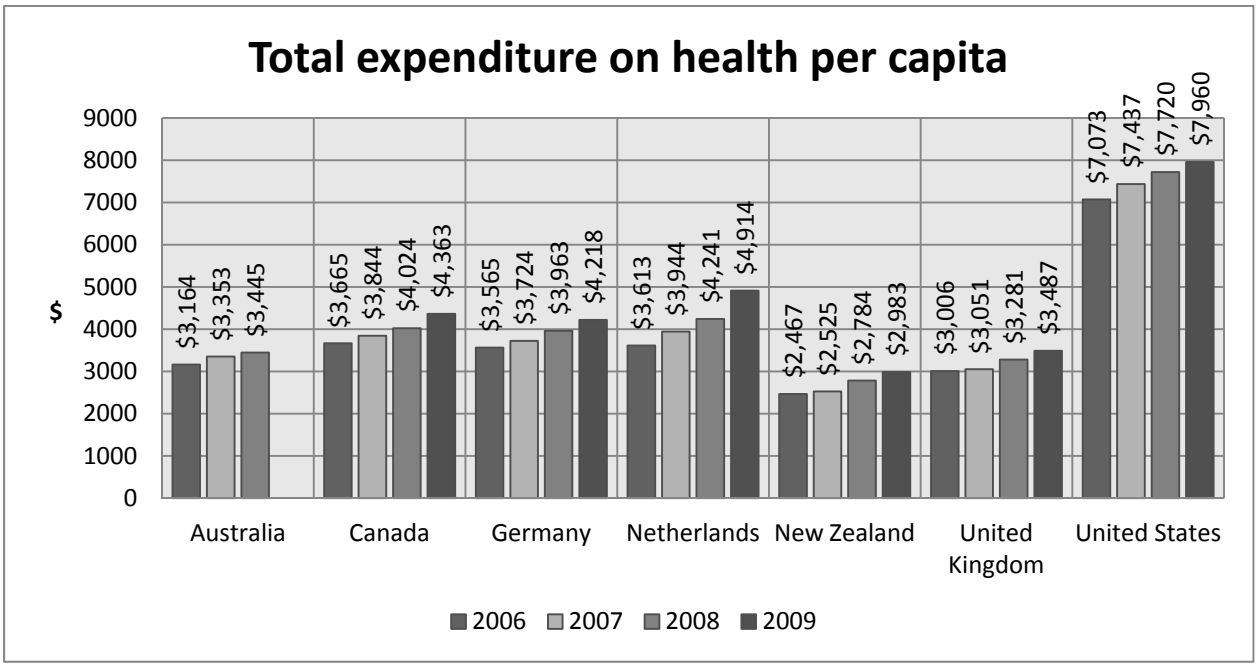

Figure 2.3 Total expenditure on health per capita

Source: *the Organization for Economic Co-operation and Development (OECD)*
URL: *www.oecd.org/dataoecd/52/42/48304068.xls*
Graph developed by the researcher

Figure 2.3 also demonstrates that in most of these countries the expenditure on health is increasing. Figure 2.4 shows the total per capita expenditure on health as a percentage of the GDP for the same countries. Canada ranks fourth after the United States of America, the Netherlands, and Germany.

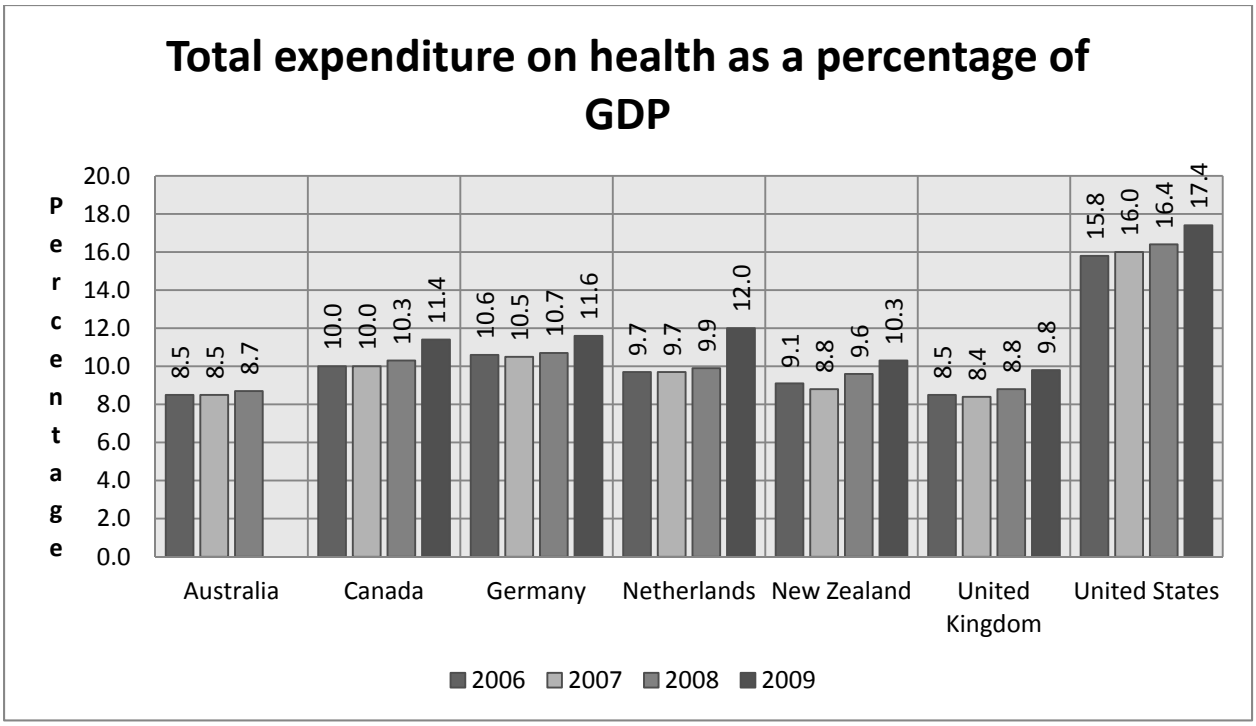

Figure 2.4 Total expenditure on health as a percentage of GDP

Source: *the Organization for Economic Co-operation and Development (OECD)*
URL: *www.oecd.org/dataoecd/52/42/48304068.xls*
Graph developed by the researcher

From the above data it can be concluded that spending on health in the included countries is increasing both in value and percentage of the GDP. That is, even if the GDP of these countries is increasing, the rate of expenditure on health is increasing at a higher rate.

Although these cost measures are indicators of spending on health in the countries under comparison, there is still the question of whether this spending is efficient. In other words, can the costs associated with the healthcare systems in these countries be reduced while at the same time delivering an even better quality of care? Considering diagnostic imaging as an example, despite increased investment in Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) equipment, a large waiting time problem exists in Canada. The reason for this could be simply the inefficient use of the healthcare system in Canada in which both primary care doctors and specialists are ordering too many MRI and CT tests. Any inappropriate ordering might be a cause of unnecessary wait times for tests that really are necessary, leading to implications for patient safety and quality of life (Health Council of Canada, 2010). The implications are that inappropriate tests imply extra costs that could be avoided. An investigation

of misuse of such tests in Canada found that only 2% of the CT tests ordered that are related to headaches have shown abnormal results. This does not necessarily mean that the remaining 98% percent of such tests could possibly be replaced by other less expensive diagnostic methods. (Health Council of Canada, 2010).

Avoidable costs associated with the healthcare system in Canada can be associated with drug-to-drug interactions. Ordering a specific medication for a patient who is already taking another medication without understanding the potential for such interactions could lead to severe outcomes such as loss of work hours or even death of patients (Classen, 1997).

There are additional problems in Canada due to its aging population. The problem with such demographics is that countries with aging population can be in a higher risk of developing a chronic disease. For example; diabetes in Canada reached 802,696 in people of age 65 years and over and it decreases as age decreases until it reaches 12,795 for population 12 years and under (Statistics Canada, 2011). The problem with chronic diseases such as diabetes is it is usually associated with extensive additional care and increased costs to the healthcare system. *(Please revise table G-1 for diabetes in Canada classified by age)*

As an example, diabetes is one chronic disease that is increasingly common in Canada. Diabetes management requires frequent visits to family doctors, continuous attention from the patients or their caregivers, and an increased cost in medications and equipment used to monitor patient conditions. The quality of life and productivity of a diabetic patient can be negatively affected as a result, and society must pay the increased costs to the healthcare system. The economic burden of diabetes is on the rise. The cost of diabetes in Canada was expected to be C$ 12.2 billion for the year 2010 according to a report by the Canadian Diabetes Association. The report identifies that the indirect cost of resources used to treat diabetes was C$10.1 billion annually. The indirect cost is the lost economic value that diabetes was responsible for, such as loss in productivity, illness, or mortality. The remaining C$ 2.1 billion related to direct costs of diabetes treatment arising from hospitalization, medication, and visits to general practitioners and specialists (Canadian Diabetes Association, 2009).

A study prepared by the American Diabetes Association showed that the total cost for diabetes care in 2007 in the United States was $174 billion US, of which $116 billion US were medical expenditures. Fifty percent of these costs were related to inpatient care, 12% to the cost of medications, 11% was retail prescriptions, and 9% was due to physician office visits. The

remaining cost of $58 billion US was indirect costs of reduced national productivity (American Diabetes Association, 2008).

Figure 2.5 shows the increasing trend of diabetes occurrence in Canada from 2006 to 2010.

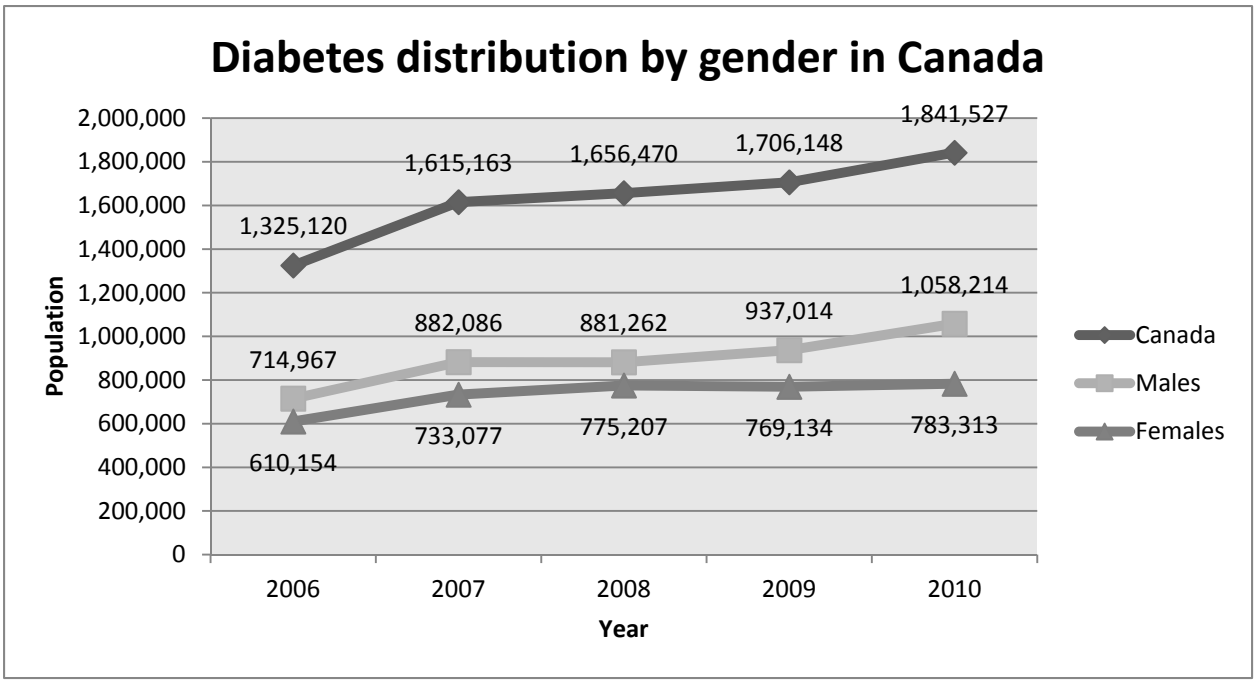

Figure 2.5 Diabetes distribution by gender in Canada

Source: *Statistics Canada*
URL: *http://www40.statcan.gc.ca/l01/cst01/health54a-eng.htm*
Graph developed by the researcher

The aging population and the increased number of patients who have developed chronic disease conditions require continuous supervision and treatment that is associated with increased costs. Moreover there is large intangible effect on patient quality of life. The increased use of IT for monitoring and managing chronic diseases will likely have a positive effect upon cost reduction, and could eventually result in an increase in the quality of life for patients (Southern California Evidence-based Practice Center, 2006).

As shown above, healthcare expenditure is not only on the rise, but it is associated as well with extra costs resulting from different sources such as: the cost associated with an aging

society in general; the direct and indirect costs associated with chronic disease such as diabetes; direct and indirect cost of errors in medication prescriptions, in the form of incorrect doses, incorrect medications, or different medication interactions; and extra costs associated with ordering unnecessary laboratory tests and procedures. (Southern California Evidence-based Practice Center, 2006)

Different applications of IT in healthcare have been designed to help physicians keep track of their patients' information, improving communication channels with patients, sharing patient information with other healthcare providers such as community hospitals, laboratories, and pharmacies, and enhancing physicians' critical decision making. The applications include EMRs, Electronic Health Records (EHRs), Personal Health Records (PHRs), Clinical Decision Support Systems (CDSS) etc. (Alliance, 2008) It has been found that the meaningful use of IT, specifically of EMRs, in primary care should improve the quality of care patients are receiving. (Crosson, 2007)

A very important characteristic in the Canadian primary care market is the number of physicians per 1000 population. Figure 2.7 compares this ratio for several OECD countries. In this Figure, Canada is tied with the U.S. for the lowest ratio, at 2.4 physicians per 1000 citizens (Organization for Economic Co-operation and Development, 2011). "The data presented refers to the total number of physician in each country".

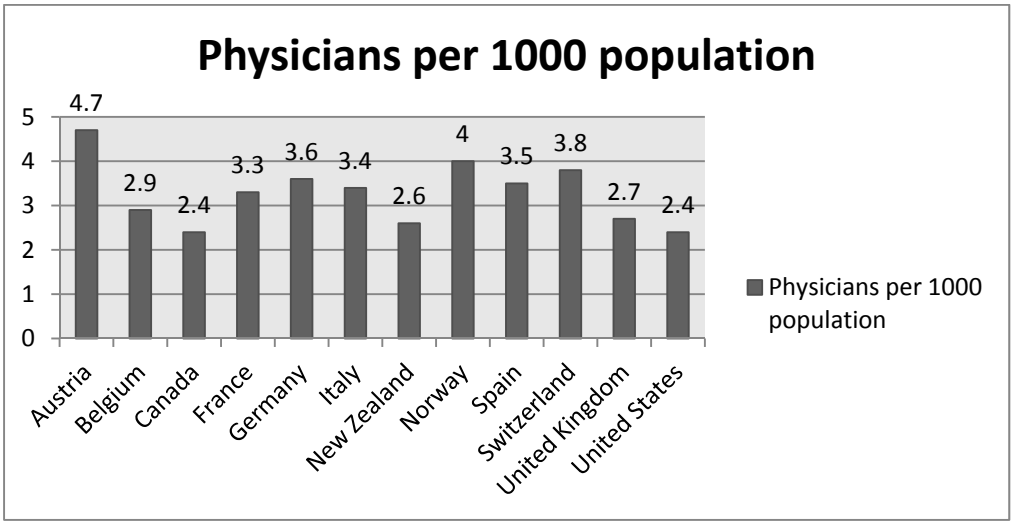

Figure 2.6 Physicians per 1000 population

Source: *the Organization for Economic Co-operation and Development (OECD)*
URL: *www.oecd.org/dataoecd/52/42/48304068.xls*
Graph developed by the researcher

2.3 EMRs in Canada

An EMR is a collection of patient health information from one healthcare provider such as a family doctor or general practitioner, while an EHR is a collection of patient health information from multiple healthcare providers (Roman, 2009). The application of IT in healthcare in terms of simply adopting an EMR by a primary care practice in Canada is still a difficult process. EMR adoption in Canada lags behind other members of the OECD.

In terms of EMR system adoption rates by primary care physicians, a 2006 survey (Figure 2.7) showed Canada the lowest among OECD members, with only 24% of physicians using EMRs. Note that this survey showed that the Netherlands, New Zealand, and United Kingdom were at 98%, 92%, and 89% respectively (Health Affairs Web Exclusive, 2007) (C. O. Schoen, R.; Huynh, P. Trang; Doty, M.; Peugh, J.; Zapert, K., 2007).

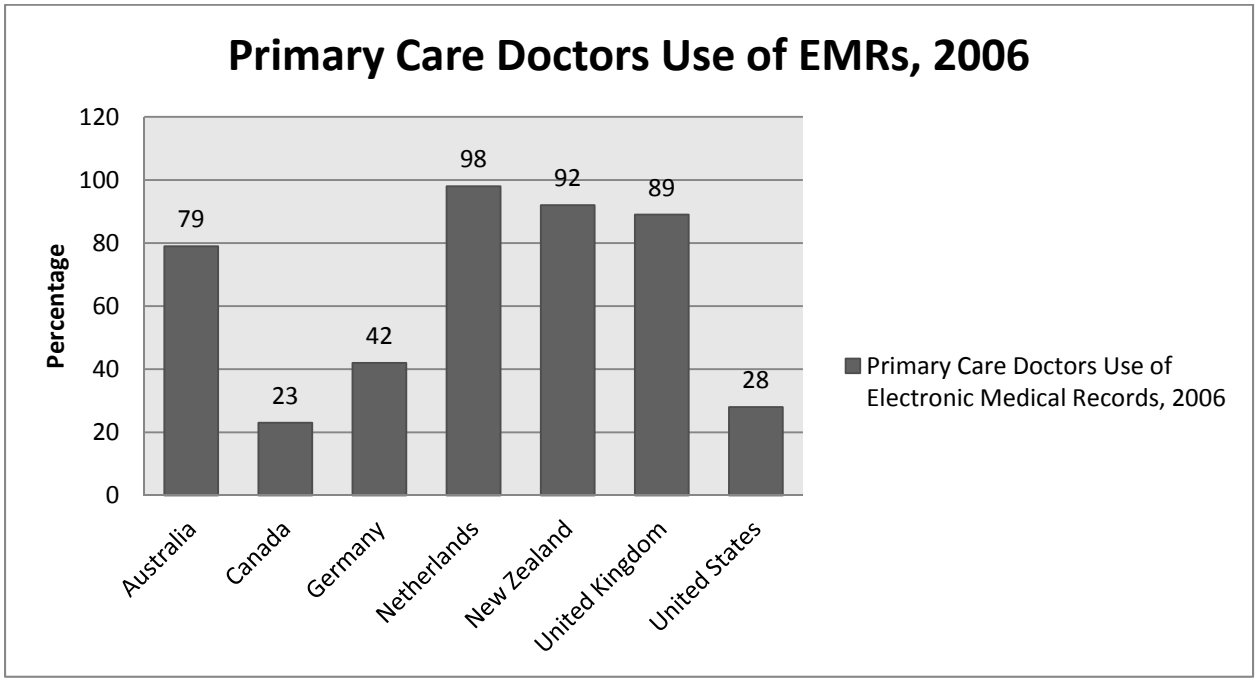

Figure 2.7 Primary Care Doctors Use of Electronic Medical Records, 2006

Source: *Harris Interactive*
URL: *http://www.harrisinteractive.com/news/newsletters/healthnews/hi_healthcarenews2007vol7_iss02.pdf*

Experts have indicated that an EMR should be capable of performing 14 functions (Harris Interactive Inc., 2007). If a primary care organization reported using an EMR that performed 7 or more out of the 14 functions, the practice was considered as a primary care

practice with advanced information capacity. When comparing Canada on the scale of primary care practices with advanced information capacity, Canada scored only 8% (only 8% of the primary care practices were equipped with EMRs that provided advanced information capacity). As shown in Figure 2.9, this is minimal when compared to countries like New Zealand (87%), United Kingdom (83%), or Australia (72%) (Harris Interactive Inc., 2007).

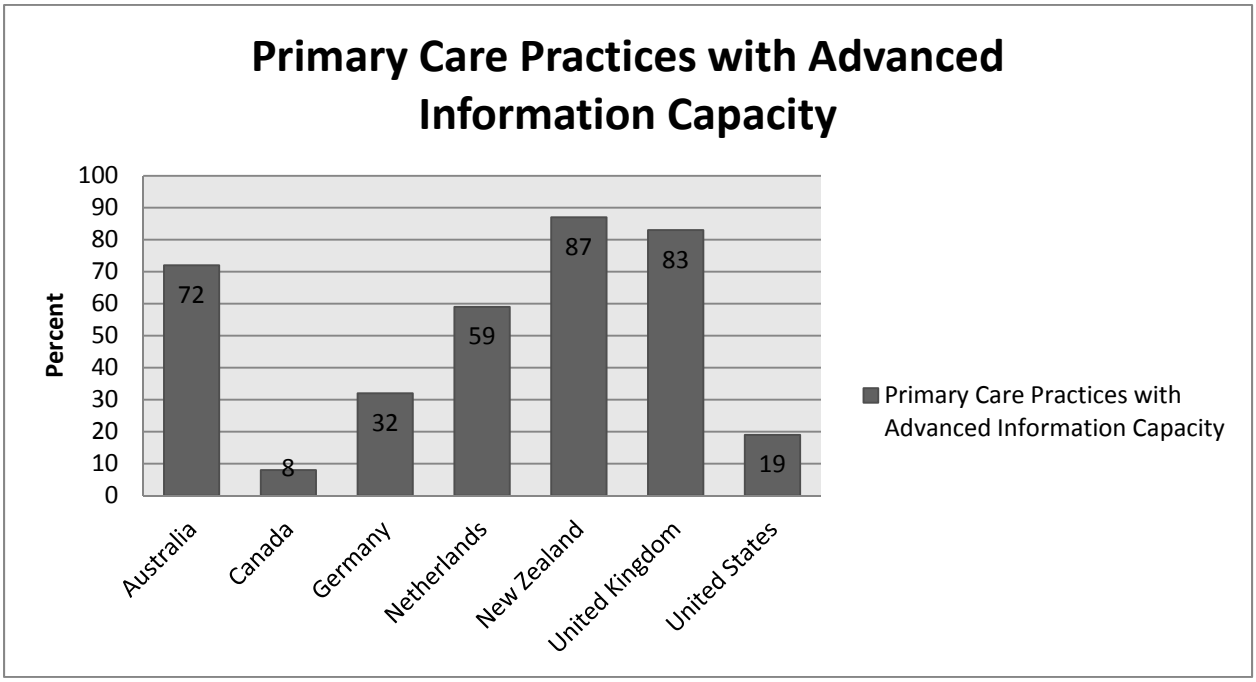

Figure 2.8 Primary care practices with advanced information capacity

Source: *Harris Interactive*
URL: *http://www.harrisinteractive.com/news/newsletters/healthnews/hi_healthcarenews2007vol7_iss02.pdf*

Since the percentage of physicians already using EMRs in Canada is about 25%, these results suggest that Canada is considerably lagging behind most other countries in terms of its EMR adoption rates.

According to a study by Accenture published in 2010, EMR adoption rates in Canada are expected to reach 58% by the year 2013 (Accenture, 2010). The Canadian EMR market was ranked third by vendors in terms of opportunities, behind the UK and Australia. However, the paper also identifies problems in global markets, with the main reported obstacle in Canada being insufficient government spending.

In its study, Accenture presented the problems hindering the increase in EMR adoption globally. The problems, as listed by Accenture are listed in Table 2.2 Note that physician resistance to using technology is considered the third most important barrier to EMR adoption globally (Table 2.1).

Table 2.2 Factors of EMR adoption active in global markets

Factors Active in Global Markets	Percentage
Shortage of clinically trained IT resources will impact future markets	86
Government funding is main driver of EMR adoption	71
Physicians continue to resist using EMR technology	57
Analytics remain a challenge for hospitals	43
HIEs will evolve with EMR, not after EMR implementation	43
Mobile technology use is an analog for EMR adoption	43
EMR reduces the number of applications supported in hospitals	29

Source: *Accenture - Overview of International EMR/EHR Markets*
URL: *http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture_EMR_Markets_Whitepaper_vfinal.pdf*

Healthcare IT is an innovation that is no different than any other innovation. The diffusion of innovation theory by Rogers M. Everett is depicted in Figure 2.10. According to the theory, Canada, with an adoption rate of 23%, is currently in the early majority phase in terms its adoption of IT in healthcare (the EMR adoption phase) (Rogers, 2003).

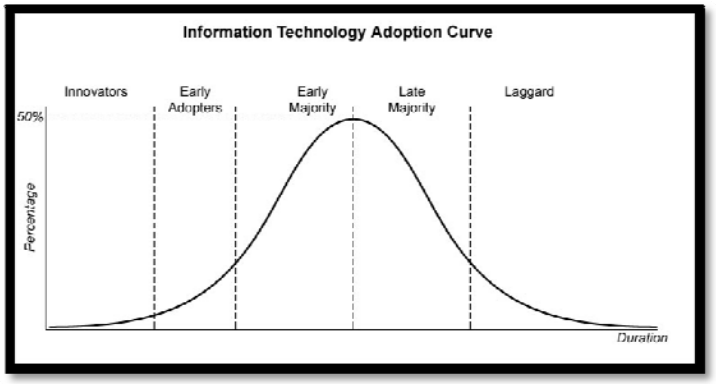

Figure 2.10 Information Technology Adoption Curve

Source: *Diffusion of Innovation, Everett M. Rogers, 2003, Free Press, New York, NY*

2.4 Benefits to Healthcare systems

Before going into depth on how change could be implemented in the setting of a small business such as a family doctor or a walk-in clinic, some critical questions about the benefits that will result from the application of IT into the daily practice of physicians need to be answered.

The parties involved in the process if a patient decides to visit a physician are numerous. These parties can be participants in one or more of the different procedures such as billing, administration, supplying pharmaceuticals, paying insurance, doing research, etc. However, four stakeholders that will be major players in a clinic's decision to adopt an EMR or will be most influential in the change process to adopt an EMR need to answer the following question:

"What is the benefit that will result from EMR adoption?"

The benefits that will result from EMR adoption is numerous and could be classified based on the beneficiaries into patients, physicians, vendors, and governments

From a patient's perspective, the benefit of EMR adoption will be significant when the patient's quality of life is improved. This could translate into fewer visits to the physician, more accurate treatment, the possibility of improved self monitoring, and increased channels of communication with the physician.

From a physician's perspective, the benefit will be significant when the business process becomes more efficient, and when patients can be serviced more effectively. This could be represented by an increase in practice efficiency. For example: if having an EMR would enable the physician to see more patients per working hour, or if the EMR could provide direct access to patient information from different care providers such as community hospitals, laboratories, and pharmacies, increasing the accuracy of information available to the physician and therefore improving the quality of patient care.

From the government's perspective, the benefit from installing an EMR in a primary care practice would be increased efficiency in the usage of resources to provide better care. This might result in fewer medical errors, leading to a lower burden on the healthcare system to respond to these errors, ordering the right tests that might decrease waiting lines, etc.

From a vendor's perspective, increasing EMR adoption in primary care improves the vendor's business profitability and potential for long-term survival.

Testimonials from physicians

Communicating the benefits of increasing EMR adoption and the adoption of IT in general, Dr. Robert Rowley, a physician from the US with a vision on the benefits of the application of IT in healthcare, was quoted (Rowley, 2010) (The Health Care Blog, 2010)

> *"A transformed healthcare delivery system which is able to reduce medical errors, implement best-practices standards as they emerge, reduce disparities in care delivery, involve patients in their care, and encourage the coordinated delivery of health care"*

Another testimonial from Dr. Bailey, a physician who experienced the benefits of ordering the proper test for a patient who was suffering from a bleeding malignant polyp that might have gone undetected, leading to dangerous complications over time if it were not for the right test suggested by the physician's EMR, (Canadian Healthcare Network, 2011).

> *"That would never have happened if we were not using the EMR"*

Another physician in the same article suggested that EMRs are helpful in managing patients with chronic diseases and that switching to an EMR is a *"No-Brainer"*:

> *"It is just so helpful, particularly with chronic disease management, to be able to track patients' blood pressures over time, their cholesterol over time, and their blood sugars over time, and have an accurate medication list. That is all information I need to give them better care, and with an EMR I have it at the click of a mouse."*

Benefits of EMR

A study prepared for the U.S. Agency for Healthcare Research and Quality identifies the benefits from the use of IT in general and specifically for the use of EHRs (Southern California Evidence-based Practice Center, 2006). The benefits identified in the study are better quality of care could be provided when the essential medications and medical images are provided to the patients who need them to avoid dangerous outcomes, better patient centric care could be provided when all the patient information is accessible at one location by different healthcare providers, medication error reduction would be achieved when the EMR system contains all the patient information needed to provide appropriate medication for patients, drug to drug

interaction notifications would alert the physician if there was any possibility that a particular combination of medications might lead to dangerous outcomes, medication dose error reduction, where a perfect EMR system would not just recommend to the physician what medication to prescribe but the proper dose as well, because an overdose might have hazardous implications, and cost savings which would result when the right medications are dispensed to patients at the correct dosage, leading to savings to the healthcare system.

In general, this literature survey concluded that the use of IT will likely increase the efficiency of medication dispensing, hence increasing the overall efficiency of the healthcare system.

Currently there are systems that can be used for monitoring and reporting chronic diseases. Such systems that patients could use would definitely reduce patient visits to family doctors (Southern California Evidence-based Practice Center, 2006). For example, *telehome* proved to be a very effective tool in monitoring and controlling type 2 diabetes, resulting eventually in an increased quality of life. (Bujnowska-Fedak, 2011)

An example of the benefits of implementing a complete IT application in healthcare in a developing country also illustrates these benefits (Sudhahar, 2010). In this case, the installed EMR increased accuracy of medical information and speed of patient information retrieval, increased patient security, and resulted in significant time and cost savings for patients who needed to travel to visit their physicians less. If this solution were to be implemented in Canada for remote areas that do not have regular access to a physician or for patients with chronic diseases who need not leave their homes, patient safety and quality of life can improve.

An example of improved healthcare through EMR use is Kaiser Permanente, a US Health Maintenance Organization (HMO). This firm introduced a system to increase patient safety and provide better quality of care. Their system (Medical Automated Record System – MARS) was used for both the clinical and business aspects of healthcare to provide better quality of care for patients, based on this firm's strategy. If one of the physicians employed by the HMO did not adhere to system recommendations within 20% of the time allotted, reminders were sent to the physician. If a physician's behavior did not improve, there could be financial consequences (Wickramasinghe, 2002). The introduction of MARS into the Kaiser Permanente healthcare system helped to enforce medical practice guidelines. MARS became the core of Kaiser Permenante's operations by helping to track physician behavior and utilization levels. The following advantages were noted from the introduction and use of MARS: knowledge

management, increased efficiency, physician performance reviews, medication recommendations, hence avoiding incorrect medication doses or incorrect medications, and providing physicians with access to up-to-date medication data.

2.5 Information Technology Projects

Despite the discussion in the previous section concerning the benefits of EMRs, a large percentage of IT related projects still fail in almost every industry. This includes financial services, computer consulting, government, and telecommunications (El Emam, 2008). According to the Standish Group report where the data for the study results shown in Table 2.2 were gathered, the percentage of projects that are cancelled in the US has decreased from 31% in 1994 to 19% in 2006. Close to 25% of cancelled IT projects were within the range of 11-20% complete, while at least 75% of cancelled IT projects were within the range of 1-40% complete. The reasons identified in the paper for the failure of IT projects are listed in Table 2.2

Table 2.3 Reasons for IT Project Cancellation

Reason for IT Project Cancellation	Percentage
Senior management not sufficiently involved	33
Too many requirements and scope changes	33
Lack of necessary management skills	28
Over budget	28
Lack of necessary technical skills	22
No more need for the system to be developed	22
Over schedule	17
Technology too new; didn't work as expected	17
Insufficient staff	11
Critical quality problems with software	11
End users not sufficiently involved	6

Source: *A Replicated Survey of IT Software Project Failures*
URL:*http://www.ruor.uottawa.ca/fr/bitstream/handle/10393/12988/El_Emam_Khaled_2008_A_replicated_survey_of_IT_software.pdf?sequence=1*

Note that the percentages given in the table do not total to 100 since projects could have been cancelled for more than one reason. The table shows that the failure of IT projects does not depend heavily on the software itself but mainly on the involvement of senior management, the lack of professional project management skills, budget overruns, or failure to complete on time, all of which are the cornerstones of good project management.

Reasons for IT project failures

Nelson identifies the main reasons for project failure and classifies them into 4 categories (Nelson, 2007): people level; the motivation and capabilities of the people involved in the project play a major role in the success or failure of an IT project, process level; project management methodology is a major contributor to project success or failure while budget or schedule overruns or not assessing risks correctly would likely lead to project failure, product level; avoiding unnecessary add-ons during project development or in other words "scope creep", is absolutely essential to avoid cost and schedule over runs, and technology level; switching technologies during the project could cause a project to be delayed beyond the scheduled completion date.

Nelson identified 36 factors that could lead to project failure. The top 10 factors were related to either the process or the people themselves. These are classical project management mistakes related to estimation, risk management, poor planning, or not defining requirements clearly. However, the major causes of failure were due to a lack of people management skills such as stakeholder or sponsor management, political issues, or team issues.

Iacovou and Dexter identified strategies to avoid IT project failure or cancellation, and their first recommendation was to develop a communication plan, one of the main factors in determining project success or failure (Iacovou, 2005). Grant and Qureshi argued that, although IT projects require solid project management methodology, careful planning, and strong people management skills, knowledge-based projects are more difficult to manage, so they tend to be riskier and more likely to fail (Grant, 2006).

2.6 Barriers to EMR adoption

Despite the earlier discussion concerning the benefits of EMRs, adopting new systems is not a simple process. EMR adoption is, by and large, an IT implementation project and as discussed in the previous section a large percentage of IT projects fail, sometimes even before they start. This may happen especially if the project appears to be affecting productivity.

Reardon and Davidson studied how physicians perceive the organizing vision of EMRs. This study suggested that the overall organizing vision of physicians for electronic records is not solid enough to motivate them to overcome their reluctance to adopt EMRs (Reardon & Davidson, 2007).

From the point of view of most physicians, implementing an EMR is likely to negatively affect their productivity. A study for the U.S. Agency for Healthcare Research and Quality suggested that physicians in general are reluctant to adopt EMR systems for a number of reasons: (Southern California Evidence-based Practice Center, 2006)

Financial concerns such as the cost of the EMR software, the cost of servers and computers, or the cost of training employees to use the EMR

Time concerns or in other words “Opportunity Costs” or the time that needs to be invested in the installation of software, the time for training staff and clinicians, and system down time for maintenance, resulting in loss of time that could otherwise be used to treat patients. This could be represented by two implications: financial level; the financial value invested in training employees that could otherwise be doing regular work, and time level; the effort spent during employee training time that could be spent to deliver better quality of care

Physical barriers which might result in two implications: productivity level; which is a physical barrier occurs, for example, if the physician has limited capabilities in using IT, implying that there is a learning curve for the physician to increase speed when recording patient information. A physician usually uses shortcuts to enter patient information. Over time, the physician usually gets better and faster. If an EMR system is introduced into the practice and the physician is not fast at entering information, this will eventually lead to an increase in time spent per patient because of the slower rate of capturing patient information. The slower rate of examining patients will lead to a decrease in practice efficiency, resulting in less profitability of the business. A comparative study by Rodriguez et al. to compare physician productivity between text-based and graphical-based electronic patient systems found that graphical system users were 35% faster (N. J. B. Rodriguez, Jose A.; Murillo, Viviam; Ortiz, Johanna; Sands, Daniel Z. , 2002). In the same study by Rodriguez et al., it was found that: physicians using a graphical-based electronic patient system were viewing tasks faster, documenting tasks slower, and ordering at almost the same speed as users of a text-based system. The overall results showed that the overall time per patient was almost equal between the two different systems. This means that a transition from a paper based system to an electronic graphical system should not necessarily have a negative effect on physician productivity. However, physician computer literacy and typing skills are very important factors in making this transition less painful. The higher the computer experience and typing skills that physicians possess, the higher their productivity rate will be when switching to an electronic based system (N. J. M.

Rodriguez, Viviam; Borges, Jose A.; Ortiz, Johanna; Sands, Daniel Z., 2002). The second barrier might occur on the usability level; a study by dos Santos and Martins (Soares dos Santos, 2011) investigated the usability factor impact on both physicians and patients. The outcome of this study showed that physician-patient relationships did not improve by implementing an EMR. On the contrary the results showed that 62% of practitioners thought that the relationship degraded. This result was shared by 39% of the patients surveyed (Soares dos Santos, 2011).

Privacy and security barriers; the information the physician is capturing is private and conferential information about the patient. Determining who has the right to see what information is a question that needs to be answered, and these rights in Canada are governed by provincial privacy laws. From a physical security perspective, if the physician was previously using paper format to maintain patient records, an intruder would have access to only a limited amount of data. On the other hand if the patient information is kept on a computer hard drive, a hacker breaking in to the files would have access to information about all the patients.

Attitudinal barriers could be summarized easily as the resistance to change. Simply, as quoted by Steve McMenamin in *"The Change Function"* by Pip Coburn: (Coburn, 2006)

> *"People hate change... and that's because people hate change....*
> *I want to be sure that you get my point. People really hate change.*
> *They really, really do."*

A workshop held at the University of Waterloo investigated how to accelerate EMR adoption while maintaining efficiency. The workshop identified various barriers that need to be overcome, and developed recommendations for physicians, vendors, and government (Martineau, 2010). The outcomes of the workshop identified the following barriers:

Financial concerns which are associated with the cost of the investment itself to purchase, license, run, and maintain an EMR and the ROI and for physicians the ROI is not clear. Due to the investment in changing the methodology of conducting business, there should be a clearer and more rewarding system to encourage physicians to adopt EMRs

Time concerns; when a new system is introduced to perform a task, there is always a learning curve. A physician newly introduced to an EMR system is expected to perform a bit slower at the beginning, with an expectation of increasing speed later on. However, this means

that, when introducing a new system, there is a lower work rate due to learning, resulting in a loss in productivity and profitability of the business in general.

Physical barriers such as the lack of IT knowledge; although it could be perceived that older physicians lack enough IT knowledge to consider adopting EMRs, Meinert et al. found that physician age or gender does not play a major role in embracing IT and adopting EMRs (Meinert, 2009).

Attitudinal barriers which could be represented by the satisfaction with paper-based systems; business owners and physicians tend to be similar in their attitudes. They will not drastically change their methodology of conducting a business unless there is an urgent need to do so. For most physicians, paper-based records have been in practice for a long time and have been working. This is why they may believe there is no need to change, and closeness to retirement; with a noticeable percentage of physicians getting closer to retirement, the pressure for change feels pointless. Some physicians will retire if they were forced to switch to using EMRs. In Sarnia, Ontario, half of the practicing physicians said they would retire if forced to switch to EMRs (Kula, 2011). According to the Canadian Institute for Health Information (CIHI) the average age for physicians is 49.7 years while the average age for family physicians is 49.1 years (Canadian Institute for Health Information, 2010), meaning that a large number of physicians are close to retirement age.

Liability barriers which could be represented by security and privacy, practice size, EMR and individual needs, and EMR selection criteria. Security and privacy; a very important issue when considering the adoption of an EMR is the security and privacy of patients. If a breach happens at a clinical practice, the intruder will have access to only a small amount of patient information if it is kept on paper-based records. Accessing an EMR gives an intruder access to every patient record on the system. Practice size; most Canadian primary healthcare practices are small sized practices (one to three physicians). Whether a walk-in clinic or a family practice, a practice that is a small business possesses different characteristics than larger organizations. EMRs and individual needs; the question of having an EMR depends basically on a need for having an EMR. Wanting an EMR is different than needing one. EMR selection criteria; a very important decision that every physician must make when selecting an EMR involves answering the following questions; what EMR to choose? Will an EMR meet a specific requirement? What is the cost/benefit analysis for the EMR? How to compare one EMR versus other EMRs

A set of variables identified by the HFMA (Healthcare Financial Management Association) (Healthcare Financial Management Association, 2006) also indicates barriers to EMR adoption, including: lack of funding; physicians would be encouraged to adopt an EMR if sufficient funding was available to pay for the license of the EMR, training, equipment, and the hours invested in training and learning how to use the EMR that might lead to a decrease in productivity, usage of EMR; physicians would prefer an easy to learn EMR which will enable them to spend less time learning and more time using the EMR itself, interoperability problems; some EMRs lack the ability to transfer and receive communications from other healthcare sources, ROI; return on investment is very critical for the survival of a primary care practice and its continued operation cannot tolerate serious fluctuations in profitability, and privacy issues; patient privacy is of the essence and if the EMR does not meet privacy regulations then the adoption process will be a failure.

The report suggested a set of recommendations to overcome the above mentioned barriers. The major recommendations were; finding funds to adopt EMRs, developing standards, EMR usage payment incentives, investments in regional networks to create meaningful use of EMRs

The results of the report indicate that a major issue for physicians is always the profitability of their practice, based on the combined cost of the EMR (implementation, maintenance, and operating cost), and the ROI from an EMR.

Although the above barriers are not unexpected, an objection might arise about the quality of healthcare provided to patients and that physicians should seek higher quality of healthcare and they should want to ensure their patients are receiving the best care. However, as mentioned before, a walk-in clinic or a family practice is just an example of a small business operating in a healthcare environment. The ultimate goal of such a business is to provide the best quality of healthcare to its patients. However, a small business also needs to be profitable to survive and continue providing its service.

Almost the same set of variables slowing down EMR adoption was listed by Anderson et al. (Anderson, 2006) including insufficient funding to adopt EMRs; lack of financial support, EMRs are not sophisticated enough, insufficient experienced technical support, or a decrease in ROI.

A case study by Haughom et al also identifies barriers to EMR adoption (Haughom, 2011).The barriers identified in the paper are centered on interoperability between different EHR sources to create meaningful use of EMRs. Barriers such as initial complications, building a network, and establishing connections between different organizations were thought to be the main obstacles in this study. The study also suggested answering physician questions in order to decrease the speculation around the value of having and using EMRs. The recommendations in this paper suggest the involvement of physicians right from the beginning of the process of selecting an electronic system to manage patient records, while at the same time working on establishing industry standards and creating a network to make meaningful use of patient electronic data.

EMR and Productivity Observational Studies

From the above discussion, financial concerns, time concerns, physical barriers, privacy and security barriers, and attitudinal barriers summarize the main obstacles that might prevent a physician from converting medical records in his/her practice from paper to electronic form.

In a study of productivity effects due to changes that took place because of IT adoption, it was found that if a physician used a Computerized Physician Order Entry (CPOE) system, which could be considered as a component of a true EMR, (Garets, 2005) 9% of the physician's time was used for order entry compared to 2% for paper entry. However, physicians using CPOE saved an extra 2% in total time so the difference was only an increase of 5% of the time spent by physicians (Shu, 2001). Although this does not consider the accuracy of using an EMR, from the physician's point of view 5% extra time spent per patient means less work efficiency.

An observational study by Lisa Pizziferri et al concluded that the overall usage of EMRs is not more time consuming than recording information in paper format. In fact the time per patient visit was decreased by 0.5 minutes with the EMR. However the quality and efficiency of physician work was found to increase after the use of EMRs (Pizziferria, 2005). The study observed physicians using both paper medical records and EMRs in terms of direct patient care, indirect patient care in terms of reading, searching, and writing, administration, and miscellaneous. When there was an increase in direct patient care, the overall indirect patient care was decreased so the total time spent per patient as mentioned earlier was decreased.

2.7 The nature of small business

Most primary care practices in Canada are privately held, whether the practice is a walk-in clinic with one or more physicians, a family doctor, or a community clinic with more than one physician. The practice and how it is being run does not differ from any small business in its general nature. The nature and characteristics of small businesses play a major role in IT adoption. Thong identified a model focusing on small business that took into consideration the characteristics of the small business environment (Thong, 1999):

Highly centralized; the CEO of the small business makes all the critical decisions. If this is to be applied in a primary care practice it is clear that physicians are responsible for all the critical decisions in their practices.

Human resources; because of the limited career path for small businesses; the environment of such a business is not attractive for specialists. In other words, even if a clinic could afford to hire support personnel, they would be likely to quit after a short while to follow their own career paths. Hence, small businesses are more likely to hire less skilled staff as generalists that can learn and perform different roles.

Financial resources; the small business is self sustaining. Thus, it has limited resources when it comes to funding availability. If there is no financial support to adopt an information system, (in our case EMRs), the risks will be high because of the financial burden it places on the practice. This would lead to a higher percentage of EMR adoption projects that would fail, assuming they were started at all.

Short term planning; the small business is in a highly centralized environment; it lacks skilled manpower, and has to endure multiple financial burdens. It is therefore prone to short-term planning, as the owners respond to actions in the environment around them. There is typically just enough income to sustain the business, explaining why walk-in clinics and family practices focus mainly on their profitability and not on their record keeping systems.

2.8 Change Management

Resisting change in general is a natural part of human nature (Coburn, 2006). This resistance to change might arise from a lack of understanding of the complete picture, the absence of a vision, the fear of losing one's job, inadequate training, or the fear of experiencing

a new way of doing business that might negatively affect production efficiency. These concerns must be overcome for an EMR implementation to be successful (Laura-Georgeta, 2008).

Change management could be defined as a structured approach or tactics to manage the change. In other words, if the implementation of a specific change is the target, then change management involves the tactics to implement this change. A definition of change management from Lorenzi and Riley (Lorenzi & Riley, 2000) is:

> *"Change management is the process by which an organization gets its future state, its vision"*

These authors also categorize the different types of change that can happen in an organization into four different categories: operational, strategic, cultural, and political changes. In this thesis the focus will be mainly on how to increase EMR adoption in healthcare practice. The changes that will take place in the business process could be subcategorized into two categories: internal changes and external changes. Internal changes include the operational and strategic changes that are the main responsibility of the practice itself, while the political and cultural changes will be imposed on the practice as a form of external change in the environment in which the practice is operating.

Another definition of change management, published by Canada Health Infoway: (Canada Health Infoway, 2011):

> *"…a strategic and systematic approach that supports people and their organizations in the successful transition and adoption of electronic health solutions. The outcomes of effective change management activities include solution adoption by users and the realization of benefits."*

Internal changes that will take place include the operational changes that will occur in the process of capturing patient information, filing the data, sending requests to other healthcare data sources, or processing patient information. A strategic change to the practice may also occur if the strategy of the practice itself becomes more focused into a patient centric business.

External changes include the cultural changes that will result when the patients themselves will ask for access to their own information. Other changes will occur when other health services such as pharmacies, hospitals, specialists, and laboratories shift towards

electronic based communications. Political changes might occur for example if the use of EMRs becomes mandatory for family practices.

Studies of how to increase IT adoption in different organizations exist. Different models for organizational change have been created. However, when it comes to increasing adoption in a small or medium enterprise, the model to accept change, or in other words adopt IT, will be significantly different due to various factors. Several critical factors that influence the process of EMR adoption in primary care practice (Archer, 2009) have been identified that are based on the following perceived risks

Perceived performance risk

The physicians' perceived risk related to the decrease in performance which implies, from the physicians' perspective, that they will be able to manage fewer patients per working hour.

Perceived financial risk

The perceived risk that the physicians' performance will decrease, leading to a decrease in profitability and extra costs associated with the adoption of EMR.

Perceived psychological risk

The perceived risk concerning the failure of the process of EMR adoption that is negatively communicated through peers and colleagues

Perceived legal and privacy risk

The perceived risk that EMRs are not secure enough and a breach would risk losing a large amount of private patient information.

Perceived time risk

The perceived risk that EMRs require a lot of time to be spent on training physicians and staff in the use of the technology

2.9 Change management models

Changing the methodology of doing business is not an easy task. First, the organization must be analyzed to know where it stands in terms of its ability to adopt EMRs. Once the organization has been analyzed, a change strategy must be selected. Change itself must take place in a methodical manner such as a process that can be subdivided into phases, with milestones for each phase. This makes measuring the degree of change and the success of each phase separately possible allowing for corrective actions if necessary. A number of models have been proposed over previous decades that organize the change process methodically. Not all of these are relevant to the discussion of change management in small clinical businesses, but a number have characteristics that can be useful in this context. The following sections list the following models; McKinsey 7-S Model, Nadler and Tushman Organizational Congruence Model, Burke-Litwin Causal Model, STARS Framework, Kurt-Lewin Change Management Model, Kubler-Ross Model, Sean-Covey's Seven Habits, Prochaska's Model of Change (Modified by Amatayakul), The Five Dimensions of Change, Kotter's 8-Step Change Model, and ADKAR Model very briefly, the models are categorized into three different categories; organizational analysis, change strategy, and change management. These models will be discussed in considerable detail in Chapter Three.

2.9.1 Organizational Analysis Models

McKinsey 7-S Model

The McKinsey 7-S Model was developed to help understand the organization's strengths and weaknesses. (Waterman, 1980) It consists of seven components: *"Strategy, Structure, System, Style, Staff, Shared Values, Skills"*

Burke-Litwin Causal Model

This model was designed to take into consideration the external environment and its effects on the organizational structure, vision, mission, strategy, and the organization culture itself. (Leadersphere, 2008) The model consists of the following components: *"External Environment, Leadership, Mission and Strategy, Organizational Culture, Management Practices, Work Climate, Motivation, Systems and Policies, Individual needs and Values, Organizational Structure, Task Requirement, Individual and Organizational Performance"*

Nadler and Tushman Organizational Congruence Model

This model was mainly designed to take into consideration the external environment and its effects on the change process. (Bezboruah, 2008) The model consists of the following components: *"Environment, Resources, History/Culture, Strategy, Tasks, Informal Structures and Systems, People, Designed Structure and Systems, Systems Level, Unit Level, Individual Level"*

2.9.2 Change Strategy

The STARS Framework

The STARS framework was designed to help change leaders assess the current organization state and tailor their strategies according to different business's needs (Watkins, 2009). The framework can be subdivided into the following change strategies: *"Start-Up, Turnaround, Accelerated Growth, Realignment, and Sustaining Success"*

2.9.3 Change Management Models

There are numerous models for the change management process or the management of change. Seven change management models will be discussed in this section, and a further description and comparison among models will be explained in Chapter Three. The models below are arranged chronologically according to their date of publication.

Kurt-Lewin Change Management Model

This is the most basic and simple change management model. It is based on three steps: *"unfreeze, transition, freeze"*. (Burnes, 2004b)The unfreeze step is when the organization gets to the point where the procedures and processes are being revised and a change is required. The transition stage is when the change is being implemented in the organization. The freeze stage is the final stage of the change after change has been implemented and operations continue according to the new implemented procedures (Burnes, 2004a).

Kubler-Ross Five Stage Model

This model mainly focuses on the psychological responses to the change being implemented. The five steps or stages are: *"denial, anger, bargaining, depression, and acceptance"* (Boerner, 2008) (Kubler-Ross, 1969).

Sean-Covey Model

This model consists of seven steps, first presented in 1989 by Covey. The model is coded as the seven habits and the steps are: *"being proactive, beginning with the end in mind, putting first things first, thinking win/win, seeking first to understand then to be understood, synergizing, and sharpening the saw"* (Y. Y. Haimes, 2001) (Covey, 1989).

Prochaska Model

The Prochaska model was suggested by Prochaska and refined by Amatayakul. The original model consisted of five stages: *"Preparation, Planning, Installation, Action, and Maintenance"* and Amatayakul added a final *"Termination"* step (Amatayakul, 2010) (Prochaska, 1990).

Kotter's 8-Step Change Model

The 8-Step change model was designed by John P. Kotter in 1996 and presented in his book "Leading Change". The model mainly consists of eight steps which are; Create Urgency which is the creation of a need for change, Form a Powerful Coalition which suggests the formation of coalition with key decision makers, Create a Vision for Change which implies understanding the final image of the organization because of the suggested change, Communicate the Vision which focuses on the communication of the post-change organization image, Remove Obstacles which requires understanding the problems that might face the change project and resolving them, Create Short-term Wins which is breaking the change project into smaller steps so that the audience of the change would feel the gains of each step, Build on the Change which implies that the change project would be based on successes of each step, Anchor the Changes in Corporate Culture which implies that the change project that have been subdivided into smaller steps should be aligned with the culture of the corporate.

The Five Dimensions of Change

This five step change management model was introduced by Victor and Franckeiss. The model in this case is defined by five stages or dimensions which are: *"direct, describe, define, deliver, and develop"* (Victor, 2002).

The ADKAR Model

ADKAR is one of the most widely used models. It is a five step model: *(Awareness, Desire, Knowledge, Ability, and Reinforcement)* and was developed by Jeffry M. Hiatt (Hiatt,

2006). The ADKAR model is very suitable to manage large scale projects that can end with a reinforcement step on employees.

2.10 Success or Failure Factors

Management of Change

Manikandan identified different reasons for failure during the change process: (Manikandan, 2010), only minor effort exerted by the change leader; change management requires full dedication, especially from the change management leader, too much change in too little time, and change plans are focused on top management only in a top-bottom approach that does not involve employees, who are vital to a successful change process

Quality of Care Vs Income

The three reasons for failure of change that are mentioned above are general reasons, but when it comes to the EMR adoption rate in Canada the story might be somewhat different. Simkus reported to the Canadian Healthcare Network (Sylvain, 2011)

> *"The persistence of these organizational and cultural problems, which other countries have been able to surmount, go a long way to explain why Canada's doctors are not migrating to EMRs more quickly"*

Simkus identified certain reasons for the failure to increase EMR adoption rates in Canada such as problems associated with migration from one system to another; EMRs are not sophisticated enough to cope with physician requirements, and physician income is not linked to the quality of care the patient is receiving.

Self Preparation

Mongeluzo identified key actions that should be taken by physicians to help them in making EMR adoption decisions: (Mongeluzo); checking references; physicians should educate themselves about the potential benefits of EMR and get ready for a decrease in short term profitability once a system is installed, preparing a question list; physicians should be ready for the change process with a complete understanding of EMR functionalities, and trial runs (demos) and talking to current EMR users are very important to get physicians to become

familiar with the idea of using an EMR. However, these actions are not the drivers that would encourage physicians to embark on such a journey.

Successful Business Cases

Piliouras et al suggested a strategy to help physicians to successfully select an EMR (T. Y. Piliouras, Pui Lam; Huang, Housheng; Liu, Xin; Kumar, Vijay; Siddaramaiah, Ajjampur; Sultana, Nadia 2011).

The researchers identified two major qualities that are necessary for the success of an EMR implementation project: understanding change management techniques; physicians should be aware of the long winding road ahead and that the adoption of an electronic system will hinder their productivity until the system is fully understood by the users, and learning to use the EMR; the researchers suggest a learning curve of up to one year until physicians are back at their normal productivity levels.

Piliouras et al described a quick methodology to help physicians to select an appropriate EMR by creating a business case, developing criteria for selection, then making a selection (T. F. Piliouras, Andres; Andonov, Michael; Huang, Housheng 2010).

One important factor in their selection criteria is to investigate the ROI of the proposed system. This could be done easily through the following equation:

$$ROI = \frac{Savings + Income\ (Revenue - Cost) - \ Depreciation}{Depreciated\ Investment\ Cost}$$

Source: *Methodology to Assist Physicians in the Selection of Electronic Health Records Software*
URL:
http://ieeexplore.ieee.org/search/freesrchabstract.jsp?tp=&arnumber=5478273&queryText%3DMethodology+to+Assist+Physicians+in+the+Selection+of+Electronic+Health+Records+Software%26openedRefinements%3D%26filter%3DAND%28NOT%284283010803%29%29%26searchField%3DSearch+All*

Sources of Advice

Physicians trust information provided by their peers. A study by Duennebeil et al surveyed physician strategies for EMR adoption. The study identified two important results (Duennebeil, 2010): First; physician networks were ranked as the top entity that could offer EMR advice to physicians, followed by medical specialist associations and local primary care associations in that order. Other entities such as insurance companies were ranked lower than the previous three. Second; medical associations were ranked as the top entity as a trusted

source for EMR guidelines, followed by physician unions and scientific institutions. Other entities such as health insurance companies were ranked very low compared to the top three trusted parties.

2.11 Beyond Implementation

With the availability of so many different change management models, the success of the change process might be considered guaranteed. However, as discussed in the previous sections, some change initiatives do fail. When it comes to the process of a change in the health industry in general and specifically in a small business such as a family practice or a walk-in clinic, the road to successful change is not an easy one!

2.11.1 Adoption versus implementation

It is imperative to be able to distinguish the difference between adoption and implementation in terms of a change initiative. While implementation of change management might be just suitable for larger corporations, it is crucial for small and medium enterprises.

Fickenscher et al, (Fickenscher, 2011) presented results on an EMR implementation approach with no emphasis on change management, contrasted with an EMR adoption with change management in a clinical environment.

In an implementation project, which is suitable for larger organizations, the emphasis of the project is the go-live event and the project is owned by the IT department. The focus of top management is the project milestone and its cost. In an implementation project the clinical involvement is negligible, and the training sessions are usually to demonstrate the features and functions of the software. Sustainability is usually left to chance.

For an adoption project, which is suitable for a small or a medium enterprise such as a walk-in clinic or a family practice, the emphases of the project are on its outcomes, and the business is owned by the physician or the owner of the clinic itself. The focus of management is on providing better quality of care. In an adoption project, clinician involvement is crucial to the project success, and training sessions are role-based simulations to make sure the clinician is effectively using the software. The sustainability of the project after the go-live event is usually

the primary focus of the management because of the investment in terms of time and cost that is crucial with respect to business size and profitability.

2.11.2 Sustainability of change

A very important result concerning change in Canadian family practice was found in a study by Keshavjee, which found that a large percentage of physicians revert to using paper records instead of continuing their recently introduced EMR systems. Keshavjee's study found that 35% of physicians went back to using paper records, while out of the remaining 65% only 25% became efficient users and 40% were found to be inefficient users (Keshavjee, 2010).

This deterioration effect may occasionally happen when introducing a new system and it always happens if no motivation to continue using the implemented system exists. This is especially the case if the system is causing problems, if the system requires continuous user education, if the system is slowing the users down, or if there is no connection of the new system to other systems outside the borders of the organization.

The research in this thesis will address the refusal of some clinicians to adopt EMRs, the reasons behind the failures of some primary care practices to accept change, and the reasons for going back to paper based practice even after switching to EMRs. The appropriate business change model for a small enterprise recognizes that the physician is at the same time the CEO and the change management leader.

2.12 Literature Summary

Despite the potential benefits of EMRs and the expected increase of patients with chronic disease that require either frequent visits to physicians or a better means of communicating with their physicians, Canada still lags behind other OECD countries in terms of EMR adoption by primary care physicians. As in IT implementation projects in other industries, there are numerous reasons behind the slow adoption rate of EMRs. The research has mainly focused on physician refusal to adopt or implement EMRs or to revert to paper records after an unsuccessful change process.

Primary care practices operating in Canada are small businesses, requiring a special strategy to manage the change from paper records to EMRs. The research has identified several different organizational analysis models, a framework for choosing a change strategy, and numerous change management models. However, none of the models identified is oriented towards the unique needs of the small businesses, which is a characteristic of small primary care practices operating in Canada.

The main objective of the research is the formulation of a change management model, dedicated to primary care physicians, which will help them to adopt EMRs successfully. The model will take into consideration the advantages of several different change management models, and the nature of primary care practices as small businesses. Data from the external environment resulting from discussions with industry experts will be combined with data from internal environments gathered from primary care physicians to enhance the validity of the theoretical model that will be developed.

2.13 Research Propositions

This research attempts to address the following propositions:

There are multiple change management models available. These cover organizational analysis models, change framework, and change management models, and focus on one level only: either the psychological, business process, or project level. The nature of small business change is an integrated process that involves all of these levels, so none of these change management models are suitable for primary healthcare businesses.

P1: The available change management models are not suitable for dealing with small primary healthcare businesses.

Training during EMR adoption requires time, effort, and physician dedication. However, Canadian physicians always have very busy schedules, at least partly because Canada has a limited number of physicians per 1000 population compared to other OECD countries

P2: Having more physicians per 1000 population would increase the speed of EMR adoption

Despite the availability of funding for EMR systems by Canadian provincial governments, Canadian physicians are reluctant to adopt EMRs.

P3: A different, more rewarding Canadian reimbursement system would encourage physicians to actively work towards adopting EMRs and make efficient use of them

In some European countries, the effort expended by their governments has led to an increase in EMR adoption rates and meaningful use of EMRs, resulting in reduced costs and improved care for patients

P4: Canadian provincial governments should mandate the meaningful use of EMR within 5 years, based on the expected better quality of life patients would experience due to increased levels of EMR adoption.

Chapter Three: Change Management Models – In Depth

This chapter contains a thorough comparison 11 different models that have been proposed in the literature for the process of change management. The models discussed here are categorized into 3 different categories: organizational analysis models, change framework, and change management models.

Organizational analysis models can help the change management leader to analyze the organization's current status, by setting up its future goals to decide whether a change is required or not. Change frameworks can help the change management leader to understand what strategy is needed to achieve the desired change. A change framework differs from one organization to another, depending on the current state of each organization, its future goals, the culture of the organization, and the environment in which the organization operates. A change management model is the route an organization should follow to reach its future state from its current state. The 3 categories include 11 different models. Each model was analyzed based on its advantages, disadvantages, suitability to the nature of small business, and potential usage in primary care in Canada (Urquhart, 2010).

The following classification lists the models that have been selected for detailed analysis.

Organizational Analysis Models

- McKinsey 7-S Model
- Burke-Litwin causal Model
- Nadler and Tushman Organizational Congruence Model

Change Strategy Model

- The STARS Model

Change Management Models

- Kurt-Lewin Change Management Model
- Kubler-Ross (The Five Stages of Grief)

- Sean-Covey's Seven Habits
- Prochaska's Model of Change (Modified)
- Kotter's Eight-Step Change Model
- The Five Dimensions of Change
- The ADKAR Model

The aim of this comparison is to build a theoretical change management model that is suitable for the adoption of EMRs in small primary care clinics in Canada. This model will use certain advantages of each existing model while trying to eliminate its disadvantages for this purpose. The model will be partially validated by the qualitative analysis of interviews with industry leaders in Canada and the quantitative analysis of survey results provided by physicians. The idea of comparing change management models originated from a study by Leyland et al. concerning the integration of change management in health IT (Leyland, 2009).

3.1 Organizational Analysis Models

Organizational analysis models are used to analyze the characteristics of an organization before undertaking any change effort. This helps in determining how far the current state of the organization is from its desired end state, whether a change effort is needed, and selecting the right strategy to achieve the desired end state if a change is required.

3.1.1 McKinsey 7-S Model

Strategy, Structure, System, Style, Staff, Shared Values, Skills

The McKinsey 7-S Model was developed by Tom Peters, Bob Waterman, and Julien Phillips in 1980 (Waterman, 1980) (Peters, 2011). The 7-S Model helps to understand the key strengths of the organization. It also suggests that any change in any of the seven components will affect the other components as well. This model will help a change leader to decide upon what strategy to use to reach a certain change result. A thorough description of the model was published by Cawsey and Deszca (Cawsey, 2007). The model includes the following components:

Strategy

The goals of the organization and the plans that are used to reach these goals

Structure

How the organization is organized in terms of people and work.

System

The procedures and processes of work flow

Style

Management style used to achieve organizational goals

Staff

The human resources that operate the organization

Shared Values

The vision and values the members of the organization share

Skills

The unique skills held by key personnel in the organization

Applying the McKinsey 7-S Model in an EMR adoption example

Applying the McKinsey 7-S Model in a small primary care practice might proceed as follows. The strategy of the organization would be the delivery of primary care to the Canadian population in its geographical area. The structure of the organization would revolve around a physician or group of physicians who possess the highest degree of control over the business whether they are the business owners or not. This control is due to the business model itself which depends on the physician to deliver care to the patients. The systems of the organization (mainly concerning maintaining patient records) would include recording patient information in a paper format. Physicians would use their own expertise and educational background for decision making. The style of the organization would depend on the credibility of the physicians working in the practice. Due to the major responsibilities of physicians in terms of running the business, their decision making power would be critical to decisions related to adopting an EMR. The staff would likely support the main player in a primary care practice, who is normally a physician. Staff would rarely receive any professional IT training, and highly IT trained staff would not be interested in working in a small business such as this, except possibly in a

consulting capacity. Shared values of the organization would be to deliver the best quality of care to patients at a pace that would also guarantee business profitability and generate the highest rate of return to support business survival. The technical skills of the employees in a primary care clinic would be minimal for administrative employees, while physicians would possess the highest degree of clinical skill because they are the main players in the practice. At the same time, some primary care physicians do have IT skills that help in making relevant decisions about adopting more advanced technology.

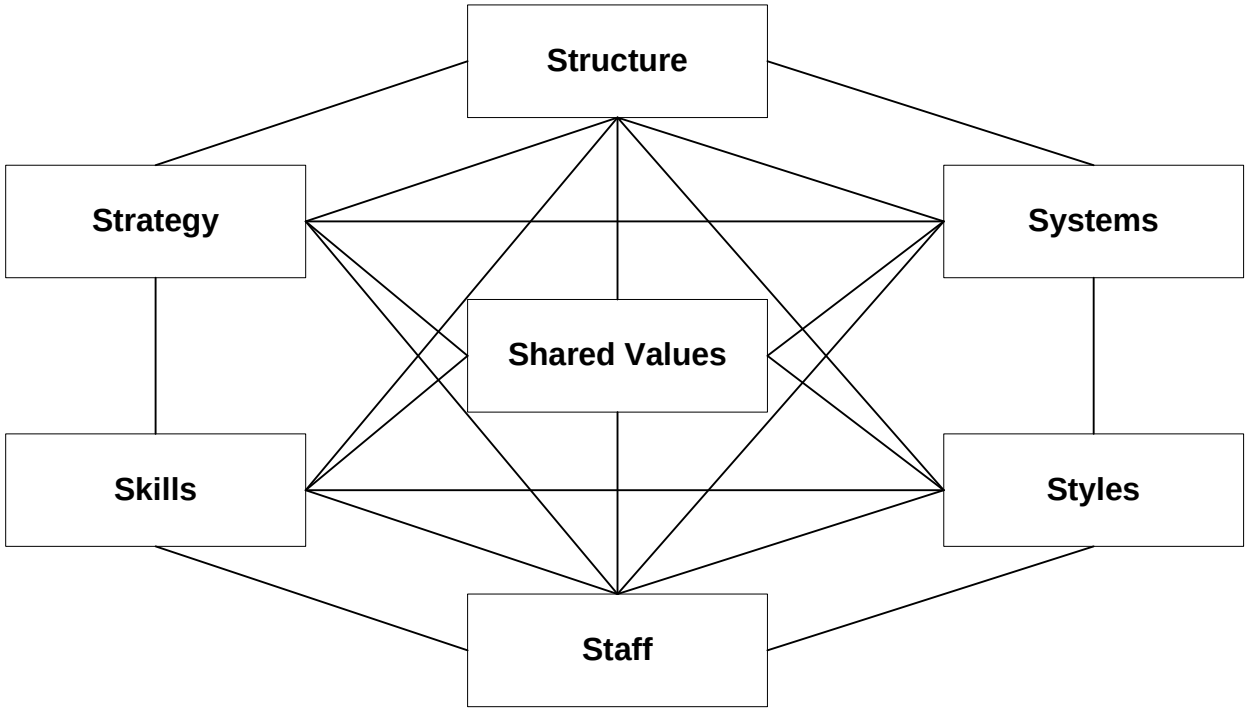

Figure 3.1 McKinsey 7-S Model

Source: *Toolkit for organizational change, Tupper Cawsey and Gene Deszca, 2007, Sage Publication, Thousand Oaks, California*

3.1.2 Nadler and Tushman Organizational Congruence Model

The Nadler and Tushman Organizational Congruence Model was established in 1988 (Bezboruah, 2008). It was mainly designed to take into consideration the effects of the external environment on change management efforts exerted within an organization. As noted by Bezboruah (Bezboruah, 2008):

> *"The organization is dependent on its environment. The outputs from the transformation of the system-received inputs are again exchanged for new inputs."*

The following are the main components of this model:

Environment

The external factors affecting the organization

Resources

The tools available to the organization in terms of finance, people, knowledge, and expertise

History/Culture

The knowledge available to the organization that governs how the business is being conducted

Strategy

The set of goals of the organization and plans to achieve those goals

Tasks

The set of steps used to carry out the organization's strategy

Informal Structures and Systems

The informal structure of an organization that governs relationships among employees, affecting communications and how tasks are being performed.

People

The human resources available to the organization

Designed Structure and Systems

The structure of an organization represents how the organization is designed and organized to help carry out its strategy, while the systems are the tools used to achieve the organization's goals

Systems Level

Any new system that is introduced in a manner that employees can be trained to use it.

Unit Level

The suggested changes for each unit in the organization which are required for the successful implementation of change

Individual Level

The suggested changes for individual jobs in the organization which are required for the successful implementation of change

Applying the Nadler and Tushman Organizational Congruence Model in EMR adoption

When applying the Nadler and Tushman Organizational Congruence Model to EMR adoption for a small primary care practice, the inputs will include an environmental scan of political, economical, social, and technological factors that might influence the change process. The resources will be the humans and capital available to be invested in the change process. The history and culture of the organization will reflect how the physicians work in the practice itself. These factors will affect the strategy of the organization, which ideally would be providing the best quality of care to patients while generating the maximum profit. The transformation process will affect the structured systems, the informal systems, the people, and their tasks. The structured system includes filing patient records electronically, and the informal system includes the impression of physicians when reviewing patient files externally in preparation to meeting the patients. This will clearly change from the former practice of viewing paper records before seeing patients. The tasks the physicians do will differ, such as recording patient information because the physician may be entering data while interacting with the patient. The tasks the physician performs will be the same when examining patients, but the differences will be in reading patient information, recording patient information, communicating with other healthcare providers, and ordering tests or medications. The process of adopting an EMR will therefore result in changes at the systems level, group level (if the practice has more than one physician), and at the individual level.

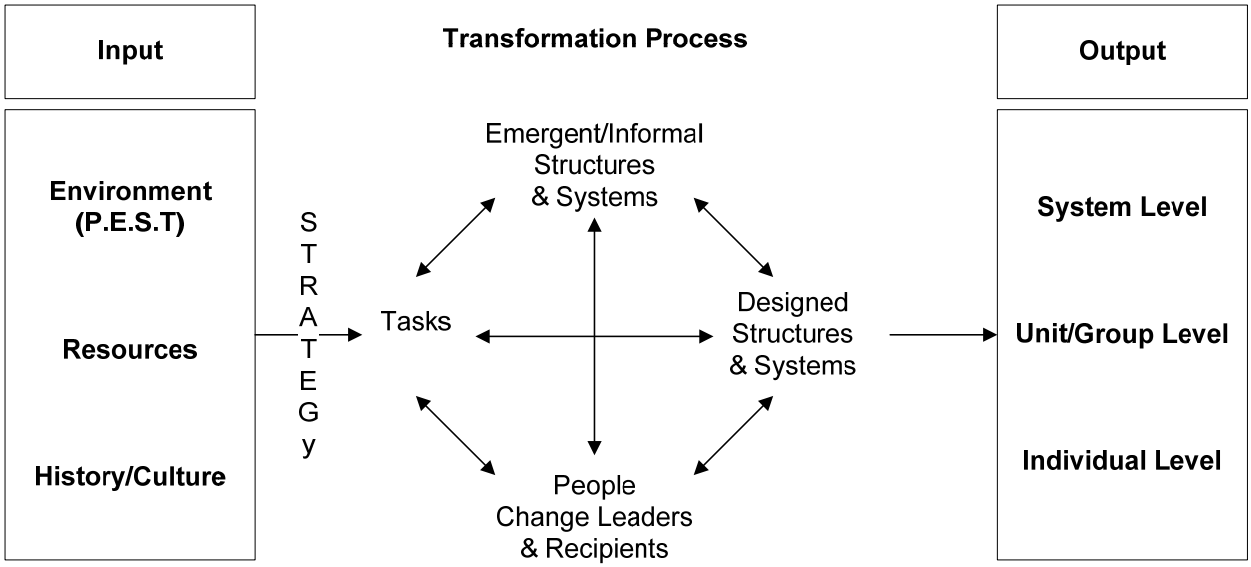

Figure 3.2 Nadler and Tushman Organizational Congruence Model

Source: *Toolkit for organizational change, Tupper Cawsey and Gene Deszca, 2007, Sage Publication, Thousand Oaks, California*

3.1.3 Burke-Litwin Causal Model

The Burke-Litwin Causal Model was established in 1992 (Leadersphere, 2008). It was designed for organizational analysis but could be extended for use as a change management model. The model takes into consideration the external environment and the effects it will have on organizational structure, culture, mission, vision, strategy, and the leadership itself. Changes in the external environment, leadership, mission and strategy, and organizational culture are more difficult to manage. Hence, these are called transformational factors. Other factors that are involved in the day-to-day activities are called transactional factors. Transformational factors usually affect the transactional factors but in some cases the effect could be in the opposite direction (Leadersphere, 2008).

External Environment

The external factors affecting the organization's performance

Leadership

Behavior and performance of top management

Mission and Strategy

- Organizational Mission describes the organization's goals
- Organizational Strategy is the set of steps and the plan to achieve the organization's goals and perform its mission.

Organizational Culture

The collection of norms that govern the organization and its plan to achieve its goals

Management Practices

The methodology used in the management of human resources

Work Climate

The work environment governing employees

Motivation

The personal goals for each employee in the organization

Systems and Policies

- Policies are the rules the organization uses to achieve its goals
- Systems are the methodologies used by the organization to perform its daily activities and achieve its goals

Individual Needs and Values

The factors affecting employee behavior in terms of achieving certain goals without intruding on one's norms and boundaries

Organizational Structure

The arrangement of different functions inside the organization

Task Requirements

The set of skills required to achieve a certain goal or perform a certain task

Individual and Organizational Performance

The degree of success achieved by each individual and the whole organization

Applying the Burke-Litwin Causal Model in EMR Adoption

When applying the Burke-Litwin Causal Model in a small primary care practice, the external environment would include the political environment represented by government rules and regulations, the social environment would be represented by the pressure that might be imposed by patients to move to an EMR, the economic environment would be represented by the average price to obtain, maintain, and successfully run an EMR, and the technological environment would be represented by the advancement of technology that affects the ease of EMR adoption. Leadership would be represented by the physicians or any other main player(s) at the practice. Management practices would include how the practice leader is managing the practice. The work climate would be represented by the work environment for employees. Employee motivation might depend on their management level at the practice. For example, physicians might be very motivated because the success of the practice would be reflected in their own personal success, administrative staff would be less motivated because they are more likely to be working only for their hourly wage, but any technical employees could be less motivated because of the lack of a clear growth path. The mission of the organization would normally be to deliver the best healthcare to its patients. The organizational structure would usually be highly centralized, revolving around the practice leader or a group of physicians. The clinical task requirements would depend on the skills of the physicians while administrative task requirements would require much less training and skill. The organizational culture would depend mainly on the practice leader or group of physicians. The systems and policies would normally be decided by the practice leader, who is the main player at the practice. The individual needs and values depend on the characteristics of each employee at the practice. Individual performance would depend mainly on the degree of knowledge of each employee and his/her satisfaction with the working environment, while organizational performance would depend mainly on the professionalism and skill of the physicians.

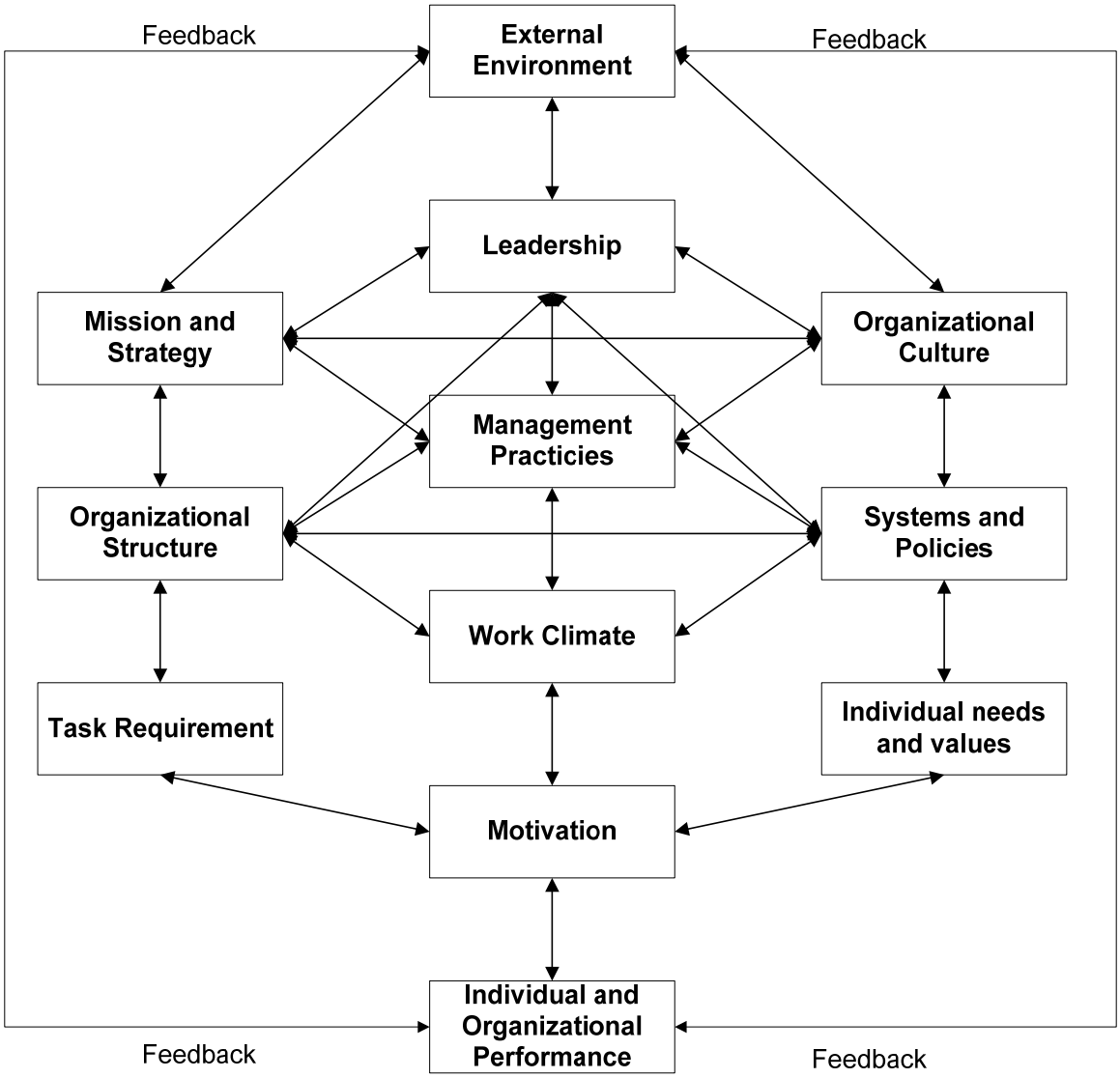

Figure 3.3 Burke-Litwin Causal Model

Source: *Toolkit for organizational change, Tupper Cawsey and Gene Deszca, 2007, Sage Publication, Thousand Oaks, California*

3.2 Change Strategy

Picking a strategy that will govern the change project is of the essence to the success of the change initiative itself. It is imperative to understand the type of change that needs to be applied, because each initiative requires a different strategy

3.2.1 STARS Framework

Start-Up, Turnaround, Accelerated Growth, Realignment, Sustaining Success

The STARS framework was designed by Michael D. Watkins to help change leaders assess the current organization's state and to tailor their strategies according to different businesses needs (Watkins, 2003). To reach a certain goal each organization requires a different strategy which should be tailored towards its current state, challenges, and opportunities in order to reach that goal. Choosing the right strategy for the organization would result in a more effective change route to reach the desired result (Watkins, 2009).

Start-Up

A change project in a business when the business is at start-up is most likely to be successful because of the opportunity of doing things right from the beginning before any major investment is even made. The challenge of such projects is the absence of a clear operational framework.

Turnaround

A turnaround change project would be required when the business need for change becomes a necessity. In this case the challenges are numerous and serious, such as demotivated staff, time pressure, and difficult choices.

Accelerated Growth

The change project for an organization in an accelerated growth phase will motivate people because of the opportunities that will arise from such growth. At the same time it is challenged by the integration of new systems to support the growth.

Realignment

A realignment change project is probably one of the most difficult to implement because the organization is already successful, stable, and strong, and the staff is already satisfied with what they have achieved in terms of personal success. However, the opportunities from such a change project would be the enhancement of business and people performance, and delivering better service. The major challenge in this case is to convince people that change is necessary.

Sustaining Success

A change project to sustain success is probably one of the easiest change projects to carry out, provided that the organization has motivated people who are in pursuit of their own success and the organization is seeking market leadership

Applying the STARS Framework in EMR adoption

The STARS framework could be applied in EMR adoption in a primary care setting. As discussed earlier the model consists of five different strategies: Start-Up, Turnaround, Accelerated Growth, Realignment, and Sustaining Success. Each could be used either separately or combined with other strategies to successfully implement an EMR adoption change project.

The *Start-Up* strategy could be implemented if the primary care practice is just starting up and the decision is made to implement an EMR from the beginning. Such a situation might occur when a young physician is opening a primary care practice, with no large set of patient files and perhaps with some experience in working with an EMR. The challenges in this case would be defining the practice requirements and choosing the most efficient EMR. The *Turnaround* strategy could be implemented if the practice is not successful, perhaps due to a loss of clientele in a town dependent on one or a few companies that have had to lay off large numbers of employees. These unemployed people are likely to migrate to other regions. Other reasons to use such a strategy might result from major disagreements among the practice's physicians. However, because of the rules and regulations under which a practice must operate and for which income from the province will reimburse healthcare services, it is unlikely that a primary care practice will face failure and require a turnaround strategy. The *Accelerated Growth* strategy could be implemented if the practice were to grow in terms of the number of patients serviced and to enhance its productivity by being electronically connected to community pharmacies and labs, hence working as a small medical center. The challenges would mainly be in designing an infrastructure that would allow continuous growth of the practice, and the integration of new physicians that would require training and enhancing their IT capabilities. The *Realignment* strategy would be one of the most difficult change projects to undertake since by its nature the practice is currently successful. The decision makers might consider that the change in its process would not be worth investing the time and money in change because business performance might be only slightly enhanced, resulting in a very low ROI. The greatest challenge for such a project would be convincing the main decision maker(s) about the importance of EMRs and the benefits their patients would likely receive. Communication of the

benefits of EMRs and the continuous education of the physician are very important tactics for the success of the Realignment strategy. The *Sustaining Success* strategy is the easiest strategy to implement because the change project arises from the main decision makers of the practice: either the lead physician or a group of physicians who want to deliver better care to their patients. Challenges from this approach might arise from commitment to legacy systems. Despite the fact that physicians could be well informed of EMRs and their benefits, and they are well trained in the use of EMRs, they might resist any changes to the system they are using, even if it would enhance their business performance, because they have mastered the legacy system.

An example of implementing a combination of different strategies of the STARS framework in a primary care setting could be described as a series of change projects such as implementing a *Start-Up* strategy when the primary care practice is just starting, followed by *Accelerated-Growth* strategy when it is growing, followed by *Sustaining Success* strategy to keep the business successful in delivering the best quality of care to its patients.

3.3 Change Management Models

The following models "Kurt Lewin Model of Change, Kubler-Ross (The Five Stages of Grief) Model of Change, Sean Covey's Seven Habits Model of Change, Prochaska's Model of Change, Kotter 8-Step Model, the five dimensions of change, and ADKAR Model" that cover different aspects of change projects will be discussed below

3.3.1 Kurt-Lewin Change Management Model

Unfreeze, Transition, Freeze

The Kurt-Lewin three step change management model was one of the earliest models developed for change management (Burke, 2008) (Burnes, 2004b).

> *"Freud the clinician and Lewin the experimentalist – these are the two men whose names will stand out before all others in the history of our psychological era."(Burke, 2008)*

As discussed earlier, the Kurt-Lewin Model is a very simple model. It consists of three phases:

Phase 1: (Unfreeze)

The model suggests an organization is initially in equilibrium state or in other words frozen. In order to start the change process the organization has to be unfrozen.

Phase 2: (Transition)

After the organization becomes unfrozen, urgency for change begins. This sparks a requirement for change and adoption of new systems.

Phase 3: (Refreeze)

The final phase of the three phases occurs when the new system is fully adopted and a new phase of equilibrium has been reached.

Applying the Kurt-Lewin model in EMR adoption

This model deals with change as a fact and as if the change has already been accepted in an organization. The model has been criticized for a number of reasons (Burnes, 2004b): It assumes that organizations under change are stable, it is suitable for small-scale projects, it ignores organizational power and politics, and it is top-down management-driven model which implies no feedback in a bottom-up approach.

A change project for a walk-in clinic or a family practice, which is considered a small enterprise, is not a small scale project. It is a mega-project to the decision makers because it requires a complete change in how business is being conducted. The Kurt-Lewin model is too simple, so it is not appropriate for small practices. It assumes that top management (the lead physician) has already approved of the change to take place.

The model also assumes that, once there is a re-freeze at the end of the change process, the business process has changed from paper to electronic and the project is over. Now, everyone has accepted the change, and the business is ready to perform with no problems at all. This is virtually never the case for EMR adoption in such an environment. The learning curve requires time. In other words, there is no immediate freeze after the transition to an EMR in a primary care practice.

Figure 3.4 Kurt-Lewin Change Management Model

Source: *Organization Change: A Comprehensive Reader, W. Warner Burke, Dale G. Lake, Jill Waymire Paine, 2008, Jossey-Bass, San Francisco, CA*

3.3.2 Kubler-Ross (The Five Stages of Grief)

Denial, Anger, Bargaining, Depression, and Acceptance

The Kubler-Ross Change Model, usually referred to as the five stages of grief, is a typical psychological behavioral model. Although it does not provide a real solution to managing the change at a business level, it is very important to fully understand what effects the process of change will have on the people who are participating in this change. This will determine their responses and attitudes when going through the change process (Kubler-Ross, 1969).

In an example of how doctors would react to any change in the methods of conducting their business, Barone and Ivy argued that surgeons will go through the stages in the Kubler-Ross model in their reactions to extended residency work hours (Barone, 2004).

Phase 1: (Denial)

Denial is an expected behavior that arises from the introduction of a new situation or method of conducting business. This reaction might occur if an individual is told something different to what he/she is are used to.

Phase 2: (Anger)

The expected reaction in the next phase is resentful behavior from the person being affected by the change. Anger will be the natural result of denial.

Phase 3: (Bargaining)

Bargaining mainly revolves around postponing the change as a last line of defense and trying to gain as much as possible from the situation.

Phase 4: (Depression)

Depression is a natural expression of the sense of defeat. This goes along with the sacrifices that must be made to cope with the required changes.

Phase 5: (Acceptance)

Acceptance is the result of looking at the situation from a different perspective and with an understanding of the benefits of the new situation.

Applying the Kubler-Ross model in EMR adoption

The previously mentioned phases will occur upon the introduction of a new EMR system to physicians. They would deny the need for any new methodology of conducting their business. This will be followed by a feeling of anger because someone else is telling them there is a new methodology of doing business other than what they know best. However, once they start to develop a need of change, whether by external forces from the government, by peer pressure, or by increased need for communication channels, they will tend to bargain. Bargaining issues might include which system to choose, the usefulness of EMR systems, and failure stories, thus psychologically trying to delay the change. This will be followed by depression, especially if there is a steep learning curve associated with the new EMR system. Finally they would accept the change and learn to live with it. Bearing in mind that the psychological reaction is usually cyclical and the graph only represents an interpretation of one cycle of the model.

Figure 3.5 Kubler-Ross Change Management Model

Source: *On Death and Dying, Elizabeth Kubler-Ross, 1969, Scribner, New York, NY*

3.3.3 Sean-Covey's Seven Habits

Being proactive, Beginning with the end in mind, Putting first things first, Thinking win/win, Seeking first to understand then to be understood, Synergizing, and Sharpening the saw

The Sean-Covey model is a psychological model representing seven reactions or "Habits" to the occurrence of change (Y. Y. Haimes, 2001). The seven habits model is compared against systems approach by Haimes and Schneiter (Y. Y. S. Haimes, Calvin, 1996), in their paper they explained how the Sean-Covey could work as an approach to help designing systems. However, the different habits were designed as habits or a methodological approach for people who want to act effectively on different matters.

Habit 1: Be proactive

The first habit suggests understanding the problem and trying to find a suitable solution for it.

Habit 2: Begin with the end in mind

The second habit suggests creating a mental solution for the problem which implies a consideration of the whole problem.

Habit 3: Put first things first

Identifying priorities is the corner stone for time management which is critical in designing the future state of any organization.

Habit 4: Think win/win (or no deal)

Identifying the best solution that would result in mutual benefits for all parties involved, and not just outsmarting the other party.

Habit 5: Seek first to understand, then to be understood

Understanding the other party first is very important in reaching a mutual ground for situational analysis and achieving a result.

Habit 6: Synergize

Based on the previous two habits and strengthened with strong communications between two groups with different opinions could result in a creative solution to the problem.

Habit 7: Sharpen the saw

This habit implies continuous improvement and reshaping of goals.

Applying the Sean-Covey model in EMR adoption

Implementing the Sean-Covey model in the process of EMR system adoption by a family practice would involve the following steps: Habit 1 *"be proactive"* requires the definition of needs. Habit 2 *"begin with the end in mind"* requires considering the whole problem and setting up a vision for the post implementation organization. Habit 3 *"put first things first"* requires identifying priorities, which is critical to the success of adopting an EMR. Habit 4 *"Think win/win"* implies the formation of mutual trust between the decision maker/physician and the EMR vendor, leading to the agreement on what EMR functionalities are to be delivered. Habit 5 "s*eeking first to understand then to be understood"* requires increasing communication channels between the decision maker and the EMR vendor. Habit 6 *"Synergizing"* is based on open communication channels between parties, to generate a creative solution. Habit 7 *"Sharpening the saw"* requires continuous improvement to the EMR system, to get the best use out of it.

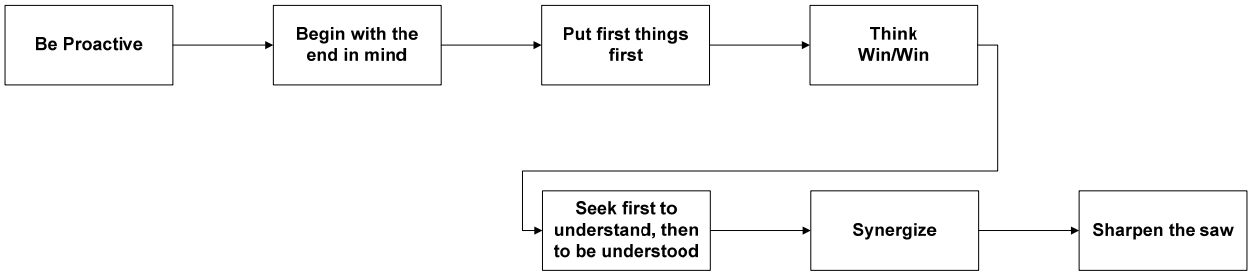

Figure 3.6 Sean-Covey Seven Habit Change Model

Source: *Risk analysis, systems analysis, and Covey's seven habits, Yacov Y. Haimes, 2001, Society for Risk Analysis, 21 (2), Page 217-227*

3.3.4 Prochaska's Model of Change (Modified)

Preparation, Planning, Installation, Action, Maintenance, and Termination

The original Prochaska model of change consisted of only five stages: "pre-contemplation, contemplation, preparation, action, and maintenance". Amatayakul extended the model with one more stage (termination) (Amatayakul, 2010) (Prochaska, 1990).

Stage 1: Preparation (Pre-contemplation)

Awareness of the need for change is raised

Stage 2: Planning (Contemplation)

In this stage, planning for change begins, with an anticipated end result of a thorough plan for change

Stage 3: Installation (Preparation)

In this very short stage the planning for change is complete and the preparation for implementing the change is put in place

Stage 4: Action

This stage is where the change occurs

Stage 5: Maintenance

This stage is where the sustainability of change and continuous improvement of the change project occurs

Stage 6: Termination

The sixth stage treats the change process as a project (which has not just a beginning but an end).

Applying Prochaska's model in EMR adoption

To implement Prochaska's model in the adoption of an EMR system in a primary care practice, the following stages would occur. This is based on the assumption that a consultant or an EMR vendor is introducing the idea of EMR adoption to the lead physician. *Stage 1 (Pre-contemplation):* the benefits of using an EMR are introduced to the physician and an analysis of the business processes is prepared. The changes that will be necessary to the business processes are communicated to the physician, so there will be no surprises during implementation of the change when the inevitable slowdown occurs in the process of running the business. *Stage 2 (Contemplation):* the physician becomes more aware of the benefits of EMRs and becomes interested in the idea of installing one. Selection of a suitable EMR that would match the needs of the physician would take place in this stage. Talking to current users of EMRs of interest to the physician, and training on usage of the selected EMR, would help to discover the advantages and disadvantages of the EMR. This would help the physician to gain experience with EMR use, and whether it would be preferable to choose one EMR instead of

another. The more time spent at this stage the better, since changes at this time are far less expensive to make than changes after EMR installation and record conversion. *Stage 3 (Preparation):* this stage is short but crucial, as it represents a milestone in the change process for EMR adoption. The installation is where the main change process starts, since the method of conducting business will probably change substantially. Continuous training is important at this stage to help physicians and other staff to learn as much as possible about the EMR chosen. Blogs and professional networks can help to answer different questions, along with support from peers using similar EMRs, and published success stories. *Stage 4 (Action):* this stage includes continuous training for physicians and staff as needed, meeting with peers and colleagues, and preparing for going live. *Stage 5 (Maintenance):* this is a very critical stage in adoption of EMRs. Although the change project is almost over, it can still fail. If there is not enough support and fast response from vendors to cover technical problems encountered by physicians, or the system is not performing as expected, the whole project might fail. In this case the physician might switch back to paper records and potentially refuse any future experimentation with EMRs. *Stage 6 (Termination):* the termination stage is where the practice has gone completely electronic and the process of conducting business has completely changed over, with little possibility of reverting to paper records. However, there is always going to be a need for maintenance and support.

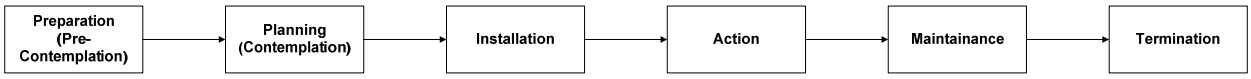

Figure 3.7 Prochaska Model

Source: *Keys to successful EHR implementation, Margret Amatayakul, 2010, Healthcare Financial Management, 105-106*

3.3.5 Kotter's 8-Step Change Model

Create Urgency, Form a Powerful Coalition, Create a Vision for Change, Communicate the Vision, Remove Obstacles, Create Short-term Wins, Build on the Change, Anchor the Changes in Corporate Culture

The 8-Step Change Model was designed by John P. Kotter in 1996 and presented in his book "Leading Change" (Kotter, 1996).

Step 1: Create Urgency

The urgency for change could be created by elaborating the potential threats of current situations and the opportunities that could arise from change

Step 2: Form a Powerful Coalition

Identifying leaders and ensuring commitment from leaders in the organization is of the essence for the success of change projects.

Step 3: Create a Vision for Change

Identify the end result of the change project and what needs to be changed. A strategy for the execution of the vision should be created

Step 4: Communicate the Vision

Increasing communication channels with the target audience to communicate the vision and answering the concerns.

Step 5: Remove Obstacles

A change leader has to be hired who is a subject matter expert in the organization and aware of the business processes in order to ease the process of carrying out the change tasks.

Step 6: Create Short-term Wins

The change strategy should be subdivided into short-term goals that could be achieved to help the decision makers and employees understand the achievements and feel they are successful.

Step 7: Build on the Change

The momentum from the success of each phase of the change project should be used as a point to move forward, while identifying the reasons for success and obstacles in each stage.

Step 8: Anchor the Changes in Corporate Culture

The change progress should be communicated repeatedly while rewarding leaders of change.

Applying the Kotter model in EMR adoption

In Step 1 urgency would be created by communicating the benefits of EMRs, the increase in the quality of care delivered to patients, and the reduction of hazards of current methodology of providing care to patients. In Step 2 a powerful coalition is formed from a team of subject matter experts who will act as defenders of the change initiative. They will increase the chances of success because the experts will be able to communicate the benefits of EMR adoption. The credibility of the selected team is very important because it will increase the potential of success of the change initiative. In Step 3 the creation of a vision for change will embody the success of the change project. The change manager should be able to understand the change initiative and be prepared to answer questions concerning workflow, quality, profitability, and meaningful use of an EMR. In Step 4 the vision is communicated to the team. Physicians should be made aware that an EMR will not dilute their power but will enhance it. An EMR will also result in better quality of care for their patients, cost savings for the practice, and access to future enhancements in technology. In Step 5 the obstacles that might appear during the change process should be eliminated or reduced. Source of obstacles must be identified, whether mental, physical, technical, or organizational and then dealt with. In Step 6 the change project should be no different than any other project in terms of dividing the whole project into smaller tasks through a process known as work break down structure. This will help to keep the project under control and will increase the ability to measure progress through the completion of each smaller step. Creating short-term wins will enable the project team to see success and progress in the change project. In Step 7 the success of previous phases can be communicated, acknowledging the help provided by team members. Moving on to the next phase will help to keep the team enthusiastic and the project energized. In Step 8 the change should be aligned, integrated, and sustained within the methodology used to conduct business in the practice until it becomes a normal part of the daily tasks of the practice.

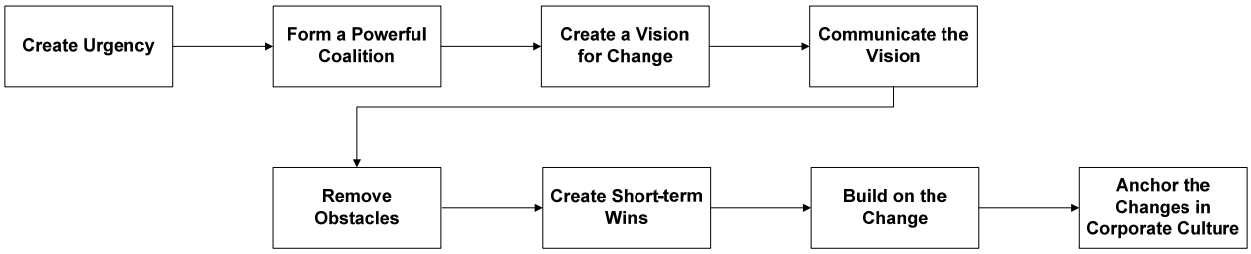

Figure 3.8 Kotter's Model of Change

Source: *Leading Change, John P. Kotter, 1996, Harvard Business School Press*

3.3.6 The Five Dimensions of Change

Direct, Describe, Define, Deliver, and Develop

Victor and Franckeiss developed the Five Dimensions of Change model (Victor, 2002). The model consists of five steps or "dimensions".

Dimension 1: Direct

The *direct* dimension is the foundation for the other four dimensions. It is mainly concerned with the mission of the organization or what the organization does, its vision or where it wants to be five, ten, or twenty years from now, and the values of the organization (how the organization will meet its mission and accomplish its vision).

Dimension 2: Describe

The *describe* dimension is associated with putting a strategy in place to achieve the organization's vision.

Dimension 3: Define

The *define* dimension is involved with definition of business needs, the documentation and plans to sustain the change after it takes place.

Dimension 4: Deliver

The *deliver* dimension is where the physical changes actually take place.

Dimension 5: Develop

The develop dimension is an ongoing process to make sure that the adoption process is completed and sustained.

Applying the Five-Dimensions model in EMR adoption

This model is suitable for an organization that is aware of its direction and already knows where it will be in the future. The five dimensions of change is a cyclical model where the cycle never stops, and there is always the possibility of change for a better result. It is also suitable for an organization that is working in a competitive market and knows that if it does not excel and

continue with endless updates in technology that will serve customers better, it will go out of business.

However, for a small primary care practice in Canada, considered a secure small business operating in a non-competitive environment, the mission is clear and the values are also very clear. At the same time, the vision for the future is not that important because the business model for primary care in Canada is not based on competition. It is based on providing professional health services to Canadians. In other words, if the physician is not already convinced that an EMR would provide better care to patients, the *direct* dimension will not even get started, leading to a failure of the whole change process. On the other hand, if the physician already wants to switch to electronic records, the *direct* dimension could be established by helping the physician expect the unexpected during the change process, including the interruptions that will occur to business performance. The *describe* dimension provides a thorough explanation of what to expect during the changes to how business is conducted. The change manager, in this phase, explains to the primary care decision maker the route of the change process. The *define* dimension is used to define the business needs of the practice, what functionalities are required, and what EMR to select, based on matching requirements to functionalities supported by various EMRs. In this dimension the physician should engage with the vendors for EMR training and selection. Support from peers should also be consistent through group meetings, conferences, or online access to peer advice in blogs and other sources. The *deliver* dimension deals with delivery of service. This is where the physical changes take place. At this time, the physician should be well trained on using computers for data entry and retrieval, ordering tests or medications, and sharing patient information with hospitals or specialists for referral. The *develop* dimension is an ongoing process to make sure that the physician has completely adopted the EMR and that it is being used with increased functionality. In other words, this dimension represents on the job training for physicians and other staff.

This model is suitable for large scale organizations as it mainly deals with employees as tools of change. It is not suitable for dealing with change in a primary care practice where the physician is the owner, the CIO, the CFO, and the CEO, as well as being the key employee. The model completely ignores the psychology of the physician as a sole employer and business owner, who is, from his/her perspective, risking the business for a change process that involves substantial risks.

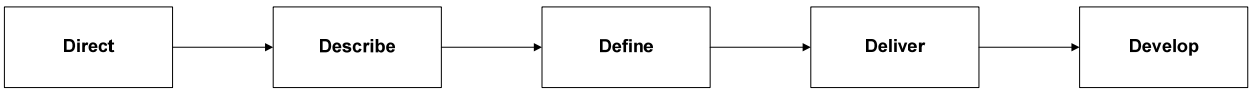

Figure 3.9 The Five Dimensions of Change

Source: *The five dimensions of change: an integrated approach to strategic organizational change management, Paul Victor and Anton Franckeiss, 2002, Strategic Change, 11(1)*

3.3.7 ADKAR Model

Awareness, Desire, Knowledge, Ability, and Reinforcement

The ADKAR model is probably one of the most well known, widely used, and efficient models in the change management field (Harvey, 2009). Development of the ADKAR model is attributed to Hiatt (Pieper, 2009).

The ADKAR model consists of five steps: Awareness, Desire, Knowledge, Ability, and Reinforcement (Hiatt, 2006). The flow of change through these five steps is demonstrated in Figure 3.10.

Step 1: Awareness

The Awareness step of the ADKAR model encompasses the creation of an awareness of a better methodology to conduct business. Benefits of this new methodology are introduced through communication channels. Very high resistance is expected at this stage, including concerns that there is no need for any change.

Step 2: Desire

The Desire step develops once the benefits of the proposed methodology have been well communicated. Resistance to change is still expected here but at a much lower level than at the awareness stage.

Step 3: Knowledge

In this step, knowledge of the newly proposed system increases, and the barriers to change start to collapse. Hands on training and experience is crucial in this step in creating a more positive attitude towards change.

Step 3: Ability

When user knowledge has increased to a high enough level through adequate training, this knowledge can be put to efficient use. This is the first practical step towards accepting change. Some advanced technical problems might arise during this phase because of negative hands on experience by the change receiving party.

Step 5: Reinforcement

The Reinforcement step is one of the most critical steps in the process of change, and occurs when the change project goes live. Some change projects fail after going live because of a lack of preparation in the previous steps, resulting in a loss of any prospect of sustainability after the change project is in complete. Reinforcement is similar to maintenance activities that are needed to keep a system running perfectly.

Applying the ADKAR model in EMR adoption

During the *Awareness* step, the physician begins to become aware of potential EMR benefits. To improve the probability of success in this step, research about the benefits of EMR must be communicated to the decision maker/physician. However, high resistance from the physician to change is expected at this stage. This may include concerns that there is no need for a new way to manage records, business is better run the way it is, there are no obvious benefits from having an EMR, there are extra costs associated with EMRs, or any other impressions a physician might have received from peers. The *Desire* step occurs once a physician acknowledges that there may be benefits from EMR and that it is not a huge disadvantage to have a working EMR installed in the practice. In this stage the physician might have been influenced by bad experiences with EMRs by peers, but the physician may have found other sources of information that are more positive about EMR adoption. The desire to accept change is created at this stage, resulting in a decrease in resistance. If those promoting the change do not seize this opportunity, the process might fail. At this stage there needs to be more elaboration on the benefits of an EMR including how it could provide better quality of care for patients while at the same time it would help the practice to run smoothly. In the *Knowledge* step the physician's knowledge about EMR increases, and the barriers to change start to collapse. Hands on training and experience play a crucial role in creating a more positive attitude by the physician, who has now more understanding of the capabilities of EMRs. Successful training at this stage should cover every aspect of IT, and not just how to use medical records electronically. Some physicians, despite owning the most advanced electronic devices such as smart phones or tablet computers, are reluctant to use EMRs in their practices

because their typing speed might slow their business performance. In the *Ability* step the knowledge of the physician is increased through adequate training, giving rise to the ability to put this new knowledge to efficient use. Some advanced technical problems might arise during this phase. Therefore it is critical for professional vendor support to be available quickly when needed, to enhance the momentum for change, even when physicians cannot overcome technical problems themselves. Otherwise the project may be abandoned due to physician discouragement. The *Reinforcement* step occurs when the EMR adoption project goes live. If there is a lack of preparation in the previous steps as outlined, there is a danger of the project failing which might result in a lack of sustainability of change. Change can be sustained by continuous training, keeping the physician psychologically satisfied by having all questions answered as needed, and by the vendor considering any recommendations from the physician for system improvements. Continuing efforts exerted by the physician also play a role in sustaining change. Resistance during the reinforcement step is usually very low, since resistance arises from the fear of change and the unknown, and the physician is now more educated about the benefits of EMRs and well trained in how to use them.

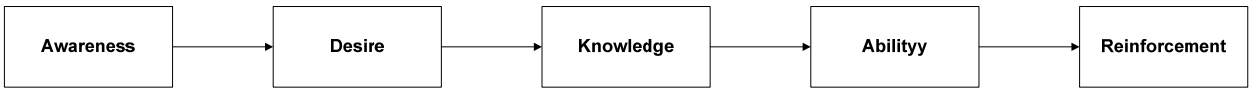

Figure 3.10 ADKAR Model

Source: *ADKAR: A model for change in business, government and our community How to Implement Successful Change in Our Personal Lives and Professional Careers, Jeffry M. Hiatt, 2006*

3.4 Change Management Model Comparison

In this Part of the research the different change management models will be compared each in their own different category in terms of its advantages and disadvantages from the point of view of a small business to check if the model could be used in for managing change in a small business environment or not.

Based on the results of the analysis of the different organizational analysis models, a model should be recommended to analyze the current situation of the primary care practice which represents the small business for which the research is being conducted and based on the results of the analysis of different change management models, a model or a combination of different models should be recommended to manage the change in such a small business environment.

3.4.1 Comparison of different Organizational Analysis Models

The McKinsey 7-S model; the model mainly focus on different parts of the organization such as Strategy, Structure, System, Style, Staff, Shared Values, and Skills which is very suitable to analyze the organization internally however the effects of different environments such as the political, economic, social, and technological environments are not clearly reflected into the analysis of how the business is to react to the demands that might occur in each separate environment or in a combination of different environments.

The Nadler and Tushman Organizational Congruence Model; the model functions in terms of a business unit that has its inputs which are the represented in the environment, resources, and the organization history or culture and its output represented in changes in its system, unit or group, and individual levels with a transformation process that takes into consideration the different parts of the organization such as the informal and formal systems, the people and their own tasks, and the organization strategy. The model is very strong to analyze an organization that is considering a change project and is very suitable for both complex organizations and small businesses.

The Burke-Litwin Causal Model; the model takes into consideration different factors such as external environment, leadership, management practices, work climate, motivation, individual and organizational performance, the organization mission, structure, and the tasks of the employees, the organizational culture, the organizational policies, and the individual needs and values. The model is very strong for analyzing an organization and takes into its consideration the effects of the external environment, however for small businesses such as a primary care practice operating in healthcare in Canada the model would be too complex to analyze because such an business because of its simple hierarchy, in most cases.

The three previously discussed models still could be used for analyzing a small business operating in healthcare. However this research suggests the use of the Nadler and Tushman Organizational Congruence Model because of its clear design to analyze such an organization.

Table 3.1 is a comparison summary of the previously discussed Organizational Analysis models in terms of each model's advantages and disadvantages:

Table 3.1 A comparison of different Organizational Analysis Models

Change Management Model	Advantages	Disadvantages
McKinsey 7-S (1980)	Model deals with the effect of change on different parts of the organization	Model ignores the effect of the external environment
Nadler and Tushman (1988)	Model takes into consideration the effect of the external environment	N/A
Burke-Litwin (1992)	Model takes into consideration the effect of external environment	Model focus is more suitable for larger organizations

3.4.2 Comparison of different Change Management Models

The Kurt-Lewin model *"freeze, transition, unfreeze"*; the model is probably the easiest and the most logical model for change that consists of three phases Unfreeze, Transition, and Freeze. Despite the fact that the model does is not dedicated towards any level that might be involved in the change process such as the physician, the practice, or even a psychological reaction to the change, the model could be still used to generally describe the different phases of the change process.

Kubler Ross Model "*Denial, Anger, Bargaining, Depression, and Acceptance*"; the model is merely a psychological reaction that focuses on reactions that might occur in different situations. Despite the fact that the model cannot be used solely in an EMR change project, it is very important to understand the different phases that a physician might undergo throughout the change process.

Sean Covey's Seven habits *"Being proactive, Beginning with the end in mind, Putting first things first, Thinking win/win, Seeking first to understand then to be understood, Synergizing, and Sharpening the saw"*; the model is mainly psychological reactions from the receivers of change which in the case of EMR installation project is mainly the physician themselves. However, the Sean Covey Seven Habits is mainly how the physician should react to overcome the change project.

Prochaska's Model of Change "*Preparation (Precontemplation), Planning (Contemplation), Installation (Preparation), Action, Maintenance, and Termination*"; the model was modified by Amatayakul which made it very suitable for the installation process of an EMR

at a practice. However, the model doesn't focus on the psychological factors that the physician might encounter. The modified model by Amatayakul also suggests a termination point of the project which might result in a conversion back to paper format because a project like EMR installation should end with a maintenance process to increase the sustainability of the change.

Kotter 8-Step Model *"Create Urgency, Form a Powerful Coalition, Create a Vision for Change, Communicate the Vision, Remove Obstacles, Create Short-term Wins, Build on the Change, Anchor the Changes in Corporate Culture"*; the model is one of the strongest model to govern a change initiative and covers the change from a physicians perspective and from a practice perspective. However; the model neglects the psychological factors that the physician might encounter or the trainings that might be required.

The five dimension of change *"Denial, Anger, Bargaining, Depression, and Acceptance"*; the model focuses on the practice level and very suitable for delivering a system which could be represented by the practice level. However the model neglects the psychological factors that the physician might encounter or the trainings that might be required.

ADKAR Model *"Awareness, Desire, Knowledge, Ability, and Reinforcement"*; the model is suitable to manage change in a larger organizations such as hospitals; it could be unsuitable to manage change in a primary care practice which could be considered as a small business. The reason is the reinforcement step because the physician in a hospital environment is considered as an employee. However, for a small business the management power of the physician escalates and when the physician is the practice owner it becomes logically unsuitable to reinforce any change that might take place.

Table 3.2 is a comparison summary of the previously discussed Change Management models.

Table 3.2 A comparison of different change management models

Change Management Model	Model Phases	Advantages	Disadvantages
Kurt Lewin (1947)	*Unfreeze* *Transition* *Freeze*	Very easy 3-phase model	Does not deal with physician psychological factors, politics, or delivery steps
Kubler-Ross (The Five Stages of Grief) (1969)	*Denial* *Anger* *Bargaining* *Depression* *Acceptance*	Model works well in understanding physicians' psychological reactions	Model is a reflection of psychological reactions only. No actual implementation

			phases
Sean Covey's Seven Habits (1989)	*Being proactive* *Beginning with the end in mind* *Putting first things first* *Thinking win/win* *Seeking first to understand then to be understood* *Synergizing* *Sharpening the saw*	Model is strong on negotiation techniques	Model focuses on psychological reactions only.
Prochaska's Model of Change (1990)	*Preparation* *Planning* *Installation* *Action* *Maintenance* *Termination*	Excellent model if the physician has agreed to adopt an EMR	Model does not deal with physician refusal of EMR adoption. The Change initiative at a small practice is an ongoing process, not a one that could be terminated
Kotter Model (1996)	*Create Urgency* *Form a Powerful Coalition* *Create a Vision for Change* *Communicate the Vision* *Remove Obstacles* *Create Short-term Wins* *Build on the Change* *Anchor the Changes in Corporate Culture*	Model is very useful for preparing and managing the change	Model ignores the psychological factors of the recipients of change
The five dimensions of change (2002)	*Direct* *Describe* *Define* *Deliver* *Develop*	The model is cyclic which means it has no end	Model ignores the psychological factors of the recipients of change
The ADKAR Model (2006)	*Awareness* *Desire* *Knowledge* *Ability* *Reinforcement*	Model is suitable for EMR adoption projects in hospitals and other large organizations	Model unsuitable for smaller organizations in which top management is the main stakeholder in the change initiative Hence the Reinforcement step becomes void

Figure 3.11 presents a comparison of different models at a time interval level. Different models are compared on the basis of the occurrence of each phase in a specific time with respect to each of the other models. *"This is just a representation of the different models, in reality the models can be in a cyclical form. The researcher is presenting the information as a straight line for presentation purposes only"*

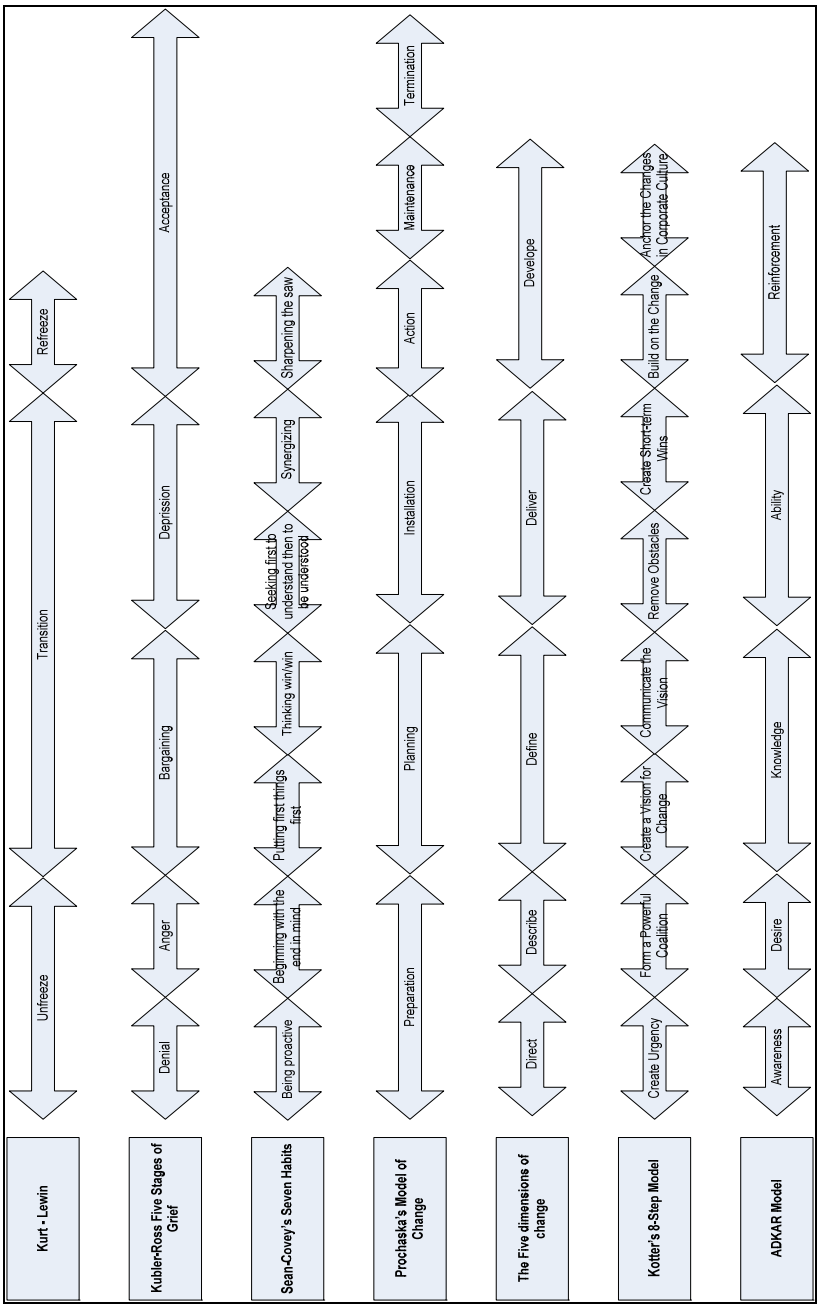

Figure 3.11 A comparison of different change management models in terms of the occurrence of each phase in the timeframe of the adoption process

Chapter Four: Qualitative Analysis

A series of interviews was held with healthcare IT industry leaders and subject matter experts during the period between July 5th, 2011 and September 14th, 2011 to investigate their opinions concerning physicians and EMR adoption. The McMaster Ethics Review Board approved this study.

The semi-structured questionnaire that was used was designed to probe interviewee opinions on business performance and the effect of the external environment on the behavior of physicians in their adoption of EMRs. Based on the Nadler and Tushman model for organizational analysis (Bezboruah, 2008) this research investigated the external environment in terms of political, economical, social, and technological effects on the business performance of a practice operating in primary care in Canada.

The questions discussed during the 1 hour interviews were open-ended in nature to give the interviewees enough time to elaborate, based on their expertise. This technique unleashed interviewee creativity and helped to discover ideas from different perspectives.

The main purpose of the interviews was to investigate the external environment of EMR adoption and develop a better understanding of current opportunities and threats which physicians might encounter during their EMR adoption journeys. Scanning the external environment in this manner can help in the formulation of a strategy for change (Hambrick, 1982). The results from the interviews were analyzed and pooled together to identify which strategies the interviewees agreed upon in each of the following five areas:

The questionnaire used for the interviews is detailed in Appendix B. The motivations to the questions in each of the areas listed above are outlined below.

Business performance

Questions in this area were oriented towards understanding and measuring the business performance of a small or a medium enterprise operating in primary care in Canada.

1. Factors that will encourage a physician to adopt an EMR.

2. How to measure the effects of adopting an EMR on the business performance of the practice.

3. Time available to physicians for self education

4. Important functions that should be available in an EMR

Questions 3 and 4 also appeared in a different format in the questions directed to physicians in the separate online survey (discussed in Chapter Five) that was used to determine the relative alignment of opinions with primary care physicians.

Political environment

Questions in this area were intended to investigate the policies that the government should undertake to help increase the adoption rate of EMRs by primary care physicians, and whether current policies were adequate.

5 and 6. Policies the government should undertake to help primary care physicians adopt EMRs.

7. The effects of increasing EMR adoption from a political perspective.

8. The role of patients in the process of EMR adoption.

9. The effect of the use of electronic record adoption and use of communication technologies by other healthcare service providers such as hospitals, laboratories, and pharmacies on the speed of adopting EMRs by primary care practitioners.

10. Policies that could be designed to ease the process of adopting EMRs by primary care physicians and how to decrease the stress physicians would encounter.

11. Policies that would help to sustain a change initiative once a change project is complete, to improve its long term success.

Economic environment

This area of the questionnaire probed the economic environment that primary care physicians are encountering in Canada. The questions were based on actual numbers derived from the OECD (Organization for Economic Co-operation and Development, 2011) and the World Health Organization (WHO) (World Health Organization, 2011) indicating that Canada has the least number of physicians per thousand populations among OECD nations.

12. An inquiry if Canada needs to increase its total physician numbers per thousand of population.

13. The effects of increasing the number of physicians on competition between physicians, their IT learning curve, and the general health outcomes for the Canadian population.

Social environment

This area investigated the social environment that primary care physicians are operating in, and their psychological behavior from the external perspective of industry leaders.

14. Factors behind the resistance to EMR adoption.

15. The ideal phase of an EMR adoption project where physicians should get involved.

16. How to help physicians sustain the changes in their business processes resulting from EMR adoption.

17. The reaction of physicians to different EMR characteristics.

18. The reaction of physicians if EMR use was mandated in primary care practice.

Technological environment

Questions in this area investigated the readiness of Canadian physicians in terms of their technology knowledge that would ease their EMR adoption process, and changes needed in the primary care sector to help physicians adopt EMRs.

19. The general classification of IT knowledge of primary care physicians in Canada.

20. The changes needed in the Canadian healthcare system in terms of technology that would encourage primary care physicians to adopt EMRs.

Six healthcare IT industry leaders and subject matter experts were chosen. The experts were chosen from different background in an attempt to cover the change project from different aspects. Each interview lasted for an hour and the data was expert answers were typed into the computer. The experts backgrounds were as follows *(to preserve anonymity, their names, titles, and organizations are not mentioned)*:

1. Chairman of a consultancy firm
2. Federal change management healthcare expert
3. Senior executive from a provincial healthcare IT agency
4. A former CTO at a teaching hospital
5. Change management expert at a major consulting firm
6. Director of professional services at a major healthcare organization

Interviewees were asked to express their perceptions of EMR system adoption by primary care physicians in Canada, according to the five topic headings outlined above. Their responses are grouped in the following sections; business performance, political environment, economic environment, social environment, and technological environment. The headings were derived from the Nadler and Tushman congruence model including an analysis of the business itself and the external environment in terms of political, economic, social, and technological environments.

4.1 Business Performance:

This section of the interview was designed to investigate the business performance of a small practice operating in primary care in Canada from the perspective of industry leaders.

4.1.1 EMR Advantages from Expert Perspectives

Providing better quality of care; interoperability between different systems will likely result in higher accuracy that will reduce clinical errors, ensure faster delivery of care, and assist patients with chronic disease to self manage their conditions, hence increasing their quality of life.

Cost savings; an EMR system integrated with communication links to different healthcare providers (hospitals, labs, etc.) will ensure cost savings for both physicians and the healthcare system in general. For physicians: as a long term strategy the administration costs of primary care practice will be reduced. For the healthcare system: an integrated EMR system will help to ensure, for example, the delivery of the correct medication at the correct dose, resulting in reductions in the number of reactions that require treatment.

4.1.2 EMR Disadvantages from Expert Perspectives

The psychological factor of using paper records will be lost; an expert who practices as a physician quoted that *"All EMRs look the same!",* the physical size of a paper file prepares the physician to deal with patients before seeing them, thus alerting the physician to anticipate the treatment required.

Time required for training; there is a demand for increased EMR training for physicians, but their tight schedules limit the time and availability for EMR training.

Experts recommended improvement in some important EMR characteristics that could increase the adoption of EMRs in primary care. The top five functionalities were: EMR ease of use, ability to complete billing via EMR, physician EMR access from outside the physician's office, alerts to physicians when test results are received online, particularly when the results signal abnormal conditions, medication lists for patients.

4.1.3 Recommended General Implementation Strategies

Experts indicated that, to increase EMR adoption, some general strategies should be taken into consideration by both vendors and the government; increasing EMR interoperability and efficiency, creating standards for meaningful use of EMRs that would enhance physician performance, increasing communication about the benefits of EMRs to physicians, and what they should expect during the implementation change process, recruitment of support teams to help physicians with EMR technical issues, changing the current reimbursement system, increasing EMR training for physicians.

4.1.4 Sustainability of Change

Experts identified critical factors that could improve the sustainability of change in primary care practices that adopt EMR systems.

Business process enhancement; adoption of an EMR must enhance the physician's business processes. A practice might tolerate a decrease in performance for a short time.

However, a long-term strategy for EMR adoption that is slowing business will result in abandonment, having a negative impact on the physician's attitude to EMRs in general.

Physician engagement during change; physicians should be engaged during the change process to make them familiar with what will be delivered and to understand the different stages of the change process.

Return on Investment; due to the nature of the primary care practice, there must be a positive ROI from investing in an EMR.

Leadership; a change of this magnitude requires vision and leadership. Helping primary care physicians to network with other physicians who have embarked successfully on the journey of EMR adoption will increase the possibility of sustaining change after successful implementation.

IT knowledge; if the system after being installed is not being used because of a technology gap between what the users know and what is needed for successful implementation, the EMR will be abandoned and physicians will go back to their old practices. The technology gap has to be addresses completed on the basis of continuous training on the meaningful use of EMRs.

4.2 Political Environment

This section of the interview was designed to investigate the political strategies that industry leaders would recommend to increase EMR adoption in primary care.

4.2.1 Recommended Political Strategies

The government should mandate meaningful use of EMRs; regional authorities should be given a mandate and empowered to mandate EMR meaningful usage. As a strategy this would increase EMR adoption because physicians would tend to use them in order to be reimbursed. Most experts agreed that a physician strike could occur if EMRs were mandated.

However, one physician recommended mandating EMR after baby-boomers retire, since the younger generation of physicians will more easily adopt technology in their practices.

Offer learning incentives; during the EMR learning curve the business performance of the primary care practice tends to drop due to fluctuations in the productivity of physicians. It is important to keep this time to a minimum by proper initial and continued training. The cost associated with the installation, training, and maintenance of EMR is a burden that physicians have to deal with. Most physicians claim they do not have the time to learn how to make meaningful use of EMRs. A properly designed financial model would help physicians to learn how to make meaningful use of EMRs.

Computerization of other healthcare providers; If all healthcare nodes that interact with the primary care practice become computerized, physicians will feel an urgency to adopt EMR systems, so they can communicate records online with the other healthcare providers such as hospitals, pharmacies, laboratories, etc.

4.3 Economic Environment

This section of the interview was designed to investigate the economic strategies that industry leaders would recommend to increase EMR adoption in primary care.

4.3.1 Recommended Economic Strategies

There has been a debate among experts concerning whether or not Canada needs more physicians. Two experts did not agree that the ratio of physicians to population should be increased in Canada, but the other three experts agreed. Objections to an increase in physicians were based on empowering other parties such as nurse practitioners that can increase the speed and access of care delivery at a lower cost. A second reason was that the actual need in the Canadian healthcare system is not for more physicians but for increasing their efficiency.

Support for increasing the number of physicians was developed on the basis of distributing the load of patients that physicians deal with daily over a larger base. This would increase the number of service channels to patients and potentially provide more free time for

physicians, allowing them to focus on delivering a meaningful use of EMR. The second reason was to increase peer support and increase competition between physicians on a personal non-professional level to adopt the latest EMR technology.

4.4 Social Environment / Behavioral Analysis

This section of the interview was designed to investigate the social strategies that industry leaders would recommend to increase EMR adoption in primary care.

4.4.1 Recommended Social Strategies

Experts indicated that certain social strategies are slowing down the adoption of EMRs in primary care.

Communication of EMR benefits; one of the experts identified the existence of "mixed signals concerning EMR adoption" as physicians are confused by success and failure stories about EMR adoption, and the likely short-term decrease in their productivity and business performance.

Increased social pressure; there should be an urgency toward delivering better care for Canadians, focusing more on the benefits that will arise when adopting an EMR system that could be integrated with other healthcare provider systems to deliver the best quality of care for patients.

ROI; there is a question about the investment needed for EMRs and whether the investment will help physicians to improve their business enough to get a higher rate of return on their initial investment.

Small business nature; the nature of the business of primary care in Canada is similar to small business operations that typically cannot tolerate more than a short term decrease in business profitability. This is disturbing to physicians because the length of time they can tolerate business profitability decreases basically depends on how easy it is for them to learn to use the EMR system effectively. At the same time they may need to change business practices and workflows to restore business performance capabilities to their previous levels.

Resistance to change; the nature of humans is the fear of change and the fear of the unknown in general. This often hinders physicians from making decisions to adopt and use EMR systems.

Reducing the technology gap; there is often a gap between the level of physician IT capabilities and the technology available in EMR systems.

Strengthening peer networks; due to the unique and reputable nature of the business itself, physicians trust each other on a professional basis, based on their expertise. Strengthening peer networks will help physicians to share success stories and leadership ideas.

4.5 Technological Environment

This section of the interview was designed to investigate the technological strategies that industry leaders would recommend to increase EMR adoption in primary care.

Experts recommended that physicians should be classified in general into three groups based on their age: physicians of average age, younger physicians, and older physicians. They graded physicians on a scale from 1 to 10 (with 10 being the highest) for IT knowledge and familiarity.

The average for younger physicians was 9 out of 10, making their adoption of EMRs an easier process to manage and sustain. Older physicians on the contrary were given an average of 1.67, which falls towards the lower end of the IT knowledge spectrum. The average grade for physicians in general was 5 out of 10 indicating their familiarity to be similar to an average IT user. The reason the experts classified physician IT knowledge in general to be this low is because of the older average age of physicians in Canada.

4.5.1 Recommended Technological Strategies

Focus on true interoperability; interoperable systems are the future of healthcare and will ensure the delivery of the best healthcare to patients by accessing data from different healthcare entities.

Physician consultation by EMR designers; physicians should be consulted during the design of EMRs. User involvement in system design is known to contribute to system adoption success.

Mandate electronic reporting to government and other insurers for reimbursement, and for referrals to other healthcare providers; if reporting is computerized, physicians would adopt EMRs in order to be reimbursed.

4.6 Summary

The experts have recommended different strategies on political, economic, social, and technological environment that can increase the adoption rate of EMR in Canada. On a political level; experts have suggested that the government should mandate meaningful use of EMRs, offer learning incentives, and increase the computerization of other healthcare providers. On an economic level; experts have suggested that more thorough research is required to investigate the need of more primary care physicians and a clear definition for return on investment of adopting an EMR needs to be set in place. On a social level; experts have suggested to increase the communication of EMR benefits, increase the social pressure, and focus on peer networks. On a technological level; experts have suggested to focus on true interoperability and mandate electronic reporting to government and insurers for reimbursement.

Chapter Five: Quantitative Analysis

Eleven physicians participated in an online survey to answer 58 structured questions that included 4 open-ended questions to allow physicians to freely express their opinion about EMRs. This study was approved by the McMaster Ethics Review Board. The questions are included in appendix A. The results obtained from the survey are analyzed in this chapter. This analysis will be used in the next chapter to assist in the formulation of a change management model that will increase EMR adoption in primary care.

An average of 3 reminders was sent to physicians to remind them about the survey. The questions were classified into 11 sections. Some of the questions asked of the physicians were designed to align with questions asked of the industry leaders in order to compare their perceptions directly. Responses to the questions are analyzed in detail in Appendix F.

The questionnaire design was based on Healthcare Information and Management Systems Society (HIMSS) case studies (McCarthy, 2010). However, their case studies were addressed towards change initiatives in large organizations, while this research was directed towards small and medium primary care enterprises.

5.1 Demographics

Descriptive statistics

Age; 27% of the participants were younger than 30 years old, 9% of the participants were between 31 and 40 years old, 27% of the participants were between 41and 50 years old, 27% of the participants were between 51 and 60 years old, and about 10 % did not indicate their age. *Gender;* 64% of the participants were male while 27% were females while 9% did not indicate their gender

5.2 Clinical Statistics

Descriptive statistical analysis

4 participants were working in a family physician setting, 4 participants were working in a medical centre setting, and 3 participants did not provide an answer. 3 of 8 participants were working in a setting where there are 2 to 3 physicians, while 5 participants were working in

clinics with more than 8 physicians. 9% of the participants were responsible for fewer than 500 patients while 46% were responsible for more than 2000 patients. 18% of the participants received fewer than 20 patient visits daily, 18% received 21 to 30 patient visits daily, 27% received 31 to 40 patient visits daily, and 9% received more than 50 patient visits daily.

5.3 Self Education

Descriptive statistical analysis

27% of the physicians claimed that they had more than 1 hour 31 minutes per day for self education and 18% of the participants recorded 1 hour 1 minute to 1 hour 31 minutes per day. That is almost 45% of the participants had more than 1 hour that they could spend on self education on a daily basis. The choice of participants for self education in declining order of preference was print media 27%, accessing professional websites 27%, workshops and conferences 19%, other 27%.

Conclusion

IT represented by accessing professional websites represented 27% of the preferred means for self education.

5.4 Communication

Statistical analysis

The first priority of physicians for communication with patients was regular patient visits to practices 55%. Physician priority for communication with their peers: Phone calls (27%), email (18%), face-to-face (27%), unreported (19%). Physician priority for communication with patients with chronic diseases: patient visits 27%, waiting for patients to call 18%, phone calls 9%, unreported 46%

Conclusion

Traditional methods are still the first priority of physicians for communication with their patients, followed by phone calls. Emails and face-to-face meetings ranked as first and second priority respectively for physician communication with peers.

5.5 Business Performance

Recording patient information

5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants have agreed that detailed patient information must be recorded (mean = 1.44), most participants have agreed that recording patient information is time consuming (mean = 1.78), most participants have agreed that the physician should be the only person accessing patient information (mean = 2.11), most participants have agreed that there should be a standardization of patient information (mean = 1.63), most participants have disagreed that it is easy to read handwritten notes by other physicians (mean = 3.78)

Use of EMRs

27% of the participants used paper patient records, 18% used EMRs, 37% used both paper and electronic records, and 18% did not report.

Conclusions

Participants showed an interest in using EMRs, but paper medical records are still fairly widely in use. The results showed that accurate information is very important despite the fact that it is time consuming to standardize patient information. The participants indicated that physicians should not delegate their care of patients to other employees such as nurses. The participants indicated that using IT would provide standardization and ease of reading patient records

5.6 Knowledge of Information Technology

Attitude to use of IT by family physicians

5 point Likert scale analysis 5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants have agreed that they are comfortable using IT (mean = 1.44), most participants have agreed that they support the use of IT (mean = 1.33), all participants have

agreed that they are all aware of the government's efforts to encourage IT for healthcare, and most participants have agreed with government efforts to increase EMR adoption (mean = 1.63)

General perceptions of using technology

Half of the participants preferred phone calls while half preferred communications through EMRs to communicate with other healthcare providers, Most of the participants agreed that major EMR problems are interoperability and usability

36% of the participants already use EMRs, and 27% use both EMRs and paper records, 64% of the participants would accept using EMRs if the government mandated it.

On a score of 1 to 5, 5 being most preferred; the following are the scores for essential EMR characteristics in declining order of preference:

- Accessing test results through the EMR (5)
- Diagnosis list (4.88)
- Alerts to receiving test results (4.71)
- Medication lists (4.71)
- Accessing hospital records (4.71)
- Prescription alerts from pharmacies (4.29)
- e-Prescription (4.14)
- Billing (4.14)
- Physician EMR access from outside their offices (4.13)
- Ordering tests (4.13)
- Reminders (4.0)
- Ease of use (3.63)
- Other (3.00)
- Patient accessing physician EMR records (2.29)

55% of the participants have used and are in support of EMR usage, 18% of the participants did not have any experience with EMRs, and 27% did not report.

Conclusions

Participants are comfortable with using and supporting the use of IT, participants are knowledgeable and in favor of government efforts to increase EMR adoption. They would use

EMRs if it were mandated, participants indicated that the most important characteristics or functionalities of EMRs are interoperability, usability, and receiving test results.

5.7 Experience with EMR training

Training for EMR users

5 point Likert scale analysis 5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants disagreed that they were stressed during EMR training (mean = 3.8), most Participants disagreed that they were involved early in the process of EMR adoption (mean = 3.8), participants were neutral about their training (mean = 2.5), most participants were neutral about receiving regular scheduled training (mean = 3.17), most participants disagreed that they received any special training (mean = 3.50)

Descriptive statistical analysis

Only 27% of the participants using EMRs received a training session every six months while there was no regular training at all for 18% of EMR users, which only represented 45% of the participants in the study.

Conclusion

The training for physicians who were using EMRs was insufficient and in some cases did not happen at all.

5.8 Experience with EMR Business Performance

EMR Adoption Experience

5 point Likert scale analysis 5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants disagreed that they were stressed during migration from paper records to EMR (mean = 3.5), participants were neutral about their ease of adopting an EMR (mean =

2.67), most participants agreed that their business performance was enhanced because of the use of EMR (mean = 1.33), most participants agreed that the quality of care patients receive was enhanced because of EMR adoption (mean = 1.67).

Conclusion

Participants perceived that EMRs have positively enhanced their performance.

5.9 Experience with EMR Usage

5 point Likert scale analysis 5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants agreed that EMRs are reliable (mean = 1.4), most participants agreed that they received support for their EMRs (mean = 2.4), most participants agreed that there was an increase in their ROI due to EMR adoption (mean = 2.4), most participants were neutral about the stress of learning different EMR functionalities (mean = 3.4), most participants were neutral about the number of screens they have to deal with when using an EMR (mean = 3.17), most participants agreed that interaction with their patients improved because of EMRs (mean = 2.00).

Conclusion

Participant felt that EMR usage had enhanced their interactions with patients, but the level of support and the return on investment is not yet clear.

5.10 Experience with EMR Sophistication

5 point Likert scale analysis5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Participants were neutral concerning the level of sophistication of their EMRs (mean = 2.67), most participants agreed that EMR helped them standardize their notes (mean = 2.00), most participants agreed that EMRs helped them exchange data with different healthcare providers (mean = 1.87), most participants agreed that patient privacy improved due to EMR usage (mean = 2.33).

Conclusions

EMRs help to improve standardization of patient information, information exchange with other healthcare providers, and increased patient privacy.

5.11 General experience with EMRs

Adoption and satisfaction with EMRs 5 point Likert scale analysis5 point Likert scale analysis (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Most participants agreed that their experience with EMR exceeded their expectations (mean = 1.6), participants were neutral concerning government efforts to increase EMR adoption (mean = 2.63), participants were neutral concerning government financial support to increase EMR adoption (mean = 3.00), most participants disagreed that they feel pressured by the government to increase EMR adoption (mean = 3.63), most participants agreed that their colleagues are generally happy with their EMR systems (mean = 1.86), most participants were neutral concerning overall EMR implementation satisfaction (mean = 2.67).

Continuing the use of EMRs

45% of the participants would not switch back to paper records and 9% said they were hesitant to switch back to paper records, A major issue identified with EMRs was more training, the government needs to increase its efforts in funding EMR training and providing one set of standards for EMRs, EMR sustainability depends on how easy it is to use, its customizability, and interoperability with other healthcare systems.

Conclusion

Participants reported that they feel more government effort is needed to increase EMR adoption.

Chapter Six: Model Formulation

The proposed change management model, based on the literature review and the inputs of physicians and industry leaders discussed in previous chapters, is presented in Figure 6.1. The model consists of four phases that are governed by the STARS framework to choose a potential strategy for change. The change manager or change leader will pick the strategy for change depending on the current state of the organization and the future desired state. It may even be suitable to select a combination of different strategies for each phase of the change project. The strategies that can be selected are start-up, turnaround, accelerated growth, realignment, or sustaining success.

If the practice is just starting business as a brand new practice, the change manager can choose a start-up strategy which would be chosen to align the business of the practice with an EMR instead of paper patient records. If the practice is adopting an EMR and it has been operating for a while with paper records, then the change manager might choose a turnaround strategy because it involves a major change in the business process. If the practice is increasing the number of its patients or adding more physicians, an accelerated growth strategy might be selected. If the practice already has an EMR but there is still a tendency to stay with its legacy system, a realignment strategy might be selected. To sustain successful changeover to an EMR, a sustaining success strategy might be selected.

Despite the fact that vendor selection is a critical question and depends on the requirements provided by the physician and the solutions that the vendor will provide, this research focuses mainly on the creation of a change management model that will help physicians adopt EMRs.

Three levels that constitute the model:

Practice level

This level focuses on the practice itself as an entity in terms of the changes that require to be achieved and the approach that will be used to manage the change process. The steps in this level are mainly derived from the Prochaska model of change, as updated by Amatayakul.

Physician level

This level focuses on the professional needs of the physicians themselves in terms of their professional needs through the change process and how to address and manage those needs. The steps of this level are mainly derived from the Five Dimensions of Change model, Kotter's 8 Step Model, and the ADKAR Model.

Psychological level

This level focuses on the reactions of the physicians, because they are the key decision makers in the change initiative in a small primary care environment setting. The steps are mainly derived from Kubler-Ross Five Stages of Grief model and the Sean-Covey Seven Habits model.

External Environment

A set of changes must be applied to the different factors affecting the external environment that can have a direct effect on the adoption rate of EMR by primary care physicians. These changes have to occur in the political, economic, social, and technological environments to have a positive impact on EMR adoption rate. The set of recommendations for the external environment are elaborated in Chapter Seven, in the Recommendation section.

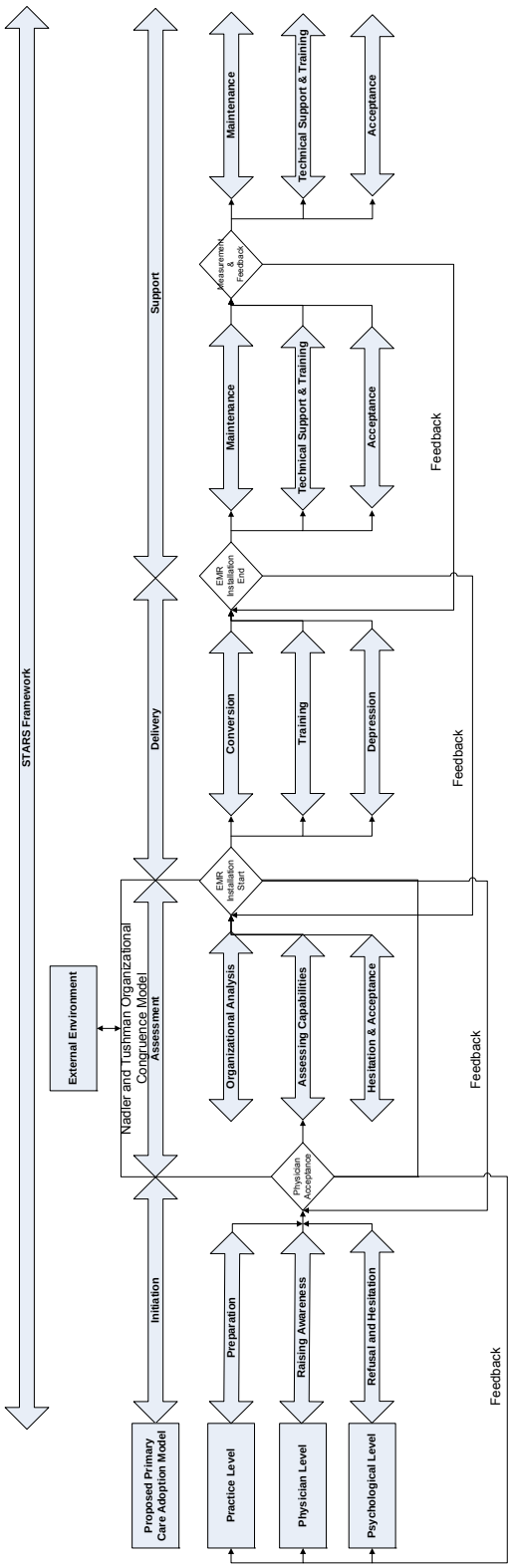

Figure 6.1 Proposed Model for Management and Sustainability of Change in a Small Primary Care Practice in Canada

Model Phases

The four phases of the proposed model for the change management process are; Initiation, Assessment, Delivery, and Support. These four phases are outlined in detail in the following sections, according to the levels in the proposed change management model.

6.1 Initiation

The initiation step begins by presenting different EMR solutions to the decision makers to raise their awareness of the possible approaches that will help them perform their daily practices. This step depends solely on the acceptance and willingness of the decision makers to consider embarking on the journey of adopting an EMR system. The milestone at the end of the preparation phase is the physician acceptance for having an EMR. This part of the process represents the unfreeze part from the Kurt-Lewin Model of Change (Burke, 2008).

6.1.1 Practice Level: Preparation

Derived from Prochaska's Model; this step is based on the preparation step from Prochaska's Model (Amatayakul, 2010) during which: A complete understanding is developed of the business processes of the practice and awareness should be raised concerning business performance enhancement due to the installation of an EMR.

Derived from Quantitative Analysis; physicians who completed the online survey showed that they were not involved in the early stages of EMR adoption *(Chapter 5 – Section 5.7).*

6.1.2 Physician Level: Raising Awareness

At the physician level Awareness should be raised on the basis of the advances and the benefits that an EMR will deliver. This may include better and faster access to different healthcare providers, savings in time and quality for e-prescriptions, and better quality of care that patients will receive.

Communication plan; focus on the benefits and risks of EMR adoption and introduce physicians to physician champions who have already adopted EMRs

Derived from the Five Dimension Model; the physician should consider the benefits of EMR adoption and how it will affect the business performance of the practice in the short-term and long-term (Victor, 2002). A thorough description of EMR implementation should be communicated to the physician, and physician specific needs must be considered and discussed

Derived from Kotter's Model; it is imperative to create urgency for change by elaborating on the strengths of EMRs and their usefulness (Kotter, 1996), including considerations of potential risks and problems during implementation, while at the same time creating a powerful coalition with the physician so that the change initiative can move forward.

Derived from the ADKAR Model; describing and supporting physicians corresponds to raising their awareness and creating a desire to use an EMR in their practice (Hiatt, 2006)

Derived from Quantitative Analysis; physicians who completed the online survey were aware of EMRs, their benefits, and the government effort to ease EMR adoption. Therefore, raising EMR awareness for physicians might not be a difficult process. *(Chapter 5 – Section 5.6)*

6.1.3 Psychological Level: Refusal and Hesitation

On the psychological level; some physicians might respond positively and adopt an EMR quite easily while others might react differently. Understanding the physician's reactions to change is very important to the success of the project. Some physicians might be inclined to continue using legacy systems because they currently have a smoothly functioning work environment. This might meant that they would not accept any instability in business performance, or they might know other physicians who have had bad experiences with EMRs. In general, as physician awareness and knowledge about EMRs and their benefits increases, their resistance to adopt EMR will drop.

Derived from the Kubler-Ross Model; the change initiative might be faced with denial and anger from physicians as a result of resistance towards the idea of installing an EMR (Barone, 2004).

6.2 Assessment

The Assessment phase begins once a physician has accepted the idea of EMR adoption. Without this acceptance the change initiative will not go any further. The Assessment phase is associated with the Nadler and Tushman Organizational Congruence model (Bezboruah, 2008) in which the external environment in terms of Political, Economical, Social, and Technological factors are taken into consideration. Their effects upon the organization must be carefully studied. They consist of 3 levels: the Practice Level in which the practice is analyzed versus external factors; the Physician Level in which the physician's capabilities in terms of IT knowledge will be benchmarked to understand the depth of the required training; and the Psychological Level of the physician in which physician acceptance should rise and resistance decrease, depending on the rate of acquired knowledge about EMRs. A successful assessment phase will end with a milestone "EMR Installation starts", depending on the acceptance of the physician, the assessment of the capabilities of the physician, and the practice itself. This phase of the process represents the transition phase of the Kurt-Lewin Model of Change (Burke, 2008).

6.2.1 Practice Level: Organizational Analysis

This step is crucial to the success of the change initiative. It depends on a thorough analysis of the organization, taking into account the external environment in terms of political, economical, social, and technological factors. This includes assessing the current state of the organization and its future vision or state and whether the organization needs to change, how the organization might move from the current state to achieve the desired future state, and what route the organization should take to reach the future state.

Derived from Prochaska's Model; this step is based on the planning step from Prochaska's Model (Amatayakul, 2010) during which: the business processes of the practice are assessed, the proposed EMR solution is discussed with the physician, the Nadler and Tushman Organizational Congruence Model can be applied to analyze the effects of the external environment in terms of political, economical, social, and technological factors upon the organization; in this case the practice itself (Bezboruah, 2008).

*Derived from Quantitative Analysis; p*hysicians who completed the online survey were aware of government efforts to increase EMR adoption by primary care physicians. This means

that they are aware of external environmental factors and they should be able to consider these when analyzing their own organization. *(Chapter 5 – Section 5.6)*

6.2.2 Physician Level: Assessing Capabilities

At the physician level, the vendor or consultant should work closely with the physicians to increase their knowledge about the EMR system to be adopted. It is also necessary to define physician needs and capabilities in order to understand the amount of training the physicians need. The vendor or consultant should also work closely with the physicians during this phase to create a new vision for the organization that would result if an EMR system is implemented. It is necessary to communicate this vision clearly to the physicians, who need to understand the changes that will occur during and after adoption due to the resulting changes.

Derived from the Five Dimension Model; based on the Define step of this model (Victor, 2002); the vendor or consultant would help the physicians to define their EMR needs.

Derived from Kotter's Model; the vendor or consultant should help the physicians to create avision for the organization that will results after the change initiative and to communicate this vision to the physician (Kotter, 1996).

Derived from the ADKAR Model; the vendor or consultant should help the physicians to increase their knowledge about EMRs by assessing their current capabilities to understand the degree of the required training (Hiatt, 2006).

Communication plan; the definite slowdown to productivity that will result from EMR installation should be communicated to the physicians

Derived from Quantitative Analysis; Physicians who completed the online survey indicated that they were comfortable using IT and they support the use of IT in their practices. However; assessment of the physicians' IT capabilities by the vendor or consultant would help to decide the depth of training physicians might need. *(Chapter 5 – Section 5.6)*

6.2.3 Psychological Level: Hesitation and Acceptance

The physicians at this stage have already decided to adopt an EMR. However, some hesitation might be expected because of the unclear picture of future business performance. This is expected to decrease as the physicians' knowledge increases.

Derived from Kubler-Ross Model; the physicians will be in a bargaining mood and possibly hesitating to completely accept an EMR (Barone, 2004). This resistance is expected to decrease as the physicians' knowledge increases and as the vision of change is communicated and accepted.

Derived from Quantitative Analysis; a percentage of the physicians who completed the online survey indicated that they would be hesitant to go back to paper format after investing the time required to install an EMR. Hesitation would also be expected before installing an EMR. *(Chapter 5 – Section 5.6)*

6.3 Delivery

Once the organizational analysis phase is complete, the milestone that initiates the *Delivery* phase signals the start of EMR installation. This of course will depend on the successful conclusion of organizational analysis, assessment of physician capabilities, and acceptance of the installation decision at both the professional and psychological levels.

In this phase the installation of the EMR takes place, while at the physician level the training on EMR system use begins to increase their capabilities towards becoming expert users of the EMR system. At the psychological level, physician depression might occur because of a reduction in business performance. This phase of the model ends with the "EMR Installation Ends" milestone, indicating the completion of physician training, installation of the EMR, and conversion of paper patient records into electronic patient records.

This phase of the process represents a continuation of the transition phase from the Kurt-Lewin Model of Change (Burke, 2008).

6.3.1 Practice Level: Conversion

At the “EMR Installation start” milestone, technical changes to the practice begin. This includes the installation of the EMR system and the conversion of old records into electronic format..

Derived from Prochaska’s Model; this step is based on the installation step from Prochaska’s Model. This is considered the shortest step of the change process if the practice does not have a huge backlog of paper patient records (Amatayakul, 2010). However, if the practice has accumulated a large number of paper patient records, the process might take a considerable amount of time, depending upon whether or not a decision is made to convert all or just recent paper records to electronic format.

Derived from Quantitative Analysis; physicians who completed the online survey were neutral about the process of converting their records into electronic format. *(Chapter 5 – section 5.8)*

6.3.2 Physician Level: Training

At the physician level, once the change process takes place at the practice level, the physician (whose technical capabilities were assessed in the previous step), should undergo training on how to efficiently use the EMR. Any other obstacles that will hinder the physicians from using the EMR should be removed or updated (e.g. changes in office workflows) in order to speed up the successful implementation of the EMR for its users.

Derived from the Five Dimension Model; the EMR is delivered to the physician (Victor, 2002), including the conversion of patient records and physician training in the efficient use of the EMR.

Derived from Kotter’s Model; the vendor or consultant should work closely with the physician to remove any obstacles such as lack of knowledge about certain EMR functionalities to be used that might hinder the use of the EMR (Kotter, 1996). Many of these obstacles might be removed by increasing the number or length of physician and office staff training sessions. Successes such as progress in the conversion of records or the readiness of the practice to go live should be communicated to physicians to keep them involved in the change process.

Derived from the ADKAR Model; the vendor or consultant should work closely with the physicians to improve their ability to use the EMR through intense training (Hiatt, 2006), depending on their needs as determined in the previous phase.

Derived from Quantitative Analysis; physicians who completed the online survey were interested in more regular training sessions. *(Appendix A – Section 11)*

6.3.3 Psychological Level: Depression

Depending on the IT knowledge of the physician the vendor should expect an inversely proportional degree of depression from the physician once the training session starts. If the physician has good IT knowledge, their training might be easier than with a physician whose IT knowledge is lower. This is because they might perceive their lack of IT knowledge as a problem with the EMR system itself, this depression is expected to decrease upon increased training on how to use EMR.

Derived from Kubler-Ross Model; physician's depression is expected because of the changes that will take place in their methodology of conducting their business. This depression is expected to decrease with the increase of training (Barone, 2004).

Derived from Quantitative Analysis; physicians who completed the online survey have reported being stressed during migration from paper patient's records to electronic patient's records. *(Chapter 5 – section 5.8)*

6.4 Support

This phase starts directly after the "EMR installation End" milestone from the previous phase when the EMR system is ready to go live. Intensive support for the practice and physicians and staff is very important. This will improve the sustainability of the change process. Prochaska's (modified) model contains a termination step that will be ignored in this model. Continuous support to both the practice and the staff can encourage their psychological acceptance of the EMR, help to enhance their technical capabilities, and ensure they are using the EMR optimally.

This phase represents the refreeze step from the Kurt-Lewin model in which change has already taken place and the business process is back to its normal state (Burke, 2008).

6.4.1 Practice Level: Maintenance

Regular maintenance of the EMR system on a timely basis and providing technical support is a key issue that will support the sustainability of the change process.

From Prochaska's Model; the maintenance step from Prochaska's Model indicates that continuous maintenance of the change project will support the sustainability of the change and hence the success of the change project (Amatayakul, 2010).

From the Quantitative Analysis; despite the fact that physicians who completed the online survey reported they were receiving support from the vendor, their response rate showed that it was not adequate enough. Hence, vendors should be required to increase their support. *(Chapter 5 – Section 5.9)*

6.4.2 Physician Level: Technical Support and Training

Providing technical support and continuous training sessions to the staff is essential to the success of the change project.

From the Five Dimension Model; the physicians' capabilities to use the EMR, developed in the previous phase will be enhanced with continuous training and technical support from the vendor (Victor, 2002), to sustain the change to the business process.

From Kotter's Model; the development of physician EMR capabilities will encourage them to investigate other functions that the EMR can perform (Kotter, 1996). This will build on the change that has already taken place in the practice and anchor the changes in the corporate culture.

From the ADKAR Model; reinforcement can take place in implementation change projects within larger corporations (Hiatt, 2006). However, in a small practice the reinforcement cannot be implemented because the physician(s) is both the key player and decision maker.

Communication plan; focuses on functionalities and products that would enhance the performance of the EMR and communicating any new EMR capabilities to the users

From Quantitative Analysis; physicians who completed the online survey were asking for more regular training sessions. *(Appendix A – Section 11)*. Physicians who completed the online survey were asking for training funded by the responsible government agency. *(Chapter 5 – section 5.11)*

6.4.3 Psychological Level: Acceptance

It is expected that a physician with adequate training will accept the EMR as an important tool in the practice. Resistance to using the EMR in daily operations will diminish with proper training and learning through practical usage of the EMR.

From the Kubler-Ross Model; it is expected that physician resistance to EMR use will drop with increased knowledge and proper training (Barone, 2004), leading to acceptance of EMR usage.

From Quantitative Analysis; physicians who completed the online survey agreed that EMRs were reliable and that their use led to an increase in clinical practice ROI and better interactions with their patients. This represents acceptance of the change initiative at the end of the change project. *(Chapter 5 – section 5.9)*

6.5 Feedback

The suggested model should include 4 feedback phases to cover the fact that change management is based on cyclical models rather than a one way linear representation. The graphs presented in chapter 3 were only an interpretation of published research to make it much easier to understand the models.

The feedback from the end of the initiation phase could be used as an input to the same phase as well. The same fact is applicable for each single phase including assessment, delivery, and support.

In the support phase the feedback is actually a measurement of the success of the change initiative and it can lead to a feedback series, even to the initiation phase if necessary.

Continuous measurement of the degree of success of the change initiative is a milestone for the success of the change initiative. Data should be gathered by holding interviews with physicians rather than through an online survey and should be continuously addressed to measure the physicians' degree of familiarity with IT. A change project would be considered 100% complete if the practice has became completely paperless from patient registration, patient record creation, recording patient information, to medication order entry or laboratory ordering. Answers from physicians should be analyzed and their requirements identified and fed back to increase their dependency on IT, hence insuring the success of the change project (Sockolow, 2011).

The analysis of physician performance and requirements would increase the probability of the success of the change project. The continuous measurement of the change initiative would enable the manager of change or the consultant to discuss the credibility of IT, how the solution provided was perceived, the quality, value and future expectations of the solution provided, and to address any questions or concerns (Ahern, 2006).

Chapter Seven: Answers, Conclusions, and Recommendations

7.1 Answers to propositions

There are multiple change management models available. These cover organizational analysis models, change framework, and change management models, and focus on one level only: either the psychological, business process, or project level. The nature of small business change is an integrated process that involves all of these levels, so none of these change management models are suitable for primary healthcare businesses.

P1: The available change management models are not suitable for dealing with small primary healthcare businesses.

True, based on the evidence gathered – refer to table 3.1 and table 3.2 at page 67 of the research.

Through the extensive literature review discussed in Chapter 3: *"Change Management Models – In Depth"*, the most widely used models were found to be focusing on either one of three levels; practice, physician, or psychological. However, taking into consideration the unique nature of business and the nature of small business environment, all of these three levels must be considered for the success of EMR adoption initiative.

Training during EMR adoption requires time, effort, and physician dedication. However, Canadian physicians always have very busy schedules, at least partly because Canada has a limited number of physicians per 1000 population compared to other OECD countries

P2: Having more physicians per 1000 population would increase the speed of EMR adoption

False, based on the evidence gathered from the qualitative analysis from industry leaders.

The experts did not provide a clear opinion on whether Canada needs more physicians. The point was made that Canada needs to make more efficient use of its current resources, despite the fact that increasing the number of physicians per capita would decrease the workload per physician, thus providing them with more time for education. *(Refer to Section 4.3.1, Recommended Economic Strategies)*

Among the physicians interviewed, 27.3% of the participants had more than 1 hour and 30 minutes per day available for self education, while 18.2% had from 1 to 1.5 hours available per day for self education. This represents only 45.5% of the participants. There were no responses from the remainder. *(Refer to Section 5.3, Self Education)*

Further investigation is required in order to understand the obviously complex relationship between the number of physicians per 1000 population and the physician's ability to adopt EMRs, and to expand their IT knowledge in general.

Despite the availability of funding for EMR systems by Canadian provincial governments, Canadian physicians are reluctant to adopt EMRs.

P3: A different, more rewarding Canadian reimbursement system would encourage physicians to actively work towards adopting EMRs and make efficient use of them

True, based on the evidence gathered.

Based on the findings of the qualitative analysis of data provided by industry leaders, most experts suggested a different reimbursement model for increasing EMR adoption *(Refer to section 4.2.1 Recommended Political Strategies)*

Based on the findings of the quantitative analysis of data provided by physicians, physicians were neutral concerning government financial support for EMR adoption. A better funding system that would cover training would encourage physicians to adopt change, leading to increased EMR adoption. *(Refer to section 5.11 General Experience with EMR)*

In some European countries, the effort expended by their governments has led to an increase in EMR adoption rates and meaningful use of EMRs, resulting in reduced costs and improved care for patients

P4: Canadian provincial governments should mandate the meaningful use of EMR within 5 years, based on the expected better quality of life patients would experience due to increased levels of EMR adoption.

True, based on the evidence gathered

Experts were split over whether the government should or should not mandate the use of EMRs. Experts who supported the mandate believed that physicians would not object. Experts who opposed the mandate believed that the physician's unions are very strong and would either push the bill back to the government or go on strike. *(Refer to section 4.2.1, Recommended Political Strategies)*

64% of the participating physicians responded through the online questionnaire that they would accept mandatory use of EMRs

These findings indicate that, if the government took the decision to mandate the meaningful use of EMRs, the majority of physicians might accept it. *(Refer to section 5.6, Knowledge of Information Technology)*

7.2 Recommendations

The proposed change model for EMR adoption would not work well unless the strategies recommended by industry leaders and subject matter experts were achieved at each of the five levels discussed, as described in detail below.

7.2.1 Political Environment

On a political level the following suggestions can increase the possibility of EMR adoption in Canada; EMR use should be mandated for the younger generation of physicians as they enter primary care practice and learning incentives should be offered to physicians to help them to consider EMR adoption in a positive light

7.2.2 Economic Environment

On economic level the following suggestion can increase the possibility of EMR adoption in Canada; a more in depth research needs to be done to investigate whether Canada needs an increase in the total number of physicians per thousand population.

7.2.3 Social Environment

On a social level the following suggestions can increase the possibility of EMR adoption in Canada; there should be increased communication to physicians about EMR benefits, increase social pressure on physicians to adopt EMRs should be increased, including a strengthening of peer networks, there should be a major focus on how to increase the ROI for physicians while their business productivity is negatively affected during the initial stages of EMR adoption, and a more thorough understanding of human nature and its resistance to change should be developed, particularly as it applies to EMR adoption

7.2.4 Technological Environment

On a technological level the following suggestions can increase the possibility of EMR adoption in Canada; interoperability between EMRs and other healthcare systems should be encouraged to achieve more meaningful use of EMRs, there should be a focus on reducing the technology gap for practicing physicians, and computerization of other healthcare services such as labs, hospitals, etc. should be encouraged, especially including digital communication links to primary care providers

7.2.5 Sustainability of Change

The following suggestions can increase the possibility of change sustainability; business processes in primary care facilities should be enhanced to improve productivity, the early engagement of physicians with technology should be encouraged, research is needed on business models that will result in a suitable long term ROI that will sustain change in small primary care clinics, physician leadership and champions should be encouraged by focusing on physician peer networks, and IT knowledge of physicians should be supported through continuous training opportunities (both general and vendor-specific)

7.3 Conclusions

The proposed model for change management was based on three model types: organizational analysis, organizational change strategies, and change management models. This was partially validated by qualitative input from industry leaders who participated in the study, and quantitative data from a survey that physicians completed online.

Each of the different models investigated were targeted towards a specific aspect of the change process: either psychological, at the practice level, or at the physician's level. However, most of the models were designed to deal with larger corporations or to describe psychological reactions to change in a small business setting.

The proposed model attempts to combine the advantages of a number of the published models and at the same time to avoid the disadvantages of each. The quantitative analysis helped to orient the suggested change management model towards primary care physicians working in small practices, and input from industry leaders enhanced the understanding of the environment that affects primary care practice.

7.4 Limitations of the study

This research was carried out with very limited time and financial resources, leading to limitations on the quantity of data that could be collected and analyzed, for the following reasons:

Due to the small number of industry leaders and subject matter experts who were contacted, sophisticated tools for qualitative data analysis such as NVIVO were not used in analyzing data collected from these participants.

The number of physicians who agreed to participate in the study was disappointingly small. However, this is not unusual and is similar to the experience of many researchers in this field, since physicians are extremely busy and often cannot take time to contribute to such studies. Therefore, it was necessary to draw as much information as possible from the small convenience sample of physicians who were kind enough to assist in the study. Following are some comments on the conduct of the survey; there was a limited amount of time to contact physicians for the study, the time frame for data collection was during the months of July to August, when many physicians were away on their annual vacation, physicians were contacted in person and via phone calls, the survey itself was sent to the physician email with a token to allow them to participate in the study, the highest response rate was achieved by contacting physicians in person, while contacting physicians via phone resulted in a very low rate of response, physicians were recruited from family and friends through communities the

researcher is involved in and a random list of family physicians was acquired from the college of physicians and surgeons of Ontario for telephone contacts

7.5 Future Research

As mentioned earlier, time and financial resources limited the research and the data gathered from physicians. If there were enough time and financial resources, it is expected that the response rate of physicians would have been higher which would lead to an increase in the accuracy of the information presented in the research.

The research should be extended in the future, with more time and financial resources to include a larger sample of physicians, which would result in a better response rate which would lead to a much better statistical analysis that would solidify the suggested model and increase its accuracy

Different parts of the research will be published as academic papers and presented in health IT conferences in Canada and abroad.

As Howitt et al. discussed (Howitt, 2002), the research result and the suggested model should be tested and implemented in EMR adoption environments in primary care practices in real world settings. Applying the model in a change initiative in a primary care setting would allow testing of the model's validity, or the degree of success of the model when it addresses a change project in EMR adoption in primary care. Reliability measures would determine how reliable the model is in addressing EMR adoption initiatives in primary care in different settings and environments.

The success of the model would also depend as discussed earlier on the changes that should occur in the external environment in terms of political, economic, social, and technological levels.

APPENDIX (A)

Physicians' Consent and Questionnaire

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

Objective of the Study

The objective of this study is to develop a functional organizational change management model that focuses on the Canadian Healthcare setting in primary care practice. To accomplish this, it is important to gather physician and industry leader perspectives on topics related to the implementation of Electronic Medical Records. These perspectives will give insights in the following:

How to sustain change and to make efficient and useful usage of Electronic Medical Records.

How to successfully manage change in a Primary Care Setting when implementing an Electronic Medical Record system.

Benefits of the Study

We hope that this study will help in the process of increasing the adoption and usage of Electronic Medical Records in Canada for the benefit of Canadians.

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What Will Happen During The Study?

As a Healthcare practitioner, you will be asked to respond to several demographic questions such as your age, gender, etc. and then to respond to a series of statements about your perceptions of electronic personal health records. The total time to complete the questionnaire will be approximately 25 minutes.

Risks

It is unlikely that your participation in this study will cause any discomfort or harm. Any responses you provide will be treated confidentially by the researchers named above.

Confidentiality

You will be participating in this study anonymously. Any responses you provide will be treated confidentially by the researchers named above.

Nobody, including the researchers, will know who provided data they will be analyzing. All information collected will be stored securely and kept in strict confidence. Participants will not be identified individually in any reports or analyses resulting from this research project.

Withdrawal

You may skip or answer “do not know” to any questions you do not wish to answer, and you may withdraw from the study at any time. If you withdraw, any data you have provided to that point will be destroyed, unless you would prefer that we use the data.

Survey Results

If you wish to see the results of this study, a working paper detailing the results will appear in about six months on the McMaster business Research Centre web site http://merc.mcmaster.ca/

Sample Question

I am very comfortable with Information Technology

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

Confidentiality of data

Data collection

Access to data: The investigators only

Data format: Electronic format for online questionnaire

Use of the data

Data will be used only for research purposes, and no individual will be identifiable in any way from any report or publication resulting from the study

The release of study findings

The study will be published in the MSc thesis, and presented at the thesis defense

The results of the study will be published in a journal article

Final storage

Questionnaire: electronic format – kept for a year on a secured, password protected computer and then archived on a secured, password protected computer.

Questions about the Study

This study has been reviewed by the McMaster University Research Ethics Board and received ethics clearance. If you have concerns or questions about your rights as a participant or about the way the study is conducted, please contact:

..... McMaster Research Ethics Secretariat

..... Telephone: (905) 525-9140 ext. 23142

.....
.....c/o Research Office for Administrative Development and Support
.....
..... E-mail: ethicsoffice@mcmaster.ca

Questionnaire

By taking and submitting this survey you are implying that you consent to be a research participant in the study and that you understand your rights as a research participant.

You may skip any questions that you don't want to answer if they make you feel uncomfortable.

Demographics

1- Age Group

30 or Less	O
31-40	O
41-50	O
51-60	O
Older than 60	O

2- Gender

Male	O
Female	O

Clinical Statistics

3- Type of practice

Walk In Clinic	O
Family Doctor	O
Medical Centre	O

4- Number of Physicians in Practice

1	O
2~3	O
4~5	O
6~7	O
8 or more	O

5- Average number of patients I am responsible for

Less than 500	O

501 to 1000	O
1001 to 1500	O
1501 to 2000	O
More than 2001	O

6- Number of patient visits per day

20 or less	O
21 to 30	O
31 to 40	O
41 to 50	O
More than 51	O

Self Education

7- On average in each working day how much time do you use for self education? (examples; training, reading news on the web, updating disease information, looking for new trends in medicine)

30 min or less	O
From 31 min to 1 hr	O
From 1 hr 1 min to 1 hr 30 min	O
From 1 hr 31 min to 2 hr	O

8- Please indicate the main methods you use for self education according to their importance to you, with 1 being the most important, 2 the second most important, etc.

Print Media	
Email	
Accessing professional websites periodically	
Attending Workshops and conferences	
Other, please specify	

Communication and patient management

9- How do you stay in touch with your patients? (Please arrange according to importance)

Text messaging	O
Telephone	O
Email	O

Blogs	O
Usually patients contact me	O

10- How do you stay professionally in touch with your peers for consultation and discussing new trends in medicine? (Please arrange according to importance)

Text messages	O
Telephone	O
Email	O
Blogs	O
Face to face	O

11- How do you monitor closely patients with chronic diseases such as diabetes, congestive heart failure, asthma, etc. (Please arrange according to importance)

Text messages sent automatically from EMR	O
Telephone	O
Email	O
Blogs	O
Regular office visits	O
Usually patients contact me	O

Business Performance

12- How do you keep and maintain your patients' medical records?

Paper format	O
Electronic format	O
Both paper and electronic	O

13- Patient information must be very detailed for better quality of care

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

14- It consumes a lot of time to record accurate patient information

Strongly agree	O

Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

15- The physician is the only one who should write down patient information because of its sensitivity and the importance of good documentation, even if it consumes a lot of the physician's time

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

16- The standards used to record patient information should not vary from one patient to another

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

17- As a physician I find that it is easy to read handwritten notes by other physicians

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

Knowledge of Information Technology

18- I am very comfortable with Information technology

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O

Strongly disagree	O

19- I support the use of Health Information Technology and Electronic Medical Records

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

20- The method I use for exchanging information with other Healthcare providers such as lab results, prescription, Hospital Information (Please check all that apply)

Text messages	O
Telephone	O
Email	O
Through EMR	O
Regular Mail	O

21- Major issues that I as a physician think are important with Electronic Medical Records (Please check all that apply)

Interoperability problems	O
Usability	O
Pricing	O
Privacy	O
Not sophisticated enough	O
Other, Please indicate	O

22- I am aware of Government efforts to increase EMR adoption by physicians

Yes	O
No	O

23- I agree with the government efforts to increase EMR adoption by physicians

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

24- Expectations for Electronic Medical Record

I am already using EMRs, in the process of switching to EMRs, or will switch to EMRs	O
I will maintain both EMRs and paper format	O
I will not switch to EMRs in the near future	O
I will never switch to EMRs	O

25- If having an EMR (Electronic Medical Record system) became mandatory in order to practice as a general practitioner

I would refuse to work as a general practitioner	O
I would accept using it	O
I would consider other options	O

26- Please check each of the following according to your perceptions and beliefs

Ease of EMR usage	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
EMR access from outside my office	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Patient access to their own records	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Diagnosis list on the EMR	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Ordering tests through the EMR	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Alerts to receiving test results	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Accessing test results online	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Medication lists for patients	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Electronic prescriptions sent from the EMR	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Prescription alerts from pharmacies	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Access to hospital records through the EMR	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Reminders	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Billing	Very Important	Somewhat Important	Neutral	Low Importance	Not at all Important
Other; Please indicate					

27- Please State what Other functions you would like to have in an EMR!

28- Experience with Electronic Medical Records (please check one of the following).

I have no experience using Electronic Medical Records	O
I have tried using Electronic Medical Records but I don't recommend using them	O
I have tried using Electronic Medical Records but my experience with them was unpleasant. However, I recommend their use by other physicians	O

I have tried using Electronic Medical Records and I support using them for better quality of care	O

If you have not tried to use Electronic Medical Records please skip to question 53.

Experience with EMR Training

29- There was a lot of stress for me as a physician during training for EMR usage

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

30- As a physician, I was involved in the process of EMR selection, EMR feature selection, etc and/or my recommendations were taken into consideration

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

31- There was sufficient EMR training for the clinic staff

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

32- There was regular EMR training for all clinic staff and new users as required

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

33- Regular EMR training sessions are held as required

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

34- There was special training for Super Users (Users who are interested in completely understanding the functionality of the EMR)

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

Experience with EMR Business Performance

35- There was a lot of stress on me as a physician during the migration from paper format to EMR format

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

36- The migration of patient records from paper to EMR was easily accomplished

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

37- Clinic efficiency and productivity was enhanced after switching to the EMR

Strongly agree	O
Somewhat agree	O
No preference	O

Somewhat disagree	O
Strongly disagree	O

38- The quality of care patients are receiving was improved due to the use of the EMR

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

Experience with EMR Usage

39- The EMR system used was reliable

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

40- The vendor's quality of support was satisfactory

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

41- The return on Investment from the EMR met expectations

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

42- There is/was a lot of stress and fear for me as a physician while learning and using the EMR functions such as data exchange and interoperability, privacy, usability, reliability, cost etc.

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

43- The number of EMR screens that need to be opened per patient is/was too high

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

44- Interaction with patients became much better after installing the EMR

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

Experince with EMR Sophistication

45- The EMR used was sophisticated enough to capture all necessary patient information and to meet all physician requirements

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

46- The EMR helped to maintain a standardized patient information format

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O

Strongly disagree	O

47- Data exchange with other healthcare providers such as labs, pharmacies, hospitals, specialists, etc. improved due to the use of the EMR

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

48- The EMR helps to increase patient information privacy

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

General Experience with EMR

49- My positive experience with the EMR exceeded my expectations

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

50- Switching back to paper format

I will never switch back to paper format	O
I am hesitant to switch back to paper format	O
I am in the process of switching back to paper format	O
I have already switched back to paper format	O

51- Government implementation of different types of Health Information Technology is satisfactory

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

52- Financial support from government to encourage the adoption of EMRs is significantly more than expected

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

53- I feel pressured by the government to start implementing and using Electronic Medical Records in my practice

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

54- I feel that my colleagues who installed EMRs are completely satisfied with their systems

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

55- At the end of the process of EMR implementation all my concerns were resolved, and the use of the EMR was successful

Strongly agree	O
Somewhat agree	O
No preference	O
Somewhat disagree	O
Strongly disagree	O

56- What are the major issues with EMRs that you would like to have resolved before using Information Technology?

57- What other efforts are needed by the government to increase the adoption of EMRs in Canada?

58 - If you have installed or were to install an EMR in your practice, what essential features would it need to have so you would never consider going back to using paper documents?

APPENDIX (B)

Open Ended Questions for Industry Leaders

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

Introduction

This interview is held to understand your perspective on how we can manage and sustain organizational change in a healthcare provider small enterprise such as a walk-in clinic or a family doctor's office. The interview is divided into 5 sections

Business Performance

Political Environment

Economic Environment

Behavioral Analysis

Technological Environment

At the same time there is a questionnaire for family physicians to understand their Perspective and behavioral response to EMR adoption in Canada.

The results from both the interview and the physicians' questionnaire will be analyzed qualitatively and quantitatively; respectively; to generate a Change Management Model dedicated for the Canadian healthcare system.

You may skip any question that you wouldn't like to answer.

Business Performance

This part of the interview is to study the Business performance of a Primary care clinic and the expected benefits of the application of Electronic Medical Records.

What are the drivers that would encourage a physician to undertake a strategic change to the method business is being conducted at his/her practice?

It's known that the application of Health Information Technology will result in positive outcomes for Canadians. However, for a small business such as a General Practitioner or a Walk-in Clinic, what are the expected effects on the business performance?

Physicians in general suffer from a very busy schedule here in Canada. Do you think the time left for self education for physicians is enough? Can you please elaborate?

Out of the following fourteen functions of EMRs. What are the 5 functions that will be critical when it comes to implementation of EMR? Why?

Ease of EMR usage

EMR access from outside my office

Patient access to their own records

Diagnosis list on the EMR

Ordering tests through the EMR

Alerts to receiving test results

Accessing test results online

Medication lists for patients

Electronic prescriptions sent from the EMR

Prescription alerts from pharmacies

Access to hospital records through the EMR

Reminders

Billing

Other; Please indicate

Political Environment

This part of the interview is to study the effects of the political environment upon the small enterprise in the Canadian healthcare system represented by walk-in clinics, family doctors, etc.

What policies should the government undertake to increase EMR adoption by physicians?

What needs to be done to convince physicians to adopt EMR? For example, creating a pulling force from physicians rather than a pushing force from the government?

Do you think that it is important for physicians in primary care practice to adopt the use of EMRs? Why?

How could consumers (Patients) help to encourage physicians to adopt EMRs?

Do you think that increasing Health Information Technology usage in other healthcare provider agencies (such as hospitals, test labs, etc.) would encourage primary care physicians to use EMRs?

What can be done to decrease the stress on physicians who are trying to adopt EMRs?

After EMRs are adopted by physicians, what needs to be done by the government to help support and sustain the change?

Economic Environment

This part of the interview is to study the effects of the economic environment upon the small enterprise in the Canadian healthcare system represented by walk-in clinics, family doctors, etc.

In a study held by the researcher it was found that Canada has the least number of physicians per ten thousand of population compared to OCED countries. Canada has around 19 Physician/10,000 of population while Austria 37, Belgium 42, Switzerland 40, Netherlands 37.

Do you think that Canada needs more physicians to match the per capita number of physicians in Europe? Please explain?

In your opinion what effects will increasing the number of physicians in Canada result-in in terms of:

Competition between physician

Learning curve about Information Technology

General Health outcomes for the Canadian population

Behavioral Analysis

This part of the interview will discuss the Behaviors of physicians towards implementation of Information technology into their practice:

What are the main behavioral factors hindering the adoption of physicians for EMR?

In which part of the process should physicians get involved-in in the implementation of Electronic Medical Records?

EMR Selection

EMR Implementation

EMR post implementation

Training

Support

In a study held by McMaster University, the Center for Evaluation of Medicine, and Infoclin, it was found that out of a random sample only 25% of the physicians became efficient users of EMR while 40% of the physicians became inefficient users and 35% percent of the physicians switched back to paper format. Can you explain?

How would physicians react to the following

EMR training

Post EMR implementation business performance

EMR usage

EMR Usability

EMR Sophistication

EMR Standardization

EMR Interoperability

EMR & Patient Privacy

How would physicians react if the usage of EMR became mandatory to run a business?

Technological Environment

This part of the interview will discuss the advances in technology and their effects on physicians and the response of physicians

On a scale of 1 to 10 (10 being very comfortable with Information technology), how would you rate and classify Canadian physicians in terms of usage of Information technology in general?

What changes could be done in our healthcare systems to encourage the adoption of EMR?

General Notes

Any general comments you would like to add…

APPENDIX (C)

Physicians' email recruitment script

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

E-mail Subject line

Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems

Script for recruiting physicians

Good day Dr. (……),

This email is from Joseph Kerollos a graduate student in the MSc eHealth program at McMaster University.

I am inviting you to complete a brief online survey that will take approximately 25 minutes to complete. As my thesis project, I am conducting this study to help understand the factors that affect the management and maintenance of change in primary healthcare settings for the implementation of Electronic Medical Record systems.

I 'm interested in whether these changes will have an impact on your business processes, business performance, productivity, work, the quality of care delivered to patients, and your clinic's profitability. I am trying to determine how adjustments to these factors might help to increase EMR adoption in Canada and how these factors might sustain and encourage more efficient use of EMRs after they are implemented.

It is expected that this study will not pose any risks to you and you can withdraw at any time. I have attached a copy of a letter of information about the study. This study has been reviewed and approved by the McMaster Research Ethics Board. If you have concerns or questions about your rights as a participant or about the way the study is being conducted you may contact:

.....
.....McMaster Research Ethics Board Secretariat

.....
..... Telephone: (905) 525-9140 ext. 23142
.....
..... c/o Office of Research Services
.....
..... E-mail: ethicsoffice@mcmaster.ca

The following link will lead you to the online survey.

http://ehealthex.degroote.mcmaster.ca/dsblimesurvey182/index.php?sid=28392&lang=en

Your participation in this study is entirely voluntary and you are under no obligation to take part. You are participating in this study anonymously, and as such nobody (not even the researcher) will know whether you did or did not take part in the study.

No one other than my supervisor and me will have access to the information that you will provide. You may withdraw at any time. If you do so, any data entered up to that time will be destroyed.

We would like to thank you in advance for your time and consideration. After a week, we will send you a follow-up reminder.

Joseph Kerollos B. Eng, MBA,

Masters of Science in eHealth

Degroote School of Business

McMaster University,

Hamilton Ontario

Tel: 905-525-9140

Ext: 23944

kerolljh@mcmaster.ca

APPENDIX (D)

Industry leaders' email recruitment script

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

E-mail Subject line

Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Records Systems

Script for recruiting Industry leaders and subject matter experts:

Good day Mr. (……);

This email is from *Joseph Kerollos,* an MSc graduate student in eHealth from McMaster University. As a part of my program, I am conducting a study into the factors that affect the *management and sustainability* of organizational change in primary healthcare settings in Canada relating to the implementation and efficient use of Electronic Medical Record systems (EMRs).

I am inviting you, as an expert and industry leader, to participate in a one on one interview to discuss a set of questions about Organizational Change Management when primary care physicians adopt Electronic Medical Records, and furthermore how to sustain and make efficient use of this change. The interview will take approximately one hour, and scheduled at your convenience.

I 'm interested in understanding your vision for the change process when and EMR is implemented, and whether it will have an impact on the business processes, business performance, productivity, work, and the quality of care delivered to patients, and whether these factors will, in the long run, increase the efficiency of EMR adoption in Canada.

It is expected that this study will not pose any risks to you and you can withdraw at any time. I have attached a copy of a letter of information about the study, which provides full details. This study has been reviewed and approved by the McMaster Research Ethics Board. If you have concerns or questions about your rights as a participant or about the way the study is being conducted you may contact:

.....
.....McMaster Research Ethics Board Secretariat
.....
..... Telephone: (905) 525-9140 ext. 23142
.....
..... c/o Office of Research Services
.....
..... E-mail: ethicsoffice@mcmaster.ca

No one other than my supervisor and me will have access to the information that you will provide. You may withdraw at any time. If you withdraw, any data you have provided to that point will be destroyed, unless you would prefer that we use the data.

We would like to thank you in advance for your time and consideration. After a week, we will send you a follow-up reminder.

Joseph Kerollos B. Eng, MBA,
Masters of Science in eHealth
Degroote School of Business
McMaster University,
Hamilton Ontario
Tel: 905-525-9140
Ext: 23944
kerolljh@mcmaster.ca

APPENDIX (E)

Industry leader interviews and answers to open-ended questions

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

The researcher was able to setup six one-on-one interviews with industry leaders and subject matter experts from across Canada during the period of July 5th, 2011 and September 14th, 2011. The backgrounds of the industry leaders varied on all levels to guarantee the complete coverage of the industry from all aspects.

The educational background of the industry leaders was from engineering, business, finance, medicine, and information technology. Their professional expertise, that arise from consultancy, a provincial healthcare information technology regulating agency, a agency operating in federal healthcare information technology regulation, information technology expertise, change management expertise, and a multinational organization operating in different industries including healthcare and healthcare information technology, combined with their educational background have added to the credibility of the research.

The experts' positions and organizations are as follows;

Chairman of a consultancy firm

Federal change management healthcare expert team

Senior executive from a provincial healthcare information technology agency

A former Chief Technology Officer at a teaching hospital

Change management expert at a major consulting firm

Director of professional services at a major healthcare organization

Generally there was no problem setting up meetings with industry leaders except for the timing. This is completely understood because of their busy schedules and the time of the research which did occur during their vacation time. However, their generosity to offer a time span to discuss the research and the factors affecting the environment physicians are working in is highly appreciated.

1. Business Performance

The table below *(Table E.1.1)* represents the industry leaders and subject matter experts expected advantages of increasing EMR adoption in Primary care

Table E.1.1 Expected advantages of increasing EMR adoption in primary care

EMR advantages	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Interoperability benefits	√	√				
Providing a better quality of care			√	√		
Cost Savings					√	
Clinical Errors Reduction	√					√

The table below *(Table E.1.2)* represents the industry leaders and subject matter experts expected disadvantages of increasing EMR adoption in Primary care

Table E.1.2 Expected disadvantages of increasing EMR adoption in primary care

EMR disadvantages	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Paper Psychological Evidence is lost	√					
Time required for training		√				√

The table below *(Table E.1.3)* represents the industry leaders and subject matter experts critical EMR functions that will eventually increase its adoption by primary care physicians

Table E.1.3 Expected critical EMR functionalities

EMR functions	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Ease of EMR usage	√	√		√	√	√
EMR access from outside my office	√		√		√	
Patient access to their own records						
Diagnosis list on the EMR		√			√	
Ordering tests through the EMR		√	√			

Alerts to receiving test results			√	√		√
Accessing test results online			√			√
Medication lists for patients	√	√				√
Electronic prescriptions sent from the EMR		√				
Prescription alerts from pharmacies						
Access to hospital records through the EMR	√			√		
Reminders						
Billing	√	√		√		√
Other; Please indicate					√	

The table below *(Table E.1.4)* represents the industry leaders and subject matter experts' critical EMR requirements to increase its adoption by primary care physicians

Table E.1.4 EMR suggestions to increase its adoption in primary care

Business Performance Recommended Strategy	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Increase EMR Interoperability and Efficiency	√		√	√		
Enhancement of Physicians Performance		√			√	√
Increase Communication		√			√	
Recruit Skilled Labor for Support			√			√
Different Reimbursement System				√		
Sufficient Training				√		

2. Political Environment

The table below *(Table E.2.1)* represents the industry leaders and subject matter experts Critical Political strategies that will eventually increase EMR adoption in Primary care

Table E.2.1 Suggested EMR political strategies to increase EMR adoption in primary care

Technological Strategy	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Increase Interoperability						√
Deliver Meaningful Use	√	√				
Government should mandate EMR			√	√	√	
Offer learning incentives			√			√
Computerize other healthcare providers		√				√

3. Economic Environment

The table below *(Table E.3.1)* represents the industry leaders and subject matter experts Critical Economic strategies that will eventually increase EMR adoption in Primary care

Table E.3.1 Answers to whether Canada needs more primary care physicians to increase EMR adoption

Does Canada need more physicians?	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
	No	No		Yes	Yes	Yes

The table below *(Table E.3.2)* represents the industry leaders and subject matter experts expected effects if the number of primary care physicians increased in Canada

Table E.3.2 Effects of increasing primary care physicians on productivity, competition, and time for self education

Effect of Increasing Physicians	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Productivity	Increase					
Competition	Increase				Not Valid	Not Valid
Time for education						Increase

4. Social Environment

The table below *(Table E.4.1)* represents the industry leaders and subject matter experts Critical social factors hindering the increase of EMR adoption in primary care

Table E.4.1 Social factors hindering EMR adoption in primary care

Factors slowing EMR adoption	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Communication of EMR benefits	√	√	√		√	
Absence of Social Pressure	√					
ROI		√			√	
Small Business Nature			√			
Resistance to Change				√	√	√
Technology Gap						√

The table below *(Table E.4.2)* represents the industry leaders and subject matter experts Critical factors affecting the sustainability of change in Primary care

Table E.4.2 Factors affecting sustainability of EMR usage in primary care

Sustainability of Change	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Business Process	√					√
Engagement during change		√			√	√
ROI		√				√
Leadership		√				
IT knowledge			√		√	

The table below *(Table E.4.3)* represents the industry leaders and subject matter experts' expectations of physicians' reaction if EMR became mandatory

Table E.4.3 Expectations of physicians reactions to mandating the use of EMR in primary care

Mandating EMR	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Physicians Reaction	Adopt EMR	Strike	Strike	Strike	Pushback	Strike

The table below *(Table E.4.4)* represents the industry leaders and subject matter experts' perspective on the involvement of physicians in the change process

Table E.4.4 Involvement of physicians in the change process

Physician Involvement in Change	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Before the Process Starts	√	√		√		
During the change Process						
No need for involvement			√			

5. Technological Environment

The table below *(Table E.5.1)* represents the industry leaders and subject matter experts grading and classification of physicians in Canada based on their own technical knowledge

Table E.5.1 physician's classification based on their technical knowledge

Physician Age Group	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Physicians' Average	7	4	3	3	7	6
Younger physicians		8	9			10
Older Physicians		2	0			3

The table below *(Table E.5.1)* represents the industry leaders and subject matter experts Critical technological strategies that will eventually increase EMR adoption in primary care

Table E.5.1 Suggested technical Strategies

Technological Strategy	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6
Focus on True Interoperability	√					
Delivering Promised EMR Capabilities	√					
Design EMR based on Evidence	√					
Strengthen Peer Networks		√				√
Design a new Reimbursement Model		√	√			√
Mandate Electronic Reporting		√		√		
increase the total number of physicians						√
increase EMR marketing Campaign for						√

APPENDIX (F)

Physicians' questionnaire analysis

"The Management and Sustainability of Organizational Change in Primary Care Adoption of Electronic Medical Record Systems"

The researcher was able to contact 20 physicians either by phone or face to face and invited them to answer the online questionnaire. The number of respondents was 11 physicians who provided email to receive invitations to the questionnaire. The recruited physicians were family, friends, or a first time contact initiated by the researcher.

The physicians who were invited were geographically distributed across Canada from Alberta, Nova Scotia, and Ontario.

There was a good response from friends with a success rate closer to 100% while the attempts to call physicians to invite them to fill the online questionnaire were unsuccessful.

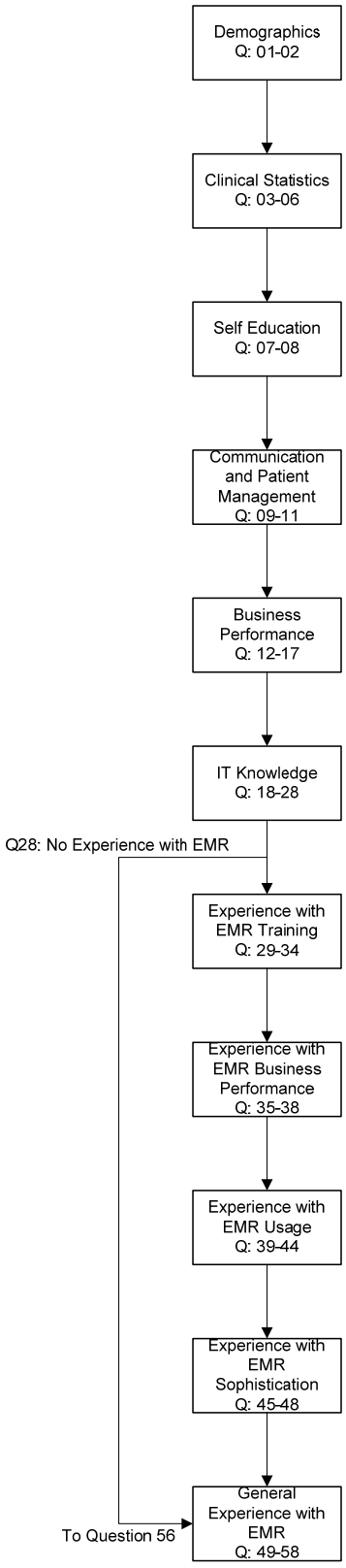

Figure F.1 Questionnaire flow chart

1. Demographics

Sample size: 11

The table below (Table F.1.1) represents the demographics of the physicians who participated in the study.

Table F.1.1 Demographics

Age		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30 years old or less	3	27.3	30.0	30.0
	31-40	1	9.1	10.0	40.0
	41-50	3	27.3	30.0	70.0
	51-60	3	27.3	30.0	100.0
	Total	10	90.9	100.0	
Missing	System	1	9.1		
Total		11	100.0		

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	7	63.6	70.0	70.0
	Female	3	27.3	30.0	100.0
	Total	10	90.9	100.0	
Missing	System	1	9.1		
Total		11	100.0		

2. Clinical Statistics

Sample Size: 11

The table below (Table F.2.1) represents the type of practice of the physicians who participated in the study.

Table F.2.1 Type of practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Family Doctor	4	36.4	50.0	50.0
	Medical Centre	4	36.4	50.0	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

The table below (Table F.2.2) represents the number of physicians at the practice of the physicians who participated in the study.

Table F.2.2 number of physicians

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2~3 physicians	3	27.3	37.5	37.5
	8 or more physicians	5	45.5	62.5	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

The table below (Table F.2.3) represents the number of patients a physician is responsible for at the practice of the physicians who participated in the study.

Table F.2.3 Patients per physician

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 500 Patients	1	9.1	16.7	16.7
	More than 2000 Patients	5	45.5	83.3	100.0
	Total	6	54.5	100.0	
Missing	System	5	45.5		
Total		11	100.0		

The table below (Table F.2.4) represents the number of patients' visits per day at the practice of the physicians who participated in the study.

Table F.2.3 Patients' visits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 or less	2	18.2	25.0	25.0
	21 to 30	2	18.2	25.0	50.0
	31 to 40	3	27.3	37.5	87.5
	More than 50	1	9.1	12.5	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

3. Self Education

Sample Size: 11

The table below (Table F.3.1) represents the self education statistics for physicians who participated in the study.

Table F.3.1 Time available for education

	Mean	N	Std. Deviation
Time available for Education/day	702.67	9	1.225

The table below (Table F.3.2) represents the self education descriptive statistics for physicians who participated in the study.

Table F.3.2 Time available for education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30 min or less	2	18.2	22.2	22.2
	31 1 min to 1 hr	2	18.2	22.2	44.4
	1 hr 1 min to 1 hr 30 min	2	18.2	22.2	66.7
	1 hr 31 min to 2 hrs	3	27.3	33.3	100.0
	Total	9	81.8	100.0	

Missing	System	2	18.2		
Total		11	100.0		

The table below (Table F.3.3) represents the preferred method of self education statistics for physicians who participated in the study.

Table F.3.3 Preferred Media for education

First Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Print Media	3	27.3	33.3	33.3
	Accessing Professional Websites	3	27.3	33.3	66.7
	Workshops and Conferences	2	18.2	22.2	88.9
	Other	1	9.1	11.1	100.0
	Total	9	81.8	100.0	
Missing	System	2	18.2		
Total		11	100.0		

Second Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Print Media	1	9.1	11.1	11.1
	Email	2	18.2	22.2	33.3
	Accessing Professional Websites	2	18.2	22.2	55.6
	Workshops and Conferences	4	36.4	44.4	100.0
	Total	9	81.8	100.0	
Missing	System	2	18.2		
Total		11	100.0		

Third Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Print Media	2	18.2	25.0	25.0
	Accessing Professional Websites	2	18.2	25.0	50.0
	Workshops and Conferences	1	9.1	12.5	62.5
	Other	3	27.3	37.5	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

Fourth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Print Media	1	9.1	12.5	12.5
	Email	4	36.4	50.0	62.5

	Workshops and Conferences	2	18.2	25.0	87.5
	Other	1	9.1	12.5	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

Fifth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Print Media	1	9.1	16.7	16.7
	Email	1	9.1	16.7	33.3
	Accessing Professional Websites	1	9.1	16.7	50.0
	Other	3	27.3	50.0	100.0
	Total	6	54.5	100.0	
Missing	System	5	45.5		
Total		11	100.0		

4. Communication

Sample Size: 11

The table below (Table F.4.1) represents the preferred method of communication with patients for physicians who participated in the study.

Table F.4.1 Preferred Media for communication with patients

First Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Telephone	1	9.1	14.3	14.3
	Usually Patients Contact me	6	54.5	85.7	100.0
	Total	7	63.6	100.0	
Missing	System	4	36.4		
Total		11	100.0		

Second Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Telephone	3	27.3	75.0	75.0
	Email	1	9.1	25.0	100.0
	Total	4	36.4	100.0	
Missing	System	7	63.6		
Total		11	100.0		

Third Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Email	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		
Fourth Priority		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Blogs	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		
Fifth Priority		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Text Messaging	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		

The table below (Table F.4.2) represents the preferred method of communication with peers for physicians who participated in the study.

Table F.4.2 Preferred Media for communication with peers

First Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Telephone	3	27.3	42.9	42.9
	Email	2	18.2	28.6	71.4
	Face to Face	2	18.2	28.6	100.0
	Total	7	63.6	100.0	
Missing	System	4	36.4		
Total		11	100.0		
Second Priority		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Text Messages	1	9.1	20.0	20.0
	Email	1	9.1	20.0	40.0
	Blogs	1	9.1	20.0	60.0
	Face to Face	2	18.2	40.0	100.0
	Total	5	45.5	100.0	
Missing	System	6	54.5		
Total		11	100.0		
Third Priority		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Telephone	2	18.2	66.7	66.7
	Email	1	9.1	33.3	100.0

	Total	3	27.3	100.0	
Missing	System	8	72.7		
Total		11	100.0		

Fourth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Text Messages	1	9.1	33.3	33.3
	Blogs	1	9.1	33.3	66.7
	Face to Face	1	9.1	33.3	100.0
	Total	3	27.3	100.0	
Missing	System	8	72.7		
Total		11	100.0		

Fifth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Text Messages	1	9.1	50.0	50.0
	Blogs	1	9.1	50.0	100.0
	Total	2	18.2	100.0	
Missing	System	9	81.8		
Total		11	100.0		

The table below (Table F.4.3) represents the preferred method for managing patients with chronic diseases for physicians who participated in the study.

Table F.4.3 Preferred Media for managing patients with chronic diseases

First Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Email	1	9.1	16.7	16.7
	Regular Office Visits	3	27.3	50.0	66.7
	Usually Patients Contact Physician	2	18.2	33.3	100.0
	Total	6	54.5	100.0	
Missing	System	5	45.5		
Total		11	100.0		

Second Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Telephone	1	9.1	25.0	25.0
	Regular Office Visits	2	18.2	50.0	75.0
	Usually Patients Contact Physician	1	9.1	25.0	100.0
	Total	4	36.4	100.0	
Missing	System	7	63.6		
Total		11	100.0		

Third Priority		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Telephone	3	27.3	75.0	75.0
	Usually Patients Contact Physician	1	9.1	25.0	100.0
	Total	4	36.4	100.0	
Missing	System	7	63.6		
Total		11	100.0		

Fourth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Email	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		

Fifth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Text Messages from EMR	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		

Sixth Priority		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Blogs	1	9.1	100.0	100.0
Missing	System	10	90.9		
Total		11	100.0		

5. Business Performance

Sample Size: 11

The table below (Table F.5.1) represents the preferred method for managing patients' records for physicians who participated in the study.

Table F.5.1 Preferred Media for managing patients records

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper Format	3	27.3	33.3	33.3
	Electronic Format	2	18.2	22.2	55.6
	Both Paper and Electronic	4	36.4	44.4	100.0
	Total	9	81.8	100.0	
Missing	System	2	18.2		
Total		11	100.0		

The table below (Table F.5.2) represents the statistical analysis for patient details, time consumption to record patient information, physician access to patient information, Standardization of patient information, and ease of understanding notes by other physicians

Table F.5.2 General Inquiry about clinical business

	Mean	N	Std. Deviation
Patient details must be recorded	1301.44	9	.527
It consumes a lot of time to record patient information	1401.78	9	.667
Physician is the only one who should access Patient Information	1502.11	9	1.054
Patient information should be standardized	1601.63	8	.744
It's easy to read notes by other physicians	1703.78	9	1.202

6. Knowledge of Information Technology

Sample Size: 11

The table below (Table F.6.1) represents the level of IT physicians' knowledge and their level of support for the use of IT in healthcare for physicians who participated in the study.

Table F.6.1 General Inquiry about clinical business

	Mean	N	Std. Deviation
IT Comfortability	1901.44	9	.726
Support of IT	2001.33	9	.500

The table below (Table F.6.2) represents the method of exchanging information with other healthcare providers for physicians who participated in the study.

Table F.6.2 Communication with other healthcare providers

	Number of occurrences
Text Messages	0
Phone	4

Email	1
Through EMR	4
Mail	2

The table below (Table F.6.3) represents the physicians' perspective of critical EMR characteristics for physicians who participated in the study.

Table F.6.3 Critical EMR issues

	Number of occurrences
Interoperability	6
Usability	5
Price	2
Privacy	3
EMR Sophistication	1
Other	0

The table below (Table F.6.4) represents the physicians' awareness of about government efforts to increase EMR adoption and the perspective of government efforts for physicians who participated in the study.

Table F.6.4 Critical EMR issues

	Mean	N	Std. Deviation
Awareness of Government Efforts	1.00	7	.000
Agreement with Government Efforts	2401.63	8	1.061

The table below (Table F.6.5) represents the physicians' usage of EMR for physicians who participated in the study.

Table F.6.5 EMR usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Already using EMR	4	36.4	50.0	50.0
	Both copies paper and electronic	3	27.3	37.5	87.5
	No Switch in the near future	1	9.1	12.5	100.0

	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

The table below (Table F.6.6) represents the physicians' perspective concerning mandating EMR by the government for physicians who participated in the study.

Table F.6.6 EMR mandating

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I would accept using EMR	7	63.6	100.0	100.0
Missing	System	4	36.4		
Total		11	100.0		

The table below (Table F.6.7) represents the score of EMR characteristics completed by physicians who participated in the study.

Table F.6.7 EMR Characteristics

	Mean	N	Std. Deviation
Ease of use	3.63	8	1.923
EMR access from outside office	4.13	8	1.126
Patient accessing their records	2.29	7	1.254
Diagnosis list	3.88	8	.641
Ordering tests	4.13	8	1.126
Alerts to receiving test results	4.71	7	.756
Accessing test results	5.00	8	.000
Medication list	4.71	7	.756
e-Prescription	4.14	7	1.215
Prescription alerts from pharmacies	4.29	7	1.113
Accessing Hospital records	4.71	7	.488
Reminders	4.00	7	1.414
Billing	11.29	7	19.328
Other	3.00	2	2.828

The table below (Table F.6.8) represents the physicians' experience with EMR completed by physicians who participated in the study.

Table F.6.8 EMR mandating

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Experience with EMR	2	18.2	25.0	25.0
	Experienced EMR and Support them	6	54.5	75.0	100.0
	Total	8	72.7	100.0	
Missing	System	3	27.3		
Total		11	100.0		

7. Experience with EMR training

The table below (Table F.7.1) represents the physicians' perspective of EMR training completed by physicians who participated in the study.

Table F.7.1 Physicians'' perspective on EMR Training

	Mean	N	Std. Deviation
Training stress	2803.80	5	1.304
Early involve	2903.80	5	1.789
EMR sufficient training	3002.50	6	1.378
EMR regular training	3103.17	6	1.329
EMR special training	3303.50	6	1.378

The table below (Table F.7.2) represents the regular training sessions duration completed by physicians who participated in the study.

Table F.7.1 Regular training sessions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Every 6 months or more	3	27.3	60.0	60.0
	No regular training sessions	2	18.2	40.0	100.0
	Total	5	45.5	100.0	
Missing	System	6	54.5		
Total		11	100.0		

8. Experience with EMR Business Performance

The table below (Table F.8.1) represents the physicians' experience with EMR business performance completed by physicians who participated in the study.

Table F.8.1 Regular training sessions

	Mean	N	Std. Deviation
Migration stress	3403.50	6	1.225
Migration ease	3502.67	6	1.506
Practice business Enhance	3601.33	6	.516
Quality improvement	3701.67	6	.816

9. Experience with EMR Usage

The table below (Table F.9.1) represents the physicians' experience with EMR usage completed by physicians who participated in the study.

Table F.8.1 General EMR usage

	Mean	N	Std. Deviation
EMR reliability	3801.40	5	.548
Satisfaction with Support	3902.40	5	.894
ROI met Expectations	4002.40	5	.548
EMR functionality stress	4103.83	6	.983
Physician has to deal with a lot of Screen	4203.17	6	1.329
Patient interaction improved	4302.00	6	.894

10. Experience with EMR Sophistication

The table below (Table F.9.1) represents the physicians' experience with EMR sophistication completed by physicians who participated in the study.

Table F.10.1 EMR sophistication

	Mean	N	Std. Deviation
EMR was sophisticated enough	4402.67	6	1.033
EMR helped maintaining standards	4502.00	6	.632
Data exchange improved	4601.83	6	.753
EMR improved privacy	4702.33	6	1.366

11. General experience with EMR

The table below (Table F.11.1) represents the physicians' experience with EMR completed by physicians who participated in the study.

Table F.11.1 EMR Experience

	Mean	N	Std. Deviation
Experience exceeded expectations	4801.60	5	.548

The table below (Table F.11.2) represents the physicians' willingness to sustain EMR completed by physicians who participated in the study.

Table F.11.2 EMR sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No switching back to paper	5	45.5	83.3	83.3
	Hesitant to switch back to paper	1	9.1	16.7	100.0
	Total	6	54.5	100.0	
Missing	System	5	45.5		
Total		11	100.0		

The table below (Table F.11.3) represents the physicians' general knowledge of EMR completed by physicians who participated in the study.

Table F.11.3 EMR general knowledge

	Mean	N	Std. Deviation
Satisfactory with Government efforts	5002.63	8	1.598
Government Financial Support is satisfactory	5103.00	8	1.512
Physician feels pressure by government	5203.63	8	.916
Colleagues' satisfaction	5301.86	7	.690
EMR implementation was Successful	5402.67	6	.516

56- Major issues with EMR

- Simplicity & training.

57- Government effort needed

- Physician 1:
    - More training
- Physician 2:
    - Older physicians who have been using the "paper" format for the past 30-40 years are going to be hesitating to switch. I think the government should make an effort to address each one of their concerns on a face to face basis.
- Physician 3:
    - There needs to be ONE set of certification standards for EMRs across the country. The vendors we have used have spent so much time, money and effort trying to "tweak" their systems to meet the differing standards in various provinces that they have not had time, money, resources to invest in addressing the issues that the physicians who purchase their systems want addressed, in order to achieve system excellence. If there were one set of requirements then all vendors could work on meeting these with excellence and then get on to focusing on the issues their clients, the health care providers themselves, want addressed.
- Physician 4:
    - More training sessions

58- Essential features to sustain using EMR

- Physician 1:
    - More simple EMRs
    - More training
- Physician 2:
    - A more customized EMR would be more accepted

- Physician 3:
    - Required features
        - Easy visible CPP
        - Past history
        - Family history
        - Social history
        - Medication record
        - Problem list
        - Allergies only
        - Easy access to other information
        - Investigations
        - Consultations
        - Immunizations
        - Investigations ordered and returned through the system. investigations "signed off" through the system
        - Ability to message other team members directly from the investigation result and replies on the same thread
        - Ability to easily forward information to other providers.
        - Ability to "forward" my incoming info to another provider when I am away or when a physician leaves practice.
        - Ease of accessing health info in other locations such as hospitals, pharmacies, specialist offices, diagnostic clinics etc.
        - Prescriptions ordered through the EMR, attached to notes and ability to send electronically to pharmacy.
        - Drug information available through EMR to attach to chart
        - Adverse reactions
        - Drug interactions
        - Patient portal to the chart customizable by patient/provider so that patient can view any combination of lab results, other investigations, consultant reports, measurements, immunizations as agreed between patient and provider.
        - secure communication between provider and patient via the EMR so all is captured in the EMR
- Physician 4:
    - High Speed Internet
- Physician 5:
    - User friendly interface

APPENDIX (G)

Data from Statistics Canada

Table G-1 Diabetes distribution by age group and sex

	2005	2007	2008	2009	2010
	number of persons				
Total, 12 years and over	**1,325,120**	**1,615,163**	**1,656,470**	**1,706,148**	**1,841,527**
Males	**714,967**	**882,086**	**881,262**	**937,014**	**1,058,214**
Females	**610,154**	**733,077**	**775,207**	**769,134**	**783,313**
12 to 19 years	9,627	15,920[E]	9,907[E]	F	12,795[E]
Males	5,731[E]	9,383[E]	F	F	7,536[E]
Females	3,895[E]	6,538[E]	F	F	F
20 to 34 years	61,776	74,884	57,771	50,182	77,896[E]
Males	28,484	39,184	21,020[E]	24,761[E]	39,261[E]
Females	33,292	35,700[E]	36,750[E]	25,421[E]	38,635[E]
35 to 44 years	103,715	128,738	132,484	115,141	133,626
Males	54,960	71,720	70,891	58,746	75,287
Females	48,755	57,017	61,593	56,395	58,339
45 to 64 years	575,276	714,750	776,872	733,121	814,513
Males	326,762	401,211	441,553	407,343	502,245
Females	248,514	313,539	335,318	325,778	312,269
65 years and over	574,726	680,870	679,436	791,816	802,696
Males	299,030	360,588	342,901	436,444	433,885
Females	275,697	320,283	336,535	355,372	368,812

Source: Statistics Canada

URL: http://www40.statcan.ca/l01/cst01/health53a-eng.htm

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