INFORMATION AND COMMUNICATIONS TECHNOLOGY AS AN ENABLER OF CHANGE IN THE DELIVERY OF CANCER CARE SERVICES

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INFORMATION AND COMMUNICATIONS TECHNOLOGY AS AN ENABLER OF CHANGE IN THE DELIVERY OF CANCER CARE SERVICES

by

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Dedication

For Dave.

"Don't cry because it's over, smile because it happened."
Dr. Seuss

Acknowledgements

My journey has been a long and challenging one, and many friends and colleagues have encouraged and supported me along the way. I have experienced the joy of new life during my journey and the devastation of loss – life truly is a circle. It is a pleasure to thank each of you who in some way made a difference and made the completion of this thesis possible.

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Abstract

The purpose of this study was to examine the current and potential uses of information and communications technology (ICT) in the provision of cancer care services. Specifically, it reviewed the use of technology in cancer care delivery in Canada, outlined issues related to the diffusion and adoption of ICT in cancer care in Canada, and examined the potential for expanding the use of existing and emerging ICT.

The study used both qualitative and quantitative methods including a Canada wide survey and key informant interviews with health care professionals working in cancer care service delivery across Canada. The results from the interviews and the survey generated a general picture of the use of ICT in cancer care services in Canada:

- a large majority of health care professionals working in cancer care service delivery are currently involved with ICT in some form;
- the ICT systems are used predominantly for educational and clinical purposes;
- videoconferencing is the technology used most often;
- the use of the telephone medical consult is still prominent;
- the most common factors contributing to the uptake of technology were funding, ease of access and user friendliness;
- the most common factors contributing to sustainability were funding, integration into health care program and incentives to participate;
- the most common factors leading institutions to adopt ICT were the presence of a local champion and the actual availability of the service;
- the primary challenge to implementation of ICT is the overall level of resistance to change; and

- the primary lesson learned by those involved in ICT related to the need to have technical support in place in order to deliver a successful service.

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Chapter 1: Introduction

> ...because of their focus on streamlining processes and making more efficient use of human, physical and information resources, health information systems and telehealth can become agents of change for the health system as a whole. They also offer opportunities to renew the focus on the five principles of the *Canada Health Act* - accessibility, universality, comprehensiveness, portability and public administration (Lee, 1997, p. 2).

Health care is one of the world's most information intensive industries (Detmer, 2003; Institute of Medicine, 2001) and information plays a critical role in its operations. The health care industry produces massive amounts of data each day that can help improve clinical practice and outcomes, guide planning and resource allocation, and enhance accountability (Canada Health Infoway and Health Council of Canada, 2006). Unfortunately much of this knowledge remains unused and the gap between knowledge and clinical practice continues to grow. The Institute of Medicine Report (2001) states that "between the health care we have and the health care we could have lies not a just a gap, but a chasm" (p. 1). It further suggests that health information technology is a necessary part of the solution for improving outcomes and reducing costs in health care (Institute of Medicine, 2001). With the rapid growth of health care information and the need to facilitate efficient information sharing, information and communications technology (ICT) has taken on a role as a facilitator in the health sector. ICT not only facilitates knowledge sharing or access to information by professionals and patients but is also a key component of education and training, administration, research, and the delivery of care. This is demonstrated in applications such as telehealth, telelearning, and the electronic health record (EHR).

Perceptions of ICT in the health environment are changing. Once perceived as an

"add on" to traditional practice, ICT is now recognized as an integral component of practice and one that many feel can revolutionize the health system (Canadian Nurses Association, 2009; Advisory Committee on Health Infostructure, 2001). According to the Commission of the European Communities (2009), the health ICT industry has the potential to be the third largest industry in the health sector. The importance of ICT in reforming the Canadian health system has also been noted as a key theme in health-related reports such as the Romanow Report (Commission on the Future of Health Care in Canada, 2002) and the Kirby Report (Standing Committee on Social Affairs, Science and Technology, 2002a). Health Canada reiterates the importance of ICT and states that "eHealth is an essential element of health care renewal: its application to Canada's health care system will result in benefits to Canadians through improvements in system accessibility, quality and efficiency" (Health Canada, 2010, para. 3).

The Canadian health care system has a history of innovation, particularly with respect to addressing the challenge of providing access to services such as health care and professional development for people in rural and remote areas who have limited access to health and education facilities and professionals. ICT has been a key facilitator in this process. For example, eHealth, which is an overarching term used to describe the application of ICT in health care (Health Telematics Unit, 2002b, e-Health, para. 1), encompasses a range of purposes from administration through to health care delivery and is used in a variety of locations from the hospital setting to the home. Within the hospital care setting, eHealth facilitates care through applications such as electronic patient information systems; laboratory and radiology information systems; electronic messaging systems; and telemedicine. Within the home care setting, examples include teleconsults

and remote vital signs monitoring systems. In the primary care setting, eHealth can refer to the use of computer systems by general practitioners and pharmacists for patient management, maintaining medical records and electronic prescribing. eHealth can also facilitate the delivery of health care services to rural and remote areas through the application of telehealth technologies such as e-mail, audioconferencing and videoconferencing.

While the merits and benefits of widespread adoption of ICT are recognized internationally (Organization for Economic Cooperation and Development, n.d.), there are still many geographical, political, demographic, technical and human challenges to the widespread adoption of technology in health care (Health Canada, 2001a; Alvarez, 2002). Over a decade ago Alvarez (2002) noted that "evidence suggests that e-Health is at least 10 years behind other information management intense sectors" (e-Health Challenges, para. 6). While substantial research investments have been made in eHealth over the past decade, the ICT investments in this area still lag behind that of other service sectors (Commission of the European Communities, 2007). In a 2012 KPMG report on global lessons in eHealth implementation (KPMG International, 2012), the authors state that "the case for eHealth has never been more compelling yet its performance globally has never been more mixed" (p. 2). While it may ultimately be seen as lagging behind, the increased pervasiveness and adoption of the Internet in the 1990s caused eHealth, along with many other "e" terms, to garner support (e.g. e-business, e-commerce). Subsequently, it has recently emerged as the new overarching term that represents the broader range of ICT applications in health care delivery, specifically those that integrate technology, the Internet and commerce.

Many governments faced with the need for greater financial austerity and rising health care costs, are taking a closer look at eHealth as a means to address cost savings, better patient outcomes and accessibility (KPMG, 2012). eHealth is slowly gaining momentum in health care and there is little doubt that it has the potential to redefine the healthcare industry (KPMG International, 2012). Unfortunately, the paradox exists that despite this growth there is still insufficient understanding of how and why such interventions do or do not work (Sheppard et al., 2009). In a recent systematic overview of the impact of eHealth (Black et al., 2011), the authors note "empirical evidence for the beneficial impact of most eHealth technologies is often absent or, at best, only modest" (p. 12).

eHealth or ICT in heath care delivery is demonstrated in a variety of clinical settings through the application of telehealth technologies which are often referenced within the specific discipline with the prefix "tele" (e.g. teleradiology, telenephrology, telepsychiatry) to describe the application. A recent telehealth application to garner particular attention is teleoncology, as it is increasingly being used to provide specialized cancer care services to those living in rural and remote locations (Brigden, Minty, Pilatzke, Della Vedova, & Sherrington, 2008). Large urban cancer centres are extending their reach to patients in smaller communities by using this ICT application to deliver a variety of cancer care services e.g. video consultations with patients, specialist support to nurses and other physicians. It has been suggested that the use of teleoncology can increase access to and improve the quality of care, which is particularly important as the incidence of cancer globally is expected to double over the next 20 years and the current disparities in care are likely to increase with the projected shortage of specialists (Hazin &

Qaddoumi, 2010). Hesse, Hanna, Massett & Hesse (2010) suggest that the application of IT to improve the effectiveness of medical care is especially important in cancer care as estimates suggest that applying what is already known can reduce mortality by 50% over time. They caution that to do this and provide a way for this knowledge to be readily available to clinicians will require commitment to developing an IT foundation that can link the health information systems and thereby enable improved medical communication.

There is a lack of research on the existing state of ICT use in cancer care. A solid understanding of the use of technology within the current environment is a necessity if we are to develop an evidence-base for the practice to grow. According to Mohr (2008), searching the literature for 'teleoncology' or 'telemedicine in oncology' has yielded scarce results over the last 15 years. There are opportunities for additional research in this expanding area of medicine, especially in relation to Canada's unique geography and health care system organization (Brigden et al., 2008).

In January 2005, the Newfoundland and Labrador Teleoncology Program was established to address some of the issues concerning the delivery of specialist oncology services in rural Newfoundland and Labrador. This program suggested that the provision of cancer care and cancer education could be enhanced across the country with an increased focus on the skilled use of ICT (House, Dwyer & Pippy, 2004; Health Research Unit, 2007). This thesis draws on the findings of the Newfoundland and Labrador Teleoncology program and will study the current and potential uses of ICT in the provision of cancer care services. As a pan-Canadian study, it is the first of its kind and the results will help define: (1) the *current* state of technology use in cancer care delivery across the country, (2) the *potential* use of the technology in cancer care delivery, and (3)

the *facilitators* of and *challenges* to the uptake of technology in cancer care delivery. The study is funded by the Lawson Foundation of Canada. Refer to Appendix A for the project's Advisory Committee members.

1.1 Theoretical Framework

Leading change has become one of the core abilities for health care professionals today. However, getting a new idea adopted and implemented, even when it has obvious advantages, is often a difficult and challenging task. Kohn (2007) reports that "Healthcare is an area in which change is characteristically slow. It has been estimated that new treatments or knowledge percolates into common use over a period of 15 years" (p. 2).

Because healthcare has been traditionally slow to embrace innovations (Weinstein et al., 2007), there remain many challenges to encouraging the adoption of innovation in health care. Some suggest that there is a clear problem with the adoption of IT in health care and despite the positive aspects of its application in health, the challenges are formidable (Moores, 2012). According to Moore and Benbasat (1991) innovations diffuse because of the cumulative decisions of individuals to adopt them – it is the perception of *using* the innovation that is key to whether the innovation diffuses not the perception of the innovation itself. Research on the diffusion and adoption of innovations suggests that a number of factors influence the process. In healthcare specifically, "the adoption of a new clinical behaviour by a clinician and healthcare system is a consequence of multiple factors, with research evidence being only one" (Sanson-Fisher, 2004, p. 1). For example, Tamblyn, McLeod, Hanley, Girard, & Hurley (2003) note that the willingness to use new drugs is influenced by the physician's sex, specialty, medical

school, years since graduation, practice location and practice volume, and the relative proportion of elderly patients in the physician's practice.

For the most part, the process of effecting practice change in organizations can be broken down into several stages. The number of stages and the terminology used by different writers and researchers may vary, but most researchers identify three broad phases to the change process (Lewin, 1951; Kanter, 1983; Fullan, 2001; Simpson, 2002). Phase 1 is generally viewed as the *initiation phase* which consists of the processes that lead up to and include the decision to proceed with the innovation. Phase 2 is the *implementation phase* which involves the process of putting a change or innovation into action. Phase 3 is the *institutionalization phase* and refers to whether the innovation or change is integrated as an ongoing part of the system or disappears from use altogether.

These same experts also agree that the number and complexity of the factors that interact in the change process make generating a prescribed roadmap for change processes next to impossible. Many researchers suggest that the uniqueness of the individual setting is the critical factor – what works in one situation may or may not work in another. This is not to say that we cannot learn from studying change and innovation in these locations. However, lessons from these cases should be used less as a blueprint for application and more as a set of guidelines for helping practitioners and planners make sense of initiating, implementing and monitoring change and innovation (Lewin, 1951; Kanter, 1983; Fullan, 2001; Simpson, 2002).

The increasing interest in end users' reactions to IT has increased the importance of theories that explain health IT acceptance and use (Holden & Karsh, 2010). IT acceptance research has spurred the development of many models, each with a different

set of acceptance determinants (Venkatesh, Morris, Davis & Davis, 2003). Three of the more prevalent models include: technology acceptance model (TAM) (Davis, 1989; Venkatesh & Davis, 2000); theory of planned behaviour model (TPB) (Ajzen, 1991); and diffusion of innovations model (Rogers, 1995).

According to Davis and Venkatesh (1996), TAM was developed in the 1980s to understand the linkage between external variables and their influence on the user's acceptance and actual use. TAM is a derivative of the theory of reasoned action (TRA) model which is a well established intention based theory. TAM suggests that the intention to use is the single best predictor of actual usage (i.e. acceptance). Intention is influenced by one's attitude towards using, which in turn is determined by perceived usefulness and perceived ease of use (Holden & Karsh, 2010). TAM has gone through numerous changes and has resulted in three main descendents – an enhanced version or TAM2, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Theory of Planned Behaviour (TPB). Overall, TAM has proven to be one of the most effective models for predicting user acceptance and usage behaviour (Davis & Venkatesh, 1996).

The TPB model is also a derivative of the TRA model and espouses the belief-intention-behaviour thread (Azjen, 1991). It focuses on attitudinal beliefs whereas TAM is focused on cognitive influences (Chau & Hu, 2002). A central factor in this theory is an individual's intention to perform a behaviour and it suggests that intention is predicted by attitude, subjective norms and perceived behavioural control (Ajzen, 1991). The stronger the intention to engage, the more likely it will occur. It is important to note that this only happens when a person can decide at will to perform or not perform the

behaviour, so it does have limitations in settings where the behaviour is dictated by the organization.

The study of innovation diffusion spans across multiple disciplines, with contributions from sociologists, economists, IT researchers and many others (Rogers, 1995). No single theory of innovation exists, but in his seminal work *Diffusion of Innovations*, Rogers (1995) has developed one of the better known theoretical approaches to diffusion of innovations. Innovation is defined as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p.11). Diffusion is the process by which an innovation is communicated through certain channels over time and among the members of a social system (Rogers & Scott, 1997) and adoption is defined as "the decision to make full use of the innovation as the best course of action available" (Rogers, 1995, p. 21). The model is quite extensive and involves a number of stages and processes.

Rogers suggests that there are four key elements in the spread or diffusion of a new idea: the aspects of the innovation; the communication channels by which it is spread; the time and steps in decision making; and the social context/system. The diffusion of an innovation occurs through a five step process: (1) knowledge stage– the individual has been exposed to the innovation but lacks knowledge about it; (2) persuasion stage – the individual is interested and seeks information; (3) decision stage - the individual makes a decision about adopting the innovation; (4) implementation stage – the individual employs the innovation and determines its usefulness; and (5) confirmation stage – the individual finalizes their decision to continue to use the innovation. Finally, Roger defines several characteristics of innovations that influence an individual's

decision to adopt or reject an innovation. These characteristics are discussed later in this section.

There were some limitations in the use of each of these aforementioned models that ultimately influenced the selection of Rogers' diffusion of innovation model as the conceptual framework for this study. While TAM is considered well respected in the information systems field, little research has been conducted in the health care context (Melas, Zampetakis, Dimopoulou,& Moustakis, 2011). Chrismar & Wiley-Patton (2006) made two important observations in this regard: (1) TAM has been applied and tested in academic and corporate settings but few have evaluated it in the healthcare environment, and (2) the enhanced TAM has been limited in its evaluation in healthcare and where it has been evaluated, it has been shown to only be partially applicable in the professional context of physicians. In Holden and Karsh's (2010) review of studies that considered TAM's application to health care, they suggested that while TAM has fared better in recent tests and does predict a substantial portion of the use or acceptance of health IT, the theory may benefit from several additions and modifications. They also suggested that "if used in its generic form, TAM may not capture – or indeed may contradict – some of the unique contextual features of computerized health care delivery" (Holden & Karsh, 2010, p.1).

Chau & Hu (2001) looked at the applicability of models such as TAM and TPB in the healthcare setting and concluded that TAM may be slightly more appropriate than TPB in the health setting. However, they highlighted several limitations in using either of these models to explain or predict technology acceptance by individual professionals, in particular physicians' acceptance of telemedicine technology.

Rogers' theoretical framework is helpful when examining the adoption rate of specific clinical behaviours, such as the use of ICT in oncology, and when deciding which aspects of change management will require additional effort if widespread diffusion is to occur (Sanson-Fisher, 2004). While there are various components of this model (e.g. diffusion pattern, innovation characteristics, adopter characteristics, adoption decision stages and change agents) this research will focus on innovation and specifically consider the characteristics of the innovations possess, which in turn, determine the ultimate rate of adoption of the innovation.

Rogers (1995) suggests that while all technologies potentially solve one problem they ultimately create another (i.e. they offer the potential to reduce uncertainty but increase uncertainty in other fields because of their unintended consequences). For technological innovation, the innovation decision process is mostly about information seeking, allowing individuals to reduce uncertainty about the advantages and disadvantages of the innovation (Greenhalgh, Robert, Bate, Macfarlane & Kyriakidou, 2008). Rogers identifies some of the prominent features of the adoption of ICT innovations: (1) regular and repeated use is necessary to strengthen the adoption decision; (2) a critical mass of adopters is necessary to convince the majority of others of the usefulness of the technology; and (3) adoption often requires an element of reinvention (Rogers, 1995; Greenhalgh et al., 2008).

According to Rogers (1995) there are five attributes of a new or substitute clinical behaviour that will each partly contribute to whether or not adoption of a new activity is likely to occur: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability. Generally, innovations that possess these characteristics tend to be

more attractive and easier to adopt, and therefore diffuse more rapidly than those with less favourable characterisitces. While Rogers warned this is not an exhaustive list and others agree with this limitation, these attributes remain the starting point for many studies of innovation characteristics and adoption (Greenhalgh et al., 2008).

Rogers (1993) defines "relative advantage" as the degree to which an innovation is perceived as better than the idea it supersedes (p. 15). A key point for consideration here is that "decisions about implementing best-evidence practice are driven not only by patient welfare but also by the interplay between the interests of the patient, the clinician and the healthcare system" (Sanson-Fisher, 2004, p. 2). For example, notes Sanson-Fisher, if a proposed change alters the balance of power between or within professional groups in a "negative" way, the innovation may not be implemented. Conversely, if the recommended behaviour increases the status of adopting physicians - the innovation may be readily adopted.

"Compatibility" is a measure of the degree to which an innovation is perceived as being compatible with existing values, past experiences, and the needs of potential adopters (Rogers, 1995, p. 15). To increase the probability of adoption, the innovation must address an issue that physicians or others perceive to be a problem. For example, a new procedure that enables early detection of a life-threatening illness is likely to be adopted. Early screening tests are compatible with medical beliefs that early detection of disease is beneficial. Consequently, tests and procedures that appear to offer this capacity are more likely to be adopted. Real-life examples include the rapid adoption of mammography screening and testing for prostate cancer, despite considerable debate about their effectiveness (Sanson-Fisher, 2004).

"Complexity" is a measure of the degree to which an innovation is perceived as difficult to understand and use (Rogers, 1995, p. 16). A clinical procedure is more likely to be adopted if it is simple and well defined. For example, the initial response to electronic health records was guarded, as medical professionals felt it was too complex in terms of having the ability to ensure privacy and confidentiality for both patients and health care providers.

Rogers (1995) defines "trialability" as the degree to which the innovation may be trialled and modified (p. 16). The ability to test, in a research setting, a potential medical intervention on a limited basis, allows physicians to assess the implementation of the procedure, its acceptability to patients, and the potential outcomes.

"Observability" is the degree to which the results of the innovation are visible to others (Rogers, 1995, p. 16). "Visibility" of an innovation stimulates peer discussion, as colleagues of a physician adopting a new procedure often request information about it. Sanson-Fisher (2004) reports that in surgery, new techniques are often adopted very quickly, especially if there are perceived disadvantages in being "left behind" if one does not adopt.

The literature on the adoption process for innovations in healthcare is extremely sparse (Greenhalgh et al., 2008) but diffusion theory (Rogers, 1995) does offer a plausible explanation for why some clinical activities are adopted rapidly and others only with difficulty, despite strong evidence of their potential benefits. Sanson-Fisher (2004) concur that this theoretical framework is helpful when looking at the adoption of clinical behaviours and their resulting diffusion and Helitzer, Heath, Maltrud, Sullivan and Alverson (2003) also support the notion that this theory can assist in understanding the

diffusion of telemedicine. The diffusion theory suggests that the key to understanding the process of adoption of an innovation is studying the social system, specifically the individuals, groups and organizations that are part of the system. It is well established that the degree of similarity among group members affects the ease and spread of the diffusion of innovation. For example as clinicians are a rather similar group, innovations generated within a particular community of clinicians (e.g.oncology) will diffuse more effectively than those coming from outside (Greenhalgh et al., 2008).

Despite telemedicine and telehealth being available for a number of years, they are still at the early stage of adoption. In order to understand the speed and success of the adoption of ICT, and its potential barriers, it is important to study both the individuals who are potential users and those who control the resources, as they ultimately will likely control the adoption process. This research seeks to develop a better understanding of how we can encourage the uptake of technology and ultimately integrate it into the "normal practice" of clinicians. It therefore considers the assumptions and characteristics of the diffusion theory as they apply to the innovation characteristics and the adoption process of ICT in the cancer care environment.

1.2 Research Questions

This study examines the current and potential uses of ICT in the provision of cancer care services. Specifically, it documents the use of technology in cancer care delivery in Canada, outlines issues in the diffusion and adoption of ICT in cancer care in Canada, and examines the potential for expanding the use of existing and emerging ICT.

The research questions addressed in the study are:

1) What types of ICT are currently being used in the delivery of cancer services in Canada?
2) To what extent are these various technologies being used?
3) What factors led cancer care institutions to adopt various ICT?
4) What are the major challenges to the use of ICT in cancer care?
5) What are the best practices and lessons learned from the adoption of ICT in cancer care?

The following chapter provides a review of the literature as it pertains to the use of information and communications technology (ICT) in health care and more specifically in cancer care services. While there is significant material on the role of ICT in health care, there is limited literature on the impact that ICT has had in the delivery of cancer care services. It is anticipated that this research will make a contribution to the literature in this area and more specifically to the state of ICT use in cancer care services in Canada and its ability to be an enabler of change.

Chapter 2: Literature Review

The initial literature search was built on the following concepts that were to be present in retrieved references as they were perceived as being key to the research questions: information technology (IT); information and communications technology (ICT); telemedicine; telehealth; teleoncology; oncology; cancer care and models of change. Building on this, search terms were developed using what were considered to be the richest sources of data for this review: MEDLINE, CINAHL and EMBASE. Several other terms and combinations were used but a comparison of results indicated that the searches noted below were exhaustive. Use was also made of the Related Articles feature in PubMed to ensure that all relevant citations were retrieved. The grey literature was also searched for these terms (see Table 1).

Table 1

Data Sources and Search Terms Used in Literature Search

Data Source	Search Terms	
MEDLINE (PubMed)	#1	telemedicine [MeSH]
	#2	delivery of health care [MeSH]
	#3	neoplasms [MeSH]
	#4	#1 AND #2 AND #3
	#5	#4 OR teleoncology (kw)
	#1	Attitude to Computers [MeSH]
	#2	Models, Theoretical [MeSH]
	#3	#1 AND #2
	#4	Internet OR technology OR computers
	#5	Patient Acceptance of Health Care [MeSH]
	#6	#3 AND #4 AND #5
	#7	"change models" OR "models of change"
	#8	#4 AND #7
	#9	"technology acceptance model"
CINAHL	#1	MM telehealth+
	#2	MM Cancer Patients
	#3	MM Oncologic Care
	#4	#2 OR #3
	#5	#1 AND #4
	#6	teleoncology (kw)
	#7	#5 OR #6
EMBASE	#1	Telehealth [Emtree]
	#2	Oncology [Emtree]
	#3	#1 AND #2
	#4	teleoncology (kw)
	#5	#3 OR #4

The literature review is divided into three main sections: (1) definitions of current terms used in the health information and communication technology (ICT) field; (2) the use of ICT in health care delivery; and (3) the role of telehealth in current health care delivery models. In the first section, the various terms that are common to health ICT are defined. The second section examines the evidence in support of ICT use and the barriers to its use in health care delivery. The third section provides a detailed description of telehealth by focussing on its history and its current status in Canada; the telehealth

policy environment and its related challenges; the challenges associated with the integration of telehealth into health care delivery; and the importance of integrating telehealth with the Electronic Health Record (EHR). This section also focuses on the specific area of cancer care and considers the various applications of ICT such as teleoncology and use of the EHR in oncology.

2.1 Definitions of Current Terms

The language of health Information and Communications Technology (ICT) has been evolving and many of the terms have significant variability in scope and focus. While the definitions vary slightly, the distinguishing feature amongst them all is the reliance on ICT to facilitate interaction among individuals involved in the process of health care delivery. It is important to note that these are relatively new terms in the health care literature and at this time there appears to be no single agreed upon definition. In fact, terms such as telemedicine, telehealth and eHealth are sometimes used interchangeably to describe the practice of health care at a distance. While the author recognizes the growing acceptance of the term "eHealth" as the overarching term, for the purposes of this thesis, the term ICT is predominantly used as it was the term originally used in the participant survey and key informant interviews. The definitions provided below capture how health infostructure, telemedicine, telehealth, eHealth and teleoncology will be defined for the purposes of this study.

2.1.1 Health infostructure. Health infostructure is defined as "the development/adoption of modern systems of information and communications technologies (ICTs) within the overall Canadian health information infrastructure"

(Health Canada, n.d.-a, para. 4). ICT is used to develop applications such as electronic health records, telehealth and Internet based health information (Health Canada, n.d.-b).

2.1.2 Telemedicine. The earliest attempts to define telemedicine occurred in the 1970s and at that time initiatives were focussed on the delivery of medical care as the only function of telemedicine (Bashshur, Reardon & Shannon, 2000). As telemedicine applications grew in that decade, so did new terms which embraced the broader application of technology in health care e.g. telehealth. Telemedicine, however, continued to be defined in narrower terms such as the definition provided by Brown (2002) - "the direct provision of clinical care via telecommunications - diagnosing, treating or following up with a patient at a distance" (Telemedicine or Telehealth section, para. 1). According to the Health Telematics Unit at the University of Calgary (2002b), the term telemedicine "generally implies a physician mediated interaction with patients" (glossary - telemedicine). It should be noted that in some European countries, telemedicine is also referred to as telematics (Bashshur et al., 2000). Both Bashshur et al. (2000) and Brown (2002) agree that telemedicine should be subsumed under the more broadly defined concept of telehealth.

2.1.3 Telehealth. As noted above, towards the end of the 1970s, new definitions reflected the fact that telemedicine was evolving. While telehealth initially described more of the educational and administrative applications of telemedicine, it is now "generally used as an umbrella term to describe all the possible variations of healthcare services using telecommunications" (Telemedicine or Telehealth section, para. 1). The Canadian Society of Telehealth expanded the definition slightly to include distance delivery and define telehealth as "the use of information and communication

technology (ICT) to deliver health services, and transmit health information over both long and short distances (Canadian Society of Telehealth, n.d., about telehealth, para. 1).

2.1.4 eHealth. eHealth is a relatively new term that first appeared in the research literature in 2000 (Pagliari et al, 2005). It was "first introduced as a term that distinguished web-based telehealth activities from the use of videoconferencing. It is now gaining popularity as an over-arching term for the use of information and communications technology in health care" (Health Telematics Unit, 2002b, Glossary - eHealth). Many definitions of eHealth incorporate telemedicine – some as part of a range of applications and others as a synonymous term. As Pagliari et al. (2005) state, "While telemedicine is certainly a theme in the eHealth literature, and the ICTs used in this area are common to many eHealth functions, it clearly represents only one domain of the broader field" (Disussion, para. 4). The Canadian Society of Telehealth suggest eHealth be defined more broadly as "Telehealth plus Health Informatics…practices that are directed towards delivering health care, wellness information, and health education and training services (Telehealth), plus health information, statistics and data (Health Informatics)" (Canadian Society for Telehealth, n.d., about telehealth, para. 3).

2.1.5 Teleoncology. 'Teleoncology' or 'telemedicine in oncology' has not appeared in the literature frequently and when it does it is often part of other disciplines such as telemedicine in pathology, in surgery, and in internal medicine (Mohr, 2008, p.255). Doolittle and Allen (1997) suggest it was alluded to for the first time in 1990 in a paper that looked at the role of video in addressing the psychosocial problems of cancer patients (p. 67). Despite not appearing in the literature very often, teleloncology has been specifically defined by some researchers. Doolittle and Allen (1997) define teleoncology

as "the delivery of clinical oncology services from a distance; often using an interactive video telecommunication system" (p. 63) and Weinstein et al. (2007) refer to teleoncology as "the use of telehealth technology in the delivery of cancer care, including diagnosis, consultation, pathology, surgery, treatment planning, supportive care, and follow-up services" (p. 72).

2.2 Use of ICTs in Health Care Delivery

Despite the fact that ICT has transformed business processes around the developed world, the health care system has been slow to embrace the revolution that has been transforming nearly every other aspect of society. However, this is changing. ICT is starting to be viewed as "a cornerstone of efficient and effective services...use of ICT within the sector continues to grow and the Internet in particular is driving significant change" (Dezenowagis, 2009, p. 10).

Several ICT applications remain underused by health care professionals, and organizations (particularly physician practices) lag behind in the adoption of these technologies (Gagnon et al., 2012). Health care services are delivered across a broad continuum, and the use of ICT in some areas is quite extensive and in others areas it is still at an emerging stage. For example, according to Canada Health Infoway (2010) Canada demonstrates a low level of ICT use for general practitioners and specialists in community practice settings as well as in some areas of public health, mental health and long–term care, yet in some specific facilities in these sub–sectors there are heavy users of ICT. On the other hand, there are areas that have significant levels of ICT adoption such as hospitals, laboratories, digital imaging, pharmacies and home care. From a global perspective, "Canada is at the forefront in the use of some telehealth technologies and

service programs, and is on par with most western countries in the use of others" (p. 20).

ICT has gained a foothold in routine clinical functions both within Canada and abroad (e.g. billing, scheduling, medication administration, documentation, physician order entry, patient education, and communication among health-care providers). However, there has been a reluctance to broaden the applications (e.g. to areas such as remote consultations, in home monitoring, remote mentoring, and integrating multi-site delivery systems). There appear to be two main factors that have impeded integration of the more innovative uses of ICT in the clinical areas: lack of evidence on benefits to be achieved, and barriers to adoption arising from the health care system. Each is discussed below.

2.2.1 Benefits of ICT in health care delivery. According to the Organization for Economic Co-operation and Development (OECD), there is no lack of agreement on the benefits that may result from the adoption of ICT in the health sector as "health ICTs are increasingly seen as part of an inevitable process of modernisation of the health care system and eHealth as the cost of doing business in the 21st century health care" (OECD, n.d., para. 1). In recent years the use of ICT in health care has grown dramatically and the positive impact on effectiveness and efficiency is beginning to be acknowledged (Canadian Nurses Association, 2009). Gagnon et al. (2012) in their systematic review note that the perception of the benefits of the innovation was the most frequent adoption factor highlighted in the studies reviewed and the successful cases of ICT adoption were characterized by an understanding of the benefit of the innovation by its users.

ICT is being recognized as a means to improve the performance of the health system by reducing redundant and unnecessary tests; reducing medical errors; improving

clinical decision making; and improving access to information for patients so they can better navigate the system and make choices about their care (Bashshur & Shannon, 2009; Canadian Nurses Association, 2009). Others have suggested that in times of budget cutbacks, telehealth in particular can become part of the solution in terms of providing effective, cost efficient health care. For example, Borsellino (2002) claims that telehealth may be the only way to improve services with the competing demand on existing resources. Telehealth's ability to provide an integrative function is recognized by Bashshur et al. (2000) who suggest that one of the most unique and significant attributes of telehealth technology is its integrative capacity in establishing networks and in building partnerships.

The Institute of Medicine (2001) suggests that although the potential benefits of ICT are compelling, the strength of the evidence on the effects of various IT applications is variable. It notes that: (a) many applications are still in the early developmental stages (e.g. surgical simulation for teaching and virtual surgery); (b) some applications show promise but their adoption and testing are limited because of the lack of computerized patient information, regulatory or legal impediments and payment issues; and (c) other applications have not been rigorously evaluated (Institute of Medicine, 2001). Thus, while benefits may have been recognized, rigorous research evidence supporting ICT is lacking and barriers to its implementation remain (Bashshur & Shannon, 2009). Ekeland, Bowes and Flottorp (2012) also support this and note in their recent systematic review of telemedicine reviews, that larger and more rigorous studies are crucial for the production of evidence of effectiveness of telemedicine.

2.2.2 Barriers to adoption of ICT in health care. According to Bashshur and Shannon (2009) the diffusion of programs that rely on ICT in health care delivery has been selective and slow. Despite Canada's health system reaping some clear benefits from using ICT, it is estimated that technology adoption in health care has lagged behind other sectors by as much as 25-30 years (CBC News, 2007). "eHealth is more than a technological initiative; it also requires a major paradigm shift in healthcare delivery, practice and thinking" (Wickramasinghe, Geisler, Schaffer, 2006, p. 320).

While there are numerous barriers to the use of ICT in clinical practice, the Institute of Medicine (2001) highlights four in particular. First, there are privacy and standards concerns. They are interrelated and pertain to the absence of policies regarding privacy and confidentiality and the lack of standards for coding information. The second barrier is the significant financial requirement for purchasing and installing hardware and software and the costs associated with training end users how to use the new technology. Third, many of the current legacy information systems are challenged to work with new systems so there is likely to be a significant cost related to the integration of ICT into existing health care delivery sites. Barriers also arise from disruption in service and care that occur as systems are changed over and people learn new skills. Finally, there are human factors related to the application of ICT in health care. Among health care workers, ICT knowledge and skills levels, and receptivity to learning new skills, varies significantly. According to Ward, Stevens, Brentnall, & Briddon (2008) in their review of the literature relating to health care staff attitudes toward information technology (IT), attitudes of practitioners are a significant factor in the acceptance and efficiency of use of IT in practice and that education and training is a key factor for encouraging this use.

ICT adoption in health care organizations is multi faceted because of the involvement of so many stakeholders. Resistance by any user group can create a barrier and impact the overall adoption rate. For example, until recently, patients' perceptions of barriers and facilitators to health care had received little attention despite the fact that it would provide essential information for decision makers. For patients, ICT facilitates increased accessibility to information and a subsequently improved ability to make informed choices about health care. But, there are also patients who are not comfortable with technology in general and are uncomfortable with its increased use in their care, and patients who simply do not have access to technology and therefore remain dependent on traditional methods of communication and information exchange with their health providers.

2.3 The Role of Telehealth in Health Care Delivery

Many recent reports on health care reform have reinforced the perception that Canada's healthcare system is not sustainable in its present form (Canadian Health Services Research Foundation, 2007; Committee on the Future of Healthcare reform, 2002; Lee, 2007; Skinner & Rovere, 2009). Every Canadian province is challenged by the need to reduce health care expenditures without jeopardizing access to or quality of care (Leatt, Pink & Guerriere, 2000).

Shortell, Gillies & Anderson (1994) and Mercer (2001) suggest that the problems with the current health system and the new economics of managed care are driving the development of new health service models referred to as *integrated or organized* delivery systems. Integrated health systems are seen as part of the solution to the challenge of sustainability, as such integrated systems are seen to provide superior performance in

terms of quality and safety (Leatt et al., 2000). Leatt et al. (2000) note that while Canada does not currently have integrated health care, the provinces are experimenting with different organizational structures and processes with the aim of improving service coordination and collaboration among providers.

For many provinces, the development of regional health authorities in the 1990s was a way to transfer the responsibility for health policy implementation and resource allocation and control to the regions. Leatt et al. (2000) suggest that while regionalization may have reduced some problems, there is little evidence that it resulted in improvements in patient care processes. Others suggest that in spite of the numerous attempts at developing regional programs, there remain persistent issues related to determination of the constituent parts, the organizational structure, the operational system, and the boundaries of the planning regions that have not been adequately addressed (Bashshur et al., 2000). Armitage, G., Suter, E., Oelke, N. & Adair, C. (2009) suggest that despite the available literature on integration, it remains a challenge to find comprehensive, easily accessible and evidence based information.

In order to achieve integrated health care delivery, the current models of health care delivery will have to change dramatically and the sharing of information and the exploitation of technology are strategies that will have to be embraced (Leat et al., 2000). One way of exploiting technology to address the issue of integrated health care is through the implementation of telehealth networks, which some suggest offer opportunities to address service delivery issues and the challenge of containing costs, providing quality patient care and providing equitable access (Bashshur et al., 2000; Bashshur & Shannon, 2009). Mercer (2001) notes that new technologies involving connectivity projects and

telehealth applications are changing the way organizations have traditionally approached service delivery. He suggests the health system is becoming redefined in terms of "virtual" teams and that there is a shift from a focus on structure to a focus on relationships between healthcare providers and patients.

While telehealth may provide an opportunity to rethink how health care is delivered (as it has the potential to create virtual teams and regions), from an organizational perspective, it challenges the traditional notions of regionalized health care systems (Bashshur et al., 2000). Bashshur et al. (2000) warn that we should not only consider the extent of the virtual medical care region but also the interface between the virtual region and the traditional distribution of health resources. They suggest that "although virtual telemedicine regions can ignore or transcend the realities of traditional geographic boundaries, political boundaries still impose formidable barriers in terms of interstate licensure, legal liability, and other administrative regulations" (Bashshur et al., 2000, p. 619).

2.3.1 History of telehealth in Canada. Much of the activity around telehealth in the past 30 years involved short-term pilot projects with limited funding that tested the use of telecommunications technology and the provision of medical services remotely. A significant stimulus in the early 1970s was the Canadian Space Program at the Federal Department of Communications that funded programs initially in western Ontario and in Newfoundland. Newfoundland continued with the telemedicine program once it completed its pilot phase. However, in the 1990s there was a resurgence in the popularity of telemedicine/telehealth as government began to examine how telehealth services could be integrated into the Canadian health care environment. This increased interest grew out

of the need (1) to help keep health care costs down; (2) to address the national physician shortage and excessive workload issues; and (3) to improve accessibility and quality of care for patients living in underserviced areas. Subsequently, factors such as "increasing technological capacity, increased federal funding for telehealth projects, recognition of the ability of videoconferencing to deliver professional education to health professionals and reduce the isolation of health professionals in remote areas, and the perceived need to deliver specialty services to rural and remote communities" led to the increased use of telehealth across the country (Health Canada, 2003a, ¶15).

Most recently, the emphasis on telehealth as a component of health reform was reinforced in both the report from the Commission on the Future of Health Care in Canada (2002), (Romanow Report), and the report from the Standing Committee on Social Affairs, Science and Technology (2002a) (the Kirby Report). Both reports identified telehealth as a mechanism to improve health care in rural and remote regions of the country and subsequently opened a window of opportunity to move telehealth higher on the political agenda. The Romanow Report specifically recommended a Rural and Remote Access Fund that would support: (a) new approaches for delivering health care services; (b) the expansion of telehealth to improve access to health care services and information; and (c) the use of telehealth technology to support the retention of health care providers in rural and remote communities (Commission on the Future of Health Care in Canada, 2002). The Kirby Report suggested that telehealth applications be used to implement a health infrastructure that would foster the sharing of information through mechanisms such as the EHR and that would ultimately provide the base for vertical and

horizontal integration of services (Standing Committee on Social Affairs, Science and Technology, 2002a).

Although telehealth has been practiced in Canada for over 25 years, the formal structures around telehealth only began in 1994 with the Information Highway Advisory Council (IHAC). Since that time, government institutions have played a significant role in advancing the development of a health infostructure in this country and in identifying a number of priorities in its development, including telehealth.

Table 2 provides an overview of the history of health infostructure and telehealth development in Canada. Currently, the Health and Information Highway Division (HIH) of Health Canada is the primary source of policy and expertise regarding the implementation of eHealth (including telehealth) in Canada. Its work also includes research and disseminating information and knowledge about eHealth to stakeholders across Canada and abroad.

Table 2
Overview of Health Infostructure and Telehealth Development in Canada (Health Canada, 2007)

Year	Development
1994	The formal structures around telehealth began with the Information Highway Advisory Council (IHAC) whose mandate was to investigate how the information highway could be developed and used in a wide variety of areas.
1995	IHAC issued a report that recommended that an advisory council be established to identify new information technology applications within the health sector.
1997	CANARIE and the Advisory Council on Health Infostructure were established and confirmed the advantages of setting up a nationwide health information highway, particularly with respect to improving quality, accessibility, and efficiency of health services. Health Canada established the Office of Health and the Information Highway (OHIH) as the central point for the use of ICT in the health sector and based its national structure for telehealth within OHIH.
1998	Health Canada hosted the Federal/Provincial/Territorial (F/P/T) Chief Information Officers' Forum to discuss barriers to the application of information management and information technology to the health sector. This evolved into the Advisory Committee on Health Infostructure(ACHI).
2002	The F/P/T Deputy Ministers of Health created the Advisory Committee on Information and Emerging Technologies (ACIET) to carry on the work of ACHI. Its mandate was to provide policy development and strategic advice on health information issues and on the effectiveness, appropriateness and utilization of emerging health products and technologies to the Conference of F/P/T Deputy Ministers of Health. The federal government also created Canada Health Infoway Inc. to accelerate the development and adoption of modern systems of information technology such as the EHR and more recently telehealth.
2004	Infoway approved a Telehealth Strategy with goals: to increase the coverage of telehealth in aboriginal, official language minority, northern, remote and rural communities; to increase the clinical utilization and sustainability of existing telehealth networks; to increase the integration of telemedicine activities into mainstream health care service delivery; and to increase the crucial telehealth link to EHRs. The former OHIH was reorganized and the Privacy Policy Division moved to Health Canada's Health Policy Branch and the remainder moved to Health Canada's Corporate Services Branch (also known as the Health and the Information Highway Section - HIH).

2.3.2 Current status of telehealth. The health care industry has traditionally been slow to embrace innovations and the use of telehealth as a means to address specific health care issues has been no exception (Weinstein, Lopez, Barker, Krupinski, Descour, Scott, Richter, Beinar, Holcomb, Bartels, McNeely & Bhattacharyya, 2007). Nonetheless, the delivery of health care services via telehealth appears to be making rapid advancements in all Canadian provinces and territories and many telehealth initiatives are currently underway (Canada Health Infoway, 2011). According to the Canadian Society of Telehealth (2007), telehealth in Canada has significantly advanced over the past twenty years and the success of early demonstration projects has provided a good appreciation for telehealth and has subsequently contributed to considerable investments by the federal and provincial governments. Almost all federal, provincial and territorial governments across Canada have a strategic information systems initiative and all provinces and territories now have provincial telehealth initiatives (Health Canada, 2001b; Canadian Society of Telehealth, 2007; Canada Health Infoway, 2012).

According to a recent study commissioned by Canada Health Infoway on the benefits and adoption of telehealth in Canada (Canada Health Infoway, 2011), there are a diverse set of clinicians using a variety of telehealth programs throughout the country. Some provinces have consolidated telehealth into a centralized provincial program (e.g. Ontario and Manitoba) while others leave the program to regional discretion with little centralized coordination. Some programs (e.g. Alberta, Manitoba, Ontario) have focussed specifically on process infrastructures such as scheduling, governance, operating procedures, clinical guidelines. Nationally, there have been substantial efforts between

Health Canada's First Nations and Inuit Health Branch working with First Nations to deploy telehealth services in a fully integrated fashion with provinces.

The recent growth of telehealth applications can be attributed to factors such as the availability of more cost effective digital computing and communications and the fact that telehealth is now seen as having high face validity (i.e. it is perceived, at least on the surface, as an appropriate way to address access and delivery issues) (Wooton, 2006; Lehoux, Battista & Lance, 2000). Despite the increase in activity and the fact that several telehealth networks have been implemented over the last two decades, some still caution that the networks have had relatively little success (Noorani & Picot, 2001) and the diffusion of this technology in the health care system is still very limited (Gagnon et al., 2005).

2.3.3 Telehealth policy development. A significant challenge facing those involved in telehealth is to ensure that policy makers not only understand that telehealth can be part of a solution but that policies supporting telehealth can no longer lag behind the technology. According to Bashshur et al. (2000) there has been significant research focused on determining technology capabilities, user acceptance and telemedicine costs but the research has not provided the evidence necessary for program strategies and overall health policy (p. 622). From an operational perspective, each province has its own idea of what telehealth encompasses, based on its unique set of political, economic and geographic factors. These interprovincial differences in practice, combined with the lack of strategic documents, have hindered telehealth policy development within the national context. Since the late 1990s, telehealth has become an agenda item for many levels of government and as such, a focus for public policy intervention. Nonetheless,

specific policies to enable telehealth are still not in place (Health Canada, 2001b, Tactical Plan, para. 13; Jennet et al., 2003). Scott et al. (2004) notes that few eHealth policy related documents or publications exist and those that do warn of the urgent need to address the issue. In placing Canada's policy agenda in an international context, Jennett et al. (2003) note that "the vast majority of the world's 234 populated countries have no telehealth policy...and since policy is meant to guide, this telehealth policy void is a concern that must be addressed in an urgent manner" (p. 18). Some have even suggested that this lack of policy is currently impeding the ability to realize telehealth's goals in terms of increasing access and addressing issues of equity (Jennett et al., 2003).

The specific issues related to telehealth that require policy guidance fall under four main themes: (1) *organizational* issues such as organizational readiness, resources, legalities, regulations, policies and business plans; (2) *human resource* issues such as telehealth specific policies, licensure, liability, malpractice, remuneration, changes to practice norms, and cross-jurisdictional human resource issues; (3) *technology and equipment* such as standards, safety, security, maintenance, interoperability, and interactive, integrated and supportive systems; and (4) *clinical standards and outcomes* such as accountability, standards, ethics, best practices, confidentiality, information security, equity, accessibility, efficiency and effectiveness (NIFTE, 2003a, p. 18-19; Health Canada, 2001b, Tactical Plan, para. 13).

In 2002, the need for national leadership on issues related to telehealth and telehealth standards was recognized and led to the creation of the National Initiative for Telehealth (NIFTE) Guidelines, a multi-stakeholder project with the primary outcome being the development of a Framework of Guidelines for Telehealth. The purpose of the

Guidelines was to provide a structured set of statements to assist individuals and organizations with the development of telehealth policy, procedures, guidelines, and/or standards (NIFTE, 2003a). This increased telehealth activity also led to attention on policy and, quality and outcome issues related to the delivery of telehealth services (NIFTE). In 2006 the Canadian Council on Health Services Accreditation (CCHSA) established accreditation criteria specific to telehealth that recognized telehealth as a mode of health care delivery integrated into the full complement of service delivery and not an entity unto itself (Canadian Society of Telehealth, 2007).

Overall, how does telehealth policy in Canada translate into current practice? Scott (2005) provides a synopsis of Canada's eHealth (i.e. telehealth) policy environment and his analysis suggests that: the macro (federal) policy seems structured and 'on course'; the meso (provincial/territorial) policy remains at best a patchwork and at worst is non-existent; the micro (regional health authorities) policy remains limited, 'paternalistic' or contractual; the inter-jurisdictional policy is nascent; and the global policy is non-existent (p. 5). Despite the fact that Canada has enjoyed considerable policy debate and is recognized as a leader with regard to telehealth (Jennett et al., 2003), it is unlikely that there will ever be widespread adoption of telehealth if the legal and organizational issues are not resolved.

2.3.4 Integration of telehealth in health care. The past pattern of viewing telehealth as a technology and not as an alternate delivery mechanism for health care, has led many physicians and health care administrators to view telehealth as a radically different form of health care delivery that requires many special accommodations. As a result of this type of thinking, ensuring that the integration and adoption of telehealth is

successful will involve much more than simply focusing on technology and network capabilities. There must also be a focus on full integration into existing structures of health care delivery within organizations and into existing practices of working with patients in order for it to be considered an alternate mode of health care delivery (NIFTE, 2003b; Gagnon et al., 2005; Bashshur (2001).

Canada Health Infoway (2011) recently identified a number of specific issues that need to be considered to transition telehealth into mainstream health care – clinician reimbursement; professional development; technology implementation; licensing and other regulatory issues; governance and policy; change management and adoption; benefits realization and measurement; and support for implementation and transition to the mainstream.

The challenges that are limiting the integration of telehealth into clinical practice can be grouped under three main headings: organizational factors, human factors and environmental factors. Each is addressed below.

2.3.4.1 Organizational challenges. The successful implementation of an innovation such as telehealth depends on many factors including the degree of readiness of the institution or the organizational environment (Jennett & Andruchuk, 2001). The barriers related to previously established medical norms, organizational cultures, and operating systems can significantly impact the integration of telehealth and technology (Robinson, Savage & Sydow-Campbell, 2003). There are additional challenges when there is no institutional sponsorship, such as a link with a policy agency that is able to sponsor the implementation effectively (May et al., 2003, p. 25).

Sheng, Hu, Wei and Ma (1999) suggest that a lack of telehealth champions and a process for the management of change at both the individual and organizational levels will impact telehealth integration. Issues related to ownership such as the uncertainty of stewardship of the technology and who ultimately assumes responsibility (e.g. institutions, private service providers or individuals themselves) also impact the integration process (Gagnon et al., 2005).

Structural legitimization is another organizational challenge as the large number of health care providers and associated governance models pose a challenge to integrating telehealth with other information resources and into existing structures of health care delivery. Health care organizations have tended to operate in silos in terms of care delivery, therefore, the challenges associated with bringing together disparate information systems from various organizations, disciplines and professional groups is significant (May et al., 2003).

It is understood among practitioners and researchers that in order for physicians and others to adopt the telehealth framework, the workflow associated with the additional service must be fully integrated with existing communications and service workflow and into existing ways of working with the patient (May et al., 2003).

2.3.4.2 ***Human challenges.*** The Advisory Committee on Health Infostructure (Health Canada, 2001b) states that the change management required to create an electronic information culture is significant and should not be underestimated, and that the implementation of EHRs and telehealth will significantly change how health care providers carry out their duties. The literature on change in the health care sector tells us that many initiatives fail because they do not recognize the human component required to

successfully implement the technology (Advisory Committee on Health Infostructure, 2001). Often the perception is that the technology is the major barrier to the implementation of telehealth. However, the successful implementation of telehealth also depends very much on acceptance by stakeholders (i.e. government, health care providers and the public) and their willingness to change their traditional patterns of practice (Gagnon et al., 2005). The human challenges often outweigh the technical challenges that are encountered when introducing any type of ICT into the health care system

One of the major challenges related to human resources is changing roles. May et al. (2001) suggest the introduction of telehealth actually introduces a redefinition of traditional professional roles. When the technology is perceived as threatening autonomy and changing a role, resistance can be expected (Gagnon et al., 2005). One of the key stakeholder groups is physicians (the main end users of telehealth) and their acceptance is a major challenge for the sustainability of telehealth networks (Gagnon et al., 2005). Successful change is usually an incremental process, so it comes as no surprise that "changes in the professional bureaucracy will be achieved by the slow process of changing norms, skills and knowledge" (Mintzberg, 1979). Ultimately, the continuous growth in technology use will force change in the roles of institutions and health professionals in order to enable them to best leverage the power offered by the new technologies (Lee, 1997).

Another major human challenge is the engagement and preparation of staff who are the main users of telehealth systems including involvement in system design and also in user education and training. Early involvement of users in the design of clinical applications is important to ensure the product or service is usable and flexible enough to

accommodate variations in practice which ultimately impact integration and therefore success. Jennett et al. (2005) emphasize the importance of user education and training and suggests that "preparing staff will increase an organization's readiness to adopt telehealth and ongoing training will integrate the new technology into the daily working life of employees" (p. 141). A physician's unfamiliarity with the technology and an ineffective change management process can ultimately impede the technology integration process (Sheng et al., 1999).

2.3.4.3 Contextual challenges. External environment and contextual challenges range from communications and evaluation issues to ethical and legal issues. For example, expansion and integration of telehealth may encompass federal, provincial, territorial and international jurisdictions and therefore may involve communities where different languages and cultures will have to be taken into account. Communication issues such as cross-border acceptance and use of common 'language' can arise and must be addressed (Jennett et al., 2003).

The pre-existing technology environment may present challenges related to the integration of legacy systems. The resulting interoperability and communication issues require attention in order for successful integration to take place. Financial challenges with respect to securing adequate financial resources to support the development and implementation of telehealth can pose a major impediment to its integration (Jennett et al., 2003). For example, telehealth projects are often short lived pilot projects. Initial seed money for demonstration purposes is easily secured but identifying funding to support the ongoing maintenance of the service is much more challenging. Many projects do not move into the evaluation phase because the projects themselves are short lived or

because project coordinators reallocate funding and resources that are initially ear marked for evaluation to other areas such as support for the continued operation of the program (Bashshur, 2001). Lack of evaluation on the long term impacts of telehealth remains a concern.

The legal issues of privacy and security (Jennett et al., 2003) present challenges as consumer concerns related to privacy and confidentiality continue to grow. Related to this is data security and liability, which must also be adequately addressed as well as the associated ethical issues of confidentiality, consent, and authorization or data access (Jennett et al., 2003). For example, it is important to protect an individual's privacy and confidentiality regarding their health information by ensuring security of their data, while at the same time enabling information flow so that it supports effective health care and the EHR. The legal challenges related to the commercial issues of intellectual property and copyright (Jennett et al., 2003) also need to be considered in order to further the adoption and integration of telehealth.

In summary, a significant amount of work remains before we can move forward with the full integration of telehealth into the health care system. As Lehoux, Sicotte and Lacroix (1999) note, "high expectations are attached to telehealth and low levels of utilization are still observed in most programs" (p. 36). The challenge in increasing these levels of utilization is directly related to how well telehealth is integrated into the health care system.

In order to successfully integrate telehealth into the Canadian health system, Jennett and Andruchuk (2001, p. 272) suggest that we must address five issues. The first issue for successful implementation is the multi-faceted issue of *readiness of the environment*

which includes: infrastructure issues such as policy, professional standards, technical standards, and IT infrastructure; and human factors such as change agents, champions (particularly physicians), leadership and workforce issues. The second issue is related to the requirement for *needs analysis, strategic business plans, and diverse partnerships.* The needs analysis will help users to focus on the priorities for services versus a single focus on where the champions and opportunities exist. Business plans ensure there is accountability and sustainability; and partnerships help in working with diverse groups to develop and implement the telehealth service. The third issue is related to *equipment and IT vendors* and the need to understand that one solution does not work for all and that budgets, local needs and infrastructure influence the selected strategy. The fourth issue relates to the importance of *staged implementation* which has had more success than initiating all the applications concurrently. Finally, conducting an *evaluation* of the telehealth process and measuring outcomes is critical, as the lack of evidence and results has been a major impediment to telehealth adoption and institutionalization in the past.

2.3.5 Integration of telehealth with the EHR. Canada Health Infoway (2005c) is the national agency leading the development and adoption of EHRs in Canada. It is an independent not-for-profit organization established by the federal government and is one of the largest funders of EHRs in Canada. Canada Health Infoway is internationally recognized for providing leadership by establishing a strategic direction for EHR implementation in Canada in collaboration with the provinces and territories.

Despite the increased interest and significant investment by Infoway's national initiative to build a standardized EHR for all Canadians, Canada has been slow to implement and use electronic records. According to a recent national scan of Canadian

hospitals by Urowitz et al. (2008), over half (54.2%) of those surveyed reported having some sort of EHR, but an overwhelming 97.6% indicated that the EHR was not the sole method for recording patient information. This national scan indicated that very few institutions had predominately an electronic record and that most commonly, hospitals had records that were between 11-50% electronic (Urowitz et al., 2008).

Canada continues to lag behind other Western countries and as of 2009, only 36% of physicians were using electronic medical records as compared to over 90% of physicians in Australia, the United Kingdom, New Zealand and the Netherlands. This would seem to indicate that the adoption process for EHRs in Canada is still in its infancy.

In a recent study by Rozenblum et al. (2011) to identify the success factors of the Canadian plan and ways to improve the adoption of EHRs, three recommendations were made to improve adoption: "investment in the implementation of electronic health records as a priority, more effective engagement of clinicians and other health care providers and financial incentives based on patient outcomes that can be achieved with the use of electronic records" (Rozenblum et al., 2011, p. 286).

Linkage of telehealth to the EHR is recognized by many as crucial to the adoption and integration process for telehealth. As stated in the Kirby Report: "If the benefits of telehealth are to be fully realized and its value enhanced, the telehealth applications that currently stand as individual components must be merged with information from other clinical information systems such as the interoperable EHR. The EHR is identified as the central piece that can tie these components together and create a single, inclusive record containing the patient's data regardless of how or where it is gathered" (Standing

Committee on Social Affairs, Science and Technology, 2002b). Infoway also recognizes the critical link between the EHR and telehealth and the need to ensure solutions are integrated into mainstream health care networks, and therefore it has an active agenda in the area of telehealth and EHR integration (Canada Health Infoway, 2005b, para. 3; Alvarez, 2004). In fact, two of the objectives of Infoway's Telehealth Strategy are to increase the integration of telemedicine activities into mainstream health care service delivery and to increase the crucial telehealth link to the EHR (Canada Health Infoway, 2009, p. 5).

One of the challenges of integrating telehealth with information systems such as the EHR is the development of standards that facilitate interoperable systems. It is this very lack of standards and interoperability that has been a major barrier to the deployment of the EHR (Schloeffel, 2004). Interoperability is related to issues of proprietary software and hardware, and integration challenges with legacy systems and with other networks (e.g. telehealth sytems). Some of this may be attributed to the history of piecemeal implementation of telehealth across the country (Health Canada, 2001b, The Gaps - Telehealth), and subsequently inconsistent development of standards for the programs. The need to develop consistent national standards on the clinical and technical components of telehealth is now clearly recognized (Health Canada, 2001b, EHR-Telehealth Integration para. 2).

To date, telehealth has not been integrated with EHR systems, however, with the increased deployment of EHR systems and the increasing availability of telehealth technologies over the Internet, the convergence of EHRs and telehealth will begin to occur (Health Canada, 2001b, The Gaps - Telehealth). The Canadian Society of

Telehealth (2007) suggests that this convergence with other health care applications has already begun, as many of the more mature applications are now able to be integrated and the new applications are now built to EHR standards. While telehealth generally has not seen the growth that was anticipated over the last 40 years, there is an exception in terms of tele-radiology/tele-imaging which has become known as picture archiving and communication system (PACS). This is one example of a telehealth technology that has been integrated with the EHR system and has made a significant contribution to the success of the EHR.

2.3.6 The use of ICTs in cancer care delivery. Cancer care is complicated and diverse and involves complex decision making, collaboration between primary and specialty care providers, and coordination among cancer team members. This is not dissimilar to modern health care generally but yet there has been little done in terms of considering the potential for IT to improve the cancer care system (Clauser, Wagner, Bowles, Tuzzio & Greene, 2011). Those that have considered the use of ICT in oncology services have examined it in many different ways – in the general use of technology in oncology and in niche applications such as telehealth, teleoncology, the electronic health record and the electronic medical record (i.e. the patient's health record within a care delivery organization). "The importance of IT in supporting and enhancing patient-centred cancer care delivery is compelling in theory, and evidence of tangible progress is growing" (Clauser et al., p. S205).

Clauser et al. (2011) suggest that information technology is a foundational element for patient-centred care and can support cancer care by empowering patients to become more involved in their cancer care and by contributing to improvements for providers and

health care systems (e.g. improving cancer management, decision support, care coordination and continuity of care). Jimbo, Nease, Ruffin & Rana (2006) conducted a systematic review of the literature examining how information technology impacts the delivery of cancer preventive services in primary care offices and concluded that the literature in this area is limited and there is a great need to study the new technological approaches in order to understand the impact and acceptance by providers and patients.

The potential of technology to improve quality and efficiency in the health system is partly based on automating some of the clinical data. For example, many of the new applications such as computer aided decision support systems require the integration of patient clinical data with evidence based data in order to provide information to physicians to assist in their diagnosis and treatment planning (Institute of Medicine, 2001; Weed & Weed, 1999). This clinical data also has the potential to develop medical knowledge directly from patient care as seen in some of the work in cancer care (Institute of Medicine, 2001). For example, the gains in cancer survival among children may be partly attributable to the ability to systematically collect and analyze data from all the pediatric cancer patients involved in clinical trials and the subsequent ability to disseminate the results to all participants (Simone & Lyons, 1998).

In terms of the impact of ICT on cancer patients, patients are using the Internet more frequently to gather health information and to help them diagnose or manage their illness. Eysenbach et al. (2003) suggest that the Internet can have an impact on cancer patients in four areas: communication (e-mail), community (virtual support groups), content (web-based health information) and e-commerce. Madhaven et al. (2011) suggest that "nowhere has the social side of Internet-based technologies been more longstanding

and useful as it has been for individuals suffering from an illness" and note that online support groups are expanding in terms of reach and functionality with the uptake of social media.

With this increased use of technology comes an increased level of comfort and familiarity with the technology. For example, Norum, Grev, Moen, Balteskard & Holthe (2003) studied the experience of cancer patients and their relatives with ICT in oncology and found that the majority of cancer patients and their relatives have access to the Internet and are getting more and more familiar with ICT. This led the researchers to recommend that ICT be employed in the patient–hospital communication process (Norum et al., 2003).

2.3.6.1 Telehealth in cancer care. According to Statistics Canada, the proportion of Canadians who live in rural areas has been dropping and in 2011 it fell to below 1 in 5 Canadians to 18.9% (Government of Canada, 2012). This has a major impact on the provision of cancer care services as generally those living in urban centres have access to large cancer centres and services in their own community, but gaining access to cancer services in smaller rural areas is challenging. Many have recognized the usefulness of telehealth in the practice of oncology and its ability to meet some of these challenges. According to Hunter et al. (1999), teleoncology programs offer potential benefits including enhancing primary care managers' access to referrals, expanded opportunities for professional development, reduction of unnecessary referrals and smooth coordination of patient care. Others have demonstrated that practicing clinical oncology using telemedicine is a useful technique for both direct care and supportive care for the cancer patient (Doolittle & Allen, 1997, p. 69).

Physicians, dealing with large and distributed caseloads, are looking at alternate delivery methods to manage and deliver their services in a more efficient manner. For example, specialists in urban cancer centres use telehealth technology to provide services (including initial referral and disease management services) to patients in rural areas. The technology provides opportunities for remote team based delivery of care where non-cancer health professionals can be part of a group that assists cancer specialists in urban centres with the remote delivery of care for cancer patients living in small rural communities (e.g. chemo administration). Olver, in Mohr (2008) describes the range of telemedicine applications in oncology and notes they range "from real-time videoconferencing for primary and secondary opinion gathering from both generalists and specialists in a geographically circumscriptive area to the gathering of second opinion through international experts and CT-based remote 3D radiation oncology treatment planning" (p. 258).

Beyond the benefits of a hospital-patient communication tool, use of technology can reduce travel costs and stress. Teleoncology assists patients who must travel significant distances to receive specialized cancer care and the patient acceptance rate of seeing their oncologist by telemedicine is also high (Allen & Hayes, 1995; Kunkler, Rafferty, Hill, Henry & Foreman, 1997).

Brigden et al. (2008) purport that telemedicine and teleoncology are both here to stay but caution that providers must be knowledgeable about the potential benefits and the pitfalls of the proposed service before they introduce the technology. Despite the many benefits of teleoncology and the many examples of telemedicine that are seeing widespread adoption (e.g. teleradiology and telepsychiatry), teleoncology continues to be

referred to as a 'niche' application of telemedicine in that, for unknown reasons, it appears to be successful and sustainable in the centres where it was pioneered, but it has not been adopted elsewhere (Wooton, 2006, p. 335). Mohr (2008) suggests that when telemedicine applications and services in oncology are evaluated, it is important to focus on both the individual perspective (e.g. patient, physician, technician) and the financial and political perspective. He suggests that applications fail when the individual benefits are well described but because of the funding challenges, the benefits do not get integrated into routine medical use and therefore do not get evaluated (p. 259). Even though oncology is an area that benefits from ICT use, the evidence that demonstrates benefits from teleoncology is still limited (Hailey et al., 2007; Mayer, MacKenzie, McDonald & Want, 2011).

2.3.6.2 EHR in cancer care. The EHR also plays a role in the delivery of oncology services. One of the challenges in oncology is to manage the entire course of cancer treatment for patients who are interacting with multidisciplinary teams (many in multiple locations). An online accessible record that can be retrieved and updated at any location would improve the timeliness and accuracy of information, as well as the quality of cancer care (Hewitt & Simone, 2000). Others go as far as to suggest that because the treatment of cancer is so complex and influenced by so many different factors, it should have an EHR that is uniquely configured for the delivery of cancer treatment, care and follow-up (Hryniuk, Archer, Colucci, Gillespie & Saltman, 2008). Despite the potential that an EHR holds for cancer care, Hryniuk et al. (2008) note in their study that tertiary cancer centers in Canada are only using EHRs to link to regional cancer centers on a

limited basis or not at all. They suggest that this limited use could compromise the quality of care that cancer patients in rural areas receive (Hryniuk et al., 2008).

2.4 Summary

ICT has failed to achieve the same degree of penetration in health care as it has in other sectors such as finance, manufacturing and retail. While the use of ICT (i.e. telehealth/telemedicine) in health care is beginning to see advancements due to the many technological advances, health care institutions are still slow in terms of adoption and usage of technology. The existing literature on telehealth is primarily a clinical literature and continues to lack in research on evidence of effectiveness. This is particularly the case in oncology. While it is recognized that oncology is an area that appears to benefit from ICT use, the evidence that demonstrates benefits from teleoncology is still limited. Because of the lack of research evidence, the supporting policy issues also continue to be slow in their development.

While the literature suggests the fuller integration of telehealth in clinical care delivery is considered to be imminent, many challenges remain.

Chapter 3: Methods

To address the study objectives and research questions, this research employed:

(1) an Advisory Committee (Appendix A) which provided general oversight to the research project; liaison with research participants; advice on the research design and delivery process; and consultation as content experts in oncology and ICT;

(2) a Canada wide survey (Appendix B) of those involved in cancer care; and

(3) the collection and analysis of data from key informant interviews (KII) of those involved in cancer care.

Table 3 below presents a summary of the relationship between the study objectives, research questions and study instruments.

Table 3

Relationship Between Study Objectives, Research Questions and Study Instruments

Study Objectives	Study Instrument	Specific Data Sources
1. To describe the current state of technology use in cancer care delivery in Canada.	Survey	Questions 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
	Key Informant Interview	Questions 1,2, 3
2. To identify the potential use of ICT technology in cancer care delivery.	Key Informant Interview	Question 5
3. To identify the facilitators and barriers to uptake of ICT technology in cancer care delivery.	Survey	Questions 15, 16, 19, 20
	Key Informant Interview	Question 2, 3, 4
`Study Research Questions	Study Instrument	Specific Data Sources
1. What types of ICT are currently being used in the delivery of cancer services in Canada?	Survey	Questions 6, 10, 11, 12, 13, 14
	Key Informant Interview	Question 1
2. To what extent are these various technologies being used?	Survey	Questions 5, 7, 10, 11, 12, 13
	Key Informant Interview	Question 1
3. What factors led cancer care institutions to adopt various ICT?	Survey	Question 15
	Key Informant Interview	Question 2
4. What are the best practices and lessons learned from the adoption of ICT in cancer care?	Key Informant Interview	Question 4
5. What are the major challenges to the use of ICT in cancer care?	Survey	Questions 16, 19
	Key Informant Interview	Question 3

3.1 Target Population

The target population for this study was the population of health care professionals and administrators working in cancer care service delivery at cancer care centers across Canada. The Yukon, North West Territories and Nunavut were not included in this study as they are not involved in direct cancer care service delivery.[1]

3.2 Instruments

3.2.1 Survey. A four page survey (Appendix B) to determine the use and context of ICT in cancer care was developed by the investigator in consultation with the project's Advisory Committee and based on a review of the literature. The survey consisted of four sections including: (1) Profile - information on the profile of the organization that administers the cancer care program; (2) Use of ICT in Program - general information about the use of ICT in the cancer care program; (3) Health Records - information about the cancer care program's use of electronic medical records and electronic health records; and (4) Other - other comments participants wanted to add.

The survey was pre-tested in both French and English by six professionals working in the information technology and/or cancer care fields to ensure clarity and that the questions actually yielded the information that the investigators wanted to obtain. These six professionals were located within Newfoundland and Labrador and from outside the province and provided their feedback in written or verbal form to a member of the

[1] The first assessment is often done in the home community and then the patient is referred out to a larger centre in the south for further testing and for delivery of cancer services e.g. Alberta, Manitoba, Ontario as this is not available in the territories. Telehealth is often used by referring physicians or nurses to consult with specialists about the patient prior to them going out.

Advisory Committee. The necessary changes were made to the survey prior to its distribution.

3.2.2 Interview protocol. A key informant interview protocol (Appendix C) was developed to gather information regarding how ICT is used in cancer care delivery across Canada; to identify ICT adoption factors and challenges, and best practices related to ICT adoption; and to identify the potential for expansion of ICT in cancer care. A preliminary review of the survey results along with the literature review provided the necessary information to inform the development of the questions for the interviews. The protocol was developed by the investigator in consultation with the Advisory Committee.

3.3 Data Collection

3.3.1 Survey. This study used a purposive sample of the population of health care professionals and administrators working in cancer care service delivery at cancer care centers across Canada. The participants were primarily identified by the project's Advisory Committee and represented individuals such as physicians, administrators and nurse managers. These names were supplemented by names of other oncologists identified in the Canadian Medical Directory (2006) and also those working at provincial cancer care centres as identified on provincial cancer care centre websites.

Survey packages were sent by mail and contained: 1) a cover letter explaining the survey and requesting participation (Appendix D); 2) a French and English version of the survey as well as the website address for those who chose to complete the questionnaire online; and 3) a postage paid postcard that participants were asked to return if they were interested in participating in key informant interviews (Appendix E). A total of 160 surveys were distributed over a nineteen week period. This included 132 survey packages

distributed in Week 1, 12 packages in Week 7, 2 packages in Week 10, and 14 packages in Week 16. This staggered distribution was due to additional names being identified by the Advisory Committee over the course of the distribution process. Three weeks after the initial survey was mailed out a reminder postcard (Appendix F) was sent to all participants in an effort to maximize response rate. In Week 5, surveys were sent again to non-respondents as part of a package that was sent to all participants from the principal investigator (who is also the principal investigator of this research) of a previous teleoncology development project sponsored by the eHealth Research Unit at Memorial University. This package included a letter providing the previous study's final evaluation report and a reminder to complete the attached survey for this current study (Appendix G). Some of this current study's participants would have participated in the previous study or would be interested in its final evaluation report so the Advisory Committee decided to take advantage of this mailing in order to avoid multiple mail outs to the same target group and to reduce the cost of another mail out. Multiple reminders continued to be sent to non-respondents from Week 6 to Week 20 through a variety of means including e-mail (Appendix H) and fax (Appendix J); and telephone calls to non-respondents in the final four weeks as a reminder to either mail back a completed survey or as an alternative, schedule a time to complete the survey with a telephone interviewer. Nobody availed of this latter option. The distribution and data collection process was completed as outlined in Table 4.

Table 4
Survey Administration Process

Week	Number of sent items					
	Original survey	Reminder postcard	Reminder survey	Reminder e-mail	Reminder fax	Reminder phone call
Week 1 – Mar. 2-8/08	132	-	-	-	-	-
Week 2 – Mar. 9-15/08	-	-	-	-	-	-
Week 3 – Mar. 16-22/08	-	-	-	-	-	-
Week 4 – Mar. 23-29/08	-	132	-	-	-	-
Week 5 – Mar. 30-Apr. 5/08	-	-	120	-	-	-
Week 6 – Apr. 6-12/08	-	-	-	62	-	-
Week 7 – Apr. 13-19/08	12	-	-	-	45	-
Week 8 – Apr. 20-26/08	-	-	-	-	-	-
Week 9 – Apr. 27-May 3/08	-	-	-	-	-	-
Week 10 – May 4-10/08	2	-	-	-	-	-
Week 11 – May 11-17/08	-	12	-	-	-	-
Week 12 – May 18-24/08	-	-	12	-	-	-
Week 13 – May 25-31/08	-	2	-	-	12	-
Week 14 – June 1-7/08	-	-	-	-	-	-
Week 15 – June 8-14/08	-	-	-	-	-	-
Week 16 – June 15-21/08	14	-	-	-	2	-
Week 17-20 – June 22-July 19/08	-	-	-	-	-	48
Total	160					

3.3.2 Key informant interviews. The sample for key informant interviews was identified as those who returned the postcard from the mail out survey indicating that they were interested in participating in the key informant interview component of the study. The Advisory Committee reviewed the names of these respondents and ten individuals (i.e. one knowledgeable individual from each province) were selected as the primary sample for the key informant interviews. The sample ensured adequate provincial representation and included those who understood English sufficiently to participate in the interview.

The proposed sample of participants was contacted by telephone or e-mail to determine their interest in continuing to participate in a key informant interview and to schedule an appointment time for their interview. A copy of the interview protocol was

provided to the key informant prior to their interview. The protocol used by the interviewer had prompts to be used, if necessary, to help the interviewee understand what was being asked; these prompts were not included in the version provided to key informants. At the beginning of each interview the interviewer read an introductory script that explained the purpose of the interview, ensured confidentiality and asked the participant for their consent to proceed with the structured interview (Appendix J). Interviews lasted between 30 and 60 minutes and all interviews were conducted in English. All interviews were conducted by telephone, audio taped and transcribed verbatim. Pseudonyms were used for each informant and therefore the interview transcripts contain only pseudonyms.

3.4 Data Analysis and Presentation

The numerical survey data was entered into a database and analyzed using the SPSS Statistical Package (version 16). Frequencies and cross tabulations were used to identify any data entry errors and errors were then corrected by consulting the original survey. The only open ended survey question and all the interview questions were analyzed using a constant comparative analysis approach (Glaser & Strauss, 1967), and the information was coded into emerging themes and sub themes if they existed. Data collection and analysis occurred simultaneously and the data were analyzed following each interview. A coding template was developed which was applied to the interview transcripts and the responses to the one question from the survey to identify categories based on the concepts and themes found in the interviews and the open ended survey question. Findings from the open ended items are presented in summary form.

3.5 Ethics Approval

This study was reviewed by the Human Investigation Committee of Memorial University of Newfoundland and the Committee indicated the project did not require ethics approval. All letters and e-mails pertaining to the request and approval from the Human Investigation Committee are included in Appendix K.

Survey respondents implied consent by the return of a completed survey. Participants were instructed not to sign the survey nor place any identifying information on it, and study codes were assigned to each questionnaire to ensure anonymity and confidentiality, as well as to calculate response rates. Interviewees implied consent by verbally indicating so at the beginning of the telephone interview and agreeing to participate. All data files were stored on password protected computers and all paper files were stored in a locked filing cabinet in the eHealth Research Unit in the Faculty of Medicine at Memorial University.

Chapter 4: Results

The results section provides an overview of the research results from the quantitative research (i.e. the survey) and the qualitative research (i.e. the key informant interviews). The findings are presented according to study instrument.

4.1 The Survey

4.1.1 Characteristics of the sample. A total of 160 surveys were distributed to participants, and of this total, 22 individuals removed themselves voluntarily from the study (e.g. retired, did not deliver cancer services), or they were removed because the researchers were not able to contact them (e.g. respondent moved and survey returned by Canada Post). Therefore, 138 surveys were eligible for inclusion. Of the 138 eligible surveys, 45 surveys were returned representing a response rate of 33% (45/138). The three top returning provinces were Newfoundland (67%), Nova Scotia (47%) and Saskatchewan (43%). Table 5 provides the return rate for each province.

Table 5
Survey Return Rate by Location (n=160)

Province	Surveys Sent	Ineligible	Eligible	Returned Surveys	Return Rate
NL	6	0	6	4	67%
NS	16	1	15	7	47%
SK	8	1	7	3	43%
NB	8	2	6	2	33%
PEI	4	1	3	1	33%
BC	29	2	27	9	31%
ON	32	3	29	9	31%
AB	24	9	15	4	27%
MN	10	1	9	2	22%
QC	23	2	21	4	19%
Total	160	22	138	45	33%

4.1.2 The survey findings. The data from the survey is organized in four categories: (1) a general profile of cancer programs; (2) an overview of ICT use in cancer programs; (3) factors that impact ICT uptake in cancer programs; and (4) challenges to the sustainability of teleoncology programs.

4.1.2.1 General profile of cancer programs. This portion of the survey provided general descriptive information on the cancer care programs across Canada including information on items such as administration, sites, funding and policy as it relates to the cancer care programs.

Administration. The type of principal agencies to which the respondent's cancer program reports are mainly academic health centres (36.4%) but other affiliations included regional health authorities (20.5%), or hospital based health care networks (15.9%). The type of facility that administers the cancer care programs is generally a hospital with over 250 beds (60.5%) and specific cancer care facilities (67.4%). Many are also academic medical facilities (34.9%) and have outpatient clinics (30.2%).

Sites. The majority of respondents (63.9%) indicated they had less than 25 active teleoncology sites (i.e. places where teleoncology is conducted from) while 15.9% indicated they had between 25-50 sites. Almost 10% (9.1%) indicated they were not sure of the number of active sites.

Funding. Funding for the majority of programs is provided through provincial funding sources (81.8%) but additional sources of funding such as direct support from a principal agency (36.4%), research and development grants (9.1%), private grants (9.1%) an other unidentified sources (15.9%) are common. The other category includes funding

sources such as an independent group, public donations, industry support and start-up funding from federal grants.

Policy. When considering the governance structure for programs, less than half of the respondents (43.2%) indicated that their teleoncology program had formal policies/guidelines that governed its practice/utilization, while 15.9% indicated they did not have any at all. Interestingly, over one third (36.4%) of respondents were unsure if they had formal policies/guidelines governing their programs.

4.1.2.2 An overview of ICT use in cancer programs. This section provides a general overview of the use of ICT in cancer programs and provides data on (1) where it is used – ICT use in specific applications; and (2) how and what is used - the extent of ICT involvement.

(1) ICT use in specific applications. The cancer care programs use their ICT systems for a variety of specific applications that are best captured under four main applications - clinical, administration, research and education. Note that it is common for percentages to total more than 100% in this section because the survey was designed to allow respondents to select more than one response if they used more than one technology with each activity.

Education. Almost all respondents (95.3%) indicated they used their system for education purposes. In terms of the percentage of time it is used for education activities, most of those who use it for these purposes (88.6%) use it between 1-30% of the time. Of this group, 40% use it between 1-10% of the time and 37.1% use it between 11-20% of the time. The respondents who indicated they used their system for education purposes primarily used it for rounds (87.8%), continuing professional education (87.5%),

meetings (85%), conferences (72.5%) and training (65%). While all four types of technology (i.e. PACs, audio/tele conferencing, videoconferencing, internet conferencing) are used in most of these activities, videoconferencing is the technology used most often in every activity. Table 6 provides an overview of the education activities and the technology used.

Table 6
Percentage of Respondents Who Engage in Each Education Activity by Type of Technology Used in These Activities

Activities by % of Respondents Who Engage		Technology Used			
		PACS	Audio/Tele Conferencing	Video Conferencing	Internet Conferencing
Rounds (e.g. Grand)	87.8	20.0	22.5	68.3	5.0
Continuing professional education	87.5	17.9	33.3	74.4	17.9
Meetings	85.0	15.0	45.0	70.0	12.5
Conferences	72.5	10.3	28.2	51.3	20.5
Training	65.0	17.5	22.5	47.5	17.5
Other (e.g. patient use, satellite)	10.3	0.0	0.0	5.1	0.0

Clinical. Just slightly behind education applications was the use of the system for clinical purposes (93.3%). In terms of the percentage of time used for clinical activities approximately one third (31.6%) of respondents indicated the system is used for clinical purposes between 1-20% of the time and over half of the respondents (60.7%) indicated that the system was used for clinical purposes over 50% of the time. Interestingly, a large portion of this group (29%) indicated it was used for clinical purposes over 80% of the time. The respondents who indicated they use their system for clinical activities primarily use it for case conferences (86%), treatment planning (72.1%), diagnosis (71.1%), consultations (67.4%) and patient follow-up (62.8%). While all five types of technology (i.e. PACs, store and forward, audio/tele-conferencing, videoconferencing, internet

conferencing) are used in each of these activities, picture archiving and communication system (PACS) and videoconferencing are the technologies used most often. Table 7 provides an overview of the clinical activities and the technology used in each activity.

Table 7
Percentage of Respondents who Engage in Each Clinical Activity by Type of Technology Used in These Activities

Activities by % of Respondents Who Engage		Technology Used				
		PACS	Store & Forward	Audio/Tele Conferencing	Video Conferencing	Internet Conferencing
Case conferences (e.g. tumor board)	86.0	44.2	16.3	30.2	65.1	4.7
Treatment planning	72.1	39.5	27.9	20.9	37.2	4.7
Diagnosis	71.1	55.8	30.2	25.6	48.8	7.0
Consultations	67.4	23.3	18.6	16.3	51.2	4.7
Patient follow-up	62.8	26.2	19.0	19.0	38.1	2.4
Radiology	58.1	50.0	21.4	4.8	9.5	0
Specialists clinics/specialist referrals	55.	18.6	7.0	20.9	37.2	2.3
Patient monitoring	53.5	19.0	14.3	16.7	26.2	0
Facilitate patient/family visit	48.9	21.4	11.9	21.4	31.0	0
Supportive care	46.7	7.1	7.1	21.4	33.3	2.4
Lab medicine	26.6	4.8	23.8	0	4.8	0
Other e.g. imagerie, management Meditech, ongoing clinical charting, all patient medical record	20.9	0	0	7.5	12.5	2.5
Emergency services	17.8	16.3	4.7	0	0	0
Rehabilitation	16.3	4.7	2.3	9.3	11.6	2.3
Homecare	14.0	7.0	2.3	4.7	2.3	0
Mobile emergency services	4.4	4.7	0	0	0	0

Administration. A large majority of respondents (81.8%) also indicated that their system is currently used for administrative purposes. In terms of the percentage of time it

is used for administrative activities, approximately two-thirds of respondents (66.7%) indicated they used the system for administrative purposes up to 20% of the time. The respondents who indicated they used their system for administrative purposes predominantly used it for meetings (94.4%), demonstrations (55.6%) and health records (33.3%). While all four types of technology (i.e. PACs, audio/tele conferencing, videoconferencing, internet conferencing) are used in each of these activities, videoconferencing is the technology used most often. Table 8 provides an overview of the administrative activities and the technology used.

Table 8
Percentage of Respondents Who Engage in Each Administrative Activity by Type of Technology Used in These Activities

Activities by % of Respondents Who Engage		Technology Used			
		PACS	Audio/Tele Conferencing	Video Conferencing	Internet Conferencing
Meetings	94.4	8.3	52.8	86.1	13.9
Demonstrations	55.6	5.6	16.7	41.7	16.7
Health records	33.3	17.6	8.8	5.9	0.0
Other e.g. calculating delays of waitlists, establish waitlists & priorities	8.3	0.0	2.9	2.9	0.0
Supervision	5.6	2.8	2.8	2.8	0.0

Research. In contrast to education and clinical, less than two-thirds of respondents (61.4%) indicated that their system is currently used for research. In terms of the percentage of time it is used for research activities, most of those who use it for these purposes (73.9%) only use it between 1-10% of the time. The respondents that indicated they used their system for research purposes primarily used it for clinical trials (58.3%), evaluation research (54.2%) and protocol development (50%). Information gathering and dissemination (45.8%) and data collection/analysis (45.8%) are also prominent activities.

While all four types of technology (i.e. PACs, audio/tele conferencing, videoconferencing, internet conferencing) are used in each of these activities, videoconferencing is the technology used most often. Table 9 provides an overview of the research specific applications of ICT and the technology used.

Table 9
Percentage of Respondents Who Engage in Each Research Activity by Type of Technology Used in These Activities

Activities by % of Respondents who Engage		Technology Used			
		PACS	Audio/Tele Conferencing	Video Conferencing	Internet Conferencing
Clinical trials	58.3	31.8	27.3	22.7	18.2
Evaluation research	54.2	9.5	19.0	40.9	4.8
Protocol development	50.0	4.3	30.4	26.1	8.7
Information gathering and dissemination	45.8	13.0	17.4	30.4	12.5
Data collection/analysis	45.8	19.0	9.5	14.3	9.5
Other (e.g. in house system + another system, internet data entry clinical trials)	24.0	4..3	8.7	17.4	4.3

(2) The extent of ICT involvement. This section describes the extent that cancer programs are involved with ICT and provides information on items such as the frequency of ICT use, the type of ICT equipment used, the ICT peripherals used and the use of electronic medical records (EMR) and electronic health records (EHR) in cancer care programs.

Frequency of use. In terms of ICT involvement, the majority of the survey respondents describe their program as a current user of ICT (93.3%). Only 4.4% indicated they were considering future use and 2.2% indicated they had chosen not to use ICT in their program. Of those who indicated they are currently involved with ICT, the majority have been involved for less than 10 years. Almost one-fifth (19%) have been

involved for over 10 years. Almost a quarter of respondents (21%) did not indicate how long their program has been using ICT.

Equipment used. Among those programs that are currently involved with ICT, the majority of equipment that is used is desktop computers and videoconferencing. Laptop computers, personal digital assistants (PDA), and voice over internet protocol (VOIP)/telephones were also quite popular (see Table 10).

Table 10
Type of Equipment used by Percentage of Those Who Use it in Their Program

Equipment	%	Comment
Desktop	93.3	
Videoconferencing	93.3	
Laptop	64.4	
PDA	48.9	
VOIP/Telephony	37.8	
Other	13.3	Portable unit wheeled into exam rooms, tablet, tablet computers, teleconference, teleoncology clinics & teleoncology consultation service
Not Sure	2.2	

Peripherals used. The most common peripherals used in programs are cameras including video (62%), digital (45.7%), patient exam (45.7%) and document (37.1%) cameras. Table 11 provides more information on the types of peripherals used by participants in their programs.

Table 11
Type of Peripheral Used by Percentage of Those Who Use it in Their Program

Peripheral	%	Comment
Video camera	62.9	
Digital camera	45.7	
Patient exam camera	45.7	
Document camera	37.1	
Stethoscope	20.0	
PDA (e.g. Blackberry)	20.0	
Microscope	17.1	
X-ray scanner	17.1	
Laryngoscope	11.4	
Other	11.4	May be access(?) to other clinical devices in teleoncology clinics; projector; symptom assessment tool (ISAAC); tablets (each physician has one) so we can walk around to access electronic record, dictate, look at e-mail, powerpoint, etc., also has wireless connection
Ultrasound	8.6	
ECG/EKG	8.6	
Blood pressure monitors	8.6	
Endoscope	5.7	
Home care devices	2.9	
Dental scope	2.9	
Ophthalmology related	2.9	
Glucometer	2.9	
EEG	0.0	
Dermascope	0.0	

Use of EHR and EMR. In terms of those who indicated the type of health record system used by their organization (82.2%), most use Aria, Meditech, OPIS or the BC Cancer Agent Information System. Also, a large majority of respondents (79.1%) indicated that they use an electronic medical record (EMR) system. In terms of those who indicated the type of system they used (53.3%), most use the BC Cancer Agent Information System or Meditech. A significant portion of respondents noted they do not use an electronic medical system (20.9%). While a few of the reasons noted were associated with finances or unsuccessful attempts to introduce a system, many of the reasons for not currently using an EMR related to either the system currently being

evaluated by the institution or because there are plans to implement a system within the next few years. Table 12 provides a list of reasons participants highlighted for not using the EMR.

Table 12
Reasons for Not Using an EMR by Percentage of Respondents Who Identified Reason

Reason	%	Comment
Too expensive	4.9	
Attempted to but failed	2.4	
No time to evaluate	0	
No perceived benefits	0	
Other	14.6	In evaluation; failed to make much progress; in the process of implementing; lack of appropriate product for oncology environment that integrates with hospital IT; plan to move to an EMR within the next few years depending on satisfactory program and available funding; remote site in the middle of cancer board and regional health; to come next 2 years

Among those respondents who felt there were benefits to an electronic medical record, the most frequently cited benefit was efficient storage and retrieval (74.4%). Other benefits noted were improved patient care (48.8%), improved communications (44.2%), increased productivity (32.6%) and comprehensive features (30.2%). Table 13 provides a list of the benefits noted by participants.

Table 13
Benefits of an EMR by Percentage of Respondents Who Identified Benefit

Benefit	%	Comment
Efficient storage/retrieval	74.4	
Improved patient care	48.8	
Improved communications	44.2	
Increased productivity	32.6	
Comprehensive features	30.2	
Other benefits	11.6	Reminders to nurses and typists saves time on phone; copy and paste dictation set format save dictation time of physicians and typist time; less requirement to call for the paper charts as info available online; can answer patient's phone call faster than before; ease of access; easy access and more than one person at a time; Meditech software does not meet expectation in oncology; saving some paper
Good vendor support	7.0	

4.1.2.3 Factors that impact ICT uptake in cancer programs.

When asked about what factors contribute to the uptake of technology, the most frequently cited factors by survey respondents included funding (84.1%), ease of access (79.5%) and user friendliness (72.7). Table 14 provides more detailed information on the factors cited by respondents.

Table 14
Main Factors Contributing to Use/Uptake of Teleoncology by Percentage of Respondents Who Identified at Least One Factor

Factor	%	Comment
Funding	84.1	
Ease of access	79.5	
User friendly	72.7	
Institutional support	68.2	
Human resources, skills & knowledge	56.8	
Identified need	54.5	
Quality, infrastructure & services	52.3	
Seamless integration into current health care delivery	52.3	
Physicians	50.0	
Health care professionals	38.6	
Planning (strategic & program)	31.8	
Existence of teleoncology policies/guidelines	31.8	
Administrators	31.8	
Incentives for remote sites to participate	25.0	
Government policy	18.2	
Other	4.5	Clinical champion; funding & HR skills & knowledge particularly with small community hospitals; patients desire to have care closer to home

4.1.2.4 Challenges to the sustainability of teleoncology programs.

Numerous challenges to sustainability were noted - lack of funding was most frequently cited (53.5%). Some of the other challenges included integration of teleoncology into health care programs (46.5%) and lack of incentives to participate (34.9%). The impact on

human resources (34.9%); quality, infrastructure and services (32.6%); and convenience/lack of access (32.6%) were also noted as major challenges. Table 15 outlines the challenges cited by participants.

Table 15
Challenges to Teleoncology Program's Sustainability by Percentage of Respondents Who Identified at least One Challenge

Challenge	%	Comment
Lack of funding	53.5	
Integration of teleoncology into health care program	46.5	
Lack of Incentives to participate	34.9	
Impact on HR (technical support)	34.9	
Quality, infrastructure and services	32.6	
Convenience/lack of access	32.6	
Lack of specialist participation	27.9	
Lack of institutional support	25.6	
Other	14.0	Augmentation to caseload for medical oncologist; coordination of multiple disciplines at different sites; no challenges–happy with it; not the same as being all together; present system needs more capacity; technology which does not enable workflow processes; volume of data & limitations on e-storage.
Lack of policies	9.3	
Confidentiality	7.0	
Too difficult to learn	7.0	
Security	2.3	

4.2 Key Informant Interviews

4.2.1 Characteristics of the sample. Structured telephone interviews were conducted with a total of ten individuals – one from each Canadian province. Nine of the interviewees were male and one was female. The interviewees held senior positions within the cancer care system including clinical positions such as radiation and medical oncologists, and administrative positions such directors/vice presidents of oncology

programs and/or regional health authorities. No other specific identifying information about the interviewee was collected as the interviews were confidential.

4.2.2 The key informant interview findings. The data from the key informant interviews were coded and organized into eight major themes. The major themes include: (1) general use of technology; (2) use of electronic health records/medical records; (3) use of telehealth; (4) uptake and adoption factors contributing to technology use; (5) challenges to ICT use in cancer care; (6) challenges impacting sustainability; (7) best practices in implementing ICT; and (8) potential for ICT. The results for themes 1- 3 are presented from a provincial perspective and are summarized in Table 16.

Table 16
A Provincial Perspective of the General Use of Technology, Use of EMRs/EHRs and Use of Telehealth in Cancer Care Services

	General Use of Technology	Use of EHRs/EMRs	Use of Telehealth
NL	Significant use of ICT but use tends to be fragmented due to different information systems among the regions which limits interaction between regions	OPTIS used within Cancer Treatment Research Foundation but many health info systems used across regions	Provides Teleoncology Program that connects patients and physicians via video for assessment and follow up or via telephone where video is not available - other mobile devices such as blackberries used to access information or provide information to others
NS	Computers in consultation rooms in outpatient clinics and computers available in clinic workstations to dictate notes and use Internet	Horizon Patient Folder used in some areas	Does not frequently use the telehealth network for cancer care but does use it for educational sessions
NB	Info not provided	Implemented province wide use of ORION	Primary system used is videoconference and its associated peripherals. It is used for education purposes, to provide support to physicians in rural communities providing cancer care and as part of the Outreach program to provide patient evaluation
PEI	Info not provided	Does not have province wide EHR but did purchase Cerner to facilitate this	Use videoconferencing system for educational purposes but not for cancer care
ON	Info not provided	No provincial EHR link in all institutions	The Ontario Telemedicine Network provides many with a connection to the system but it has had limited use in cancer care
QC	Info not provided	High penetration of EHR but not all institutions linked	Telehealth system used for education but not clinical purposes with patients
MN	Smaller communities provide treatment and follow up in local hospital and utilize telehealth technology to facilitate "distance visits" to specialty services at 2 Cancer Care Manitoba clinics in Winnipeg	Only province that has province wide EMR for cancer care – ARIA	Cancer Care Manitoba is the largest user of the provincial videoconferencing network and uses it for education and clinical purposes - other telehealth applications include provincial move toward electronic drug ordering, the use of portable tablets, and considerable use of the telephone for counselling and follow up

Table 16
A Provincial Perspective of the General Use of Technology, Use of EMRs/EHRs and Use of Telehealth in Cancer Care Services

	General Use of Technology	Use of EHRs/EMRs	Use of Telehealth
SK	No teleoncology service provided for patient management so travel necessary for follow up. Significant amount of tele-education provided through ICT	No provincial EHR but move towards accessing Varian which is used in cancer care	Videoconferencing used primarily for education purposes and occurs mostly between Regina and Saskatoon and the 16 community oncology sites. Telephone counselling provided by liaison nurses to follow up patients
AB	Info not provided	Province has fairly well developed EMR for cancer care – ARIA	Alberta Cancer Board uses telehealth to provide a number of clinical initiatives as well as to support education and administrative purposes
BC	Technology important component of care to provide services at a distance and support local care providers	Developing a provincial EHR but currently has provincial electronic cancer record	Some cancer centres use a telemedicine link to connect small communities that do not have access to specialists in urban centres - also enables specialists to support family physicians in the delivery of cancer care in rural centres

4.2.2.1 General use of technology. This section provides a snapshot of the use of technology in cancer care activities in each of the provinces as identified by individual interviewees. Interviewees were not comfortable providing a thorough overview of their province so many simply provided an overview of what was happening in their specific region or institution.

Atlantic region. In the Atlantic region, cancer care is delivered on a provincial basis. Nova Scotia has two full oncology centres as well as outreach clinics located throughout the province that deliver cancer services. Within the individual patient or consultation rooms in the outpatient clinic, a computer is available for the health care provider to access patient reports. There are also computers available in the clinic

workstation areas to dictate notes and use Internet based reference resources for treatment options and guidelines.

In Newfoundland, cancer care is primarily delivered through the Cancer Care Program of the Eastern Health Regional Health Authority. The Newfoundland Cancer Treatment and Research Foundation operates a cancer centre in St. John's and regional oncology programs throughout the province. There is significant use of ICT, ranging from simple telephone clinics to a sophisticated teleoncology program. The use of technology tends to be fragmented across the province as different regions have different information systems and programs which limits access and interactions between regions and institutions.

In New Brunswick there are two tertiary level cancer centers located in Moncton and in Saint John that provide services for the province. The regional health authorities (RHAs) play a key role in providing cancer services and some provide cancer chemotherapy services as well as various levels of other cancer services. The PEI Cancer Treatment Centre in Charlottetown provides cancer care services to residents throughout the province of PEI.

Central region. In Ontario, Cancer Care Ontario is the provincial agency responsible for cancer services. Services are provided on a regional basis in the province through the 14 Regional Cancer Programs (RCP) - one in each Local Health Integration Network (LHIN) area. These RCPs are networks of health care providers that include regional cancer centres and stakeholders involved in providing cancer services in the LHIN. The organization and delivery of health care in Quebec is conducted through 17 Regional Health Authorities.

Western region. The western region is comprised of Manitoba, Saskatchewan, Alberta and British Columbia (BC). In Manitoba, almost all of the medical and radiation oncologists and cancer specialty services are located in Winnipeg at Cancer Care Manitoba. In the smaller communities, cancer treatment and follow-up is provided in the hospital by family physicians, nurses, and pharmacists. These sites utilize telehealth technology to assist in facilitating visits "at a distance" to all the specialty services at the two clinics in Winnipeg that Cancer Care Manitoba operates. There are also some cancer clinics with teams in smaller hospitals in Winnipeg that are not formally part of Cancer Care Manitoba.

In Saskatchewan, the Saskatchewan Cancer Agency provides cancer care services throughout the province through either the cancer centres in Saskatoon and Regina or through the community oncology centres. In the community oncology centres, there are trained oncology nurses, pharmacists, and social workers in all the clinics, and a family doctor who serves as the principal resource person. Cancer drugs used in treatment are sent out to the region and administered as per protocols from the referring oncologist in Saskatoon or Regina. There is no teleoncology service for patient management and patients still travel to a cancer centre periodically for follow-up. There is a significant amount of tele-education provided to health care providers through the use of ICT.

The Alberta Cancer Board is the Provincial Health Authority operating cancer facilities and programs in Alberta. It is undergoing a reorganization as part of the provincial restructuring of health care and the regions are being brought together under a larger super board. Currently the Alberta Cancer Board operates 17 cancer care facilities

– two major centres that provide patient care facilities in Calgary and Edmonton, four associate cancer centres and 11 community cancer centres throughout the province.

The BC Cancer Agency operates five regional cancer centres that provide assessment and diagnostic services, chemotherapy, radiation therapy, and supportive care. It also has several networks of oncology professionals throughout the province that ensure consistent standards of care are provided to patients as close to home as possible. For example, the Community Oncology Network is a collaborative partnership with 19 community-based cancer centres, six community based cancer services, and 10 consultative clinics across the province, in conjunction with the five regional cancer centres. The network also supports appropriate delivery of patient care and support in 27 other community hospitals. Because of the province's vast geography, the difficulties with transportation, and the challenges with recruitment and retention of oncologists in smaller communities, the technology has become vitally important in the delivery of care. It has been necessary to develop a coordinated system to provide care by using collaborative models and communities of practice that use technology (including electronic charts, provide-wide treatment algorithms, protocols, pre-printed orders) to provide care at a distance. Local support teams consisting of nurses, oncology pharmacists and physicians have been developed in response to the increased involvement of general practitioners delivering chemotherapy to patients in their own community and requiring support from specialists at larger cancer care centres who oversee treatment and care. The BC Cancer Agency has a long tradition of traveling consultation clinics where oncologists from the regional cancer centers travel to remote sites to see patients and assess them in their own community. The support is provided to

local communities through a number of processes – having patients travel to the regional cancer centers or satellite clinics to get their care; training GP's to supervise increasingly complex chemotherapy; and using the electronic chart, the regional PACS and other information systems e.g. Meditech to track information across care providers. By integrating these different components the health system is able to provide care in a more coordinated and integrated fashion.

4.2.2.2 Use of electronic health records/medical records.

Atlantic region. In the Atlantic region, Nova Scotia has begun to move towards using the Horizon Patient Folder (i.e. an electronic document management solution) in some areas. Newfoundland is using OPIS (Oncology Patient Information System) within the Cancer Treatment Research Foundation but many different health information systems are used across the regional health boards which results in challenges to interoperability and inconsistency in data collection, and therefore results in a fragmented system. PEI does not yet have a province wide EHR but did purchase an electronic health record system (i.e. Cerner) that is not yet implemented. New Brunswick implemented a province wide system using ORION in early 2009.

Central region. In the central region, Quebec does not have a province wide system; the institutions have local initiatives, but there is no provincial EHR link established in all the institutions. In some institutions, the technology is used for treatment planning and the electronic file includes the pathology reports and radiology documents. In terms of education and consultation, videoconferencing is used to connect four different sites in the province where there are Tumour Boards. In Ontario, there is a

very high penetration of the use of electronic health records but because not all the institutions are linked, there is a significant issue with duplication of records.

Western region. Looking at the use of the EHR/EMR in the western region, there is activity in all four western provinces. British Columbia is in the process of developing a provincial EHR but currently has a provincial, electronic cancer record that is linked to the Tumour Registry and enables linkage to the outreach centres. In Alberta, despite the differences in the regions with respect to different electronic databases in different stages of use and with different functionality, the province has a fairly well developed EMR for cancer care (i.e. ARIA) to which almost everyone in the province will relate to providers.

Manitoba is currently the only province that has a province-wide EMR for cancer care (i.e. ARIA). Their EMR is available in the large cancer sites, that is, every site that provides chemotherapy radiation has the EHR available, as well as the offices of family physicians that are part of a network of 24 group clinics in Manitoba. In Saskatchewan, there is no provincial electronic health record but there is a move toward hospitals accessing the one used for the cancer clinic (i.e. Varian).

4.2.2.3 Use of telehealth.

The use of telehealth across the country is summarized in Table 17.

Table 17
A Provincial Perspective of the Use of Telehealth in Cancer Care

Region		Use of Telehealth
Atlantic Region	NS	▪ do not frequently use telehealth network for cancer care but do use telehealth technology for educational sessions where there are video links ▪ used to link people in other provinces for education or consultation purposes
	NL	▪ runs a Teleoncology Program where physicians/patients connect via video ▪ telephone clinics conducted with patients where no videoconferencing ▪ other technologies include wireless devices (e.g. blackberries)
	PEI	▪ use computers for physician and patient ▪ physicians use videoconferencing for educational but not clinical purposes
	NB	▪ videoconference primary technology used in cancer care ▪ medical oncologists use for patient evaluation in rural areas ▪ used to provide support to physicians in rural areas that provide cancer care to local patients ▪ used for education purposes
Central Region	QC	▪ uses telehealth for education but not clinical purposes
	ON	▪ telehealth varies across the regions ▪ provide telephone and video conferencing through Ontario Telemedicine ▪ has been explored in small segments in cancer care
Western Region	BC	▪ some use video link to connect oncologists or specialists to small communities ▪ through use of technology, specialty care including spectrum of chemotherapy services is provided to remote centers without specialists
	AB	▪ a few telehealth initiatives being used by the Alberta Cancer Board ▪ biggest use of telehealth is by provincial program which conducts provincial meetings by videoconference ▪ there appears to be a fair amount of utilization and a fair degree of acceptance of the technology by health care providers and patients
	MN	▪ Cancer Care Manitoba largest user of provincial video conferencing network ▪ extensive use of telehealth for conducting physician and health professional visits at a distance ▪ significant use of system to deliver education programs ▪ moving toward electronic drug ordering ▪ recently piloted use of portable tablets for physicians ▪ considerable use of the telephone for informal patient follow-up and formal counselling sessions conducted by the psycho-social clinicians to patients in rural areas – videoconferencing sometimes used for this
	SK	▪ use videoconferencing primarily for education purposes ▪ currently no active patient management via this technology ▪ telephone used by liaison nurses who maintain contact with individual patients

Atlantic region. In the Atlantic region, Nova Scotia does not frequently use the telehealth network for cancer care but it does use the telehealth technology for regular educational sessions (e.g. weekly tumour boards/conferences and oncology grand grounds) where there are video link-ups to smaller hospitals within the province. It is

also used to link with people in other provinces for education or consultation purposes. Newfoundland runs a Teleoncology Program where the physicians connect to patients via a video link to rural sites for either follow-up purposes or to gather assessment information with a new patient. This clinic is offered on a weekly basis by some physicians and supplemented with regular face-to-face visits to those in rural areas. There are also telephone clinics conducted with patients where videoconferencing is not yet available. Other technologies including wireless devices such as Blackberries are used by some for telephone purposes, accessing e-mail and accessing Internet search functions. Prince Edward Island uses computers for both physician use and patient use (e.g. patients access the Internet in clinic waiting rooms to search for resource information). Physicians also use the videoconferencing system for educational purposes but not for clinical purposes in cancer care. In New Brunswick, the primary technology used in cancer care is the videoconferencing system with its associated peripherals. As part of the province's Outreach Program, medical oncologists use the videoconference system for patient evaluation for those that live over 400 kms. from the closest oncology centre. It is also used to provide support to the physicians in these communities who provide cancer care to local patients, and for education purposes.

Central region. In the central region, Quebec uses the telehealth system for education purposes but it is not used for clinical purposes with patients. In Ontario, the use of telehealth technology in cancer care varies across the regions. Some provide telephone conferencing and videoconferencing through the Ontario Telemedicine Network (as many have a connection to the system that is available across hospitals in the region). While this technology has been explored in small segments in cancer care, some

believe the big ICT opportunity in cancer care is within the diagnostic and follow-up stages, and to some extent in terms of patient management.

Western region. In the western region, British Columbia has some cancer centres that have used a telemedicine video link to connect small communities that do not have access to oncologists or to engage specialists located at larger urban centres. Patients are seen using telehealth, a course of treatment is developed by the specialist, and this is then delegated to local family doctors in the smaller communities who have been trained to provide chemotherapy services. Through the use of technology, specialty care including the spectrum of chemotherapy services is provided to remote centers without specialists. Without telehealth technology, this service can often only be provided at a center with an oncologist.

In Alberta, there are a few telehealth initiatives being used by the Alberta Cancer Board. For example, it uses videoconferencing to triage lung cancer patients in Northern Alberta, and specific case consultations are offered through videoconferencing to palliative care patients also located in Northern Alberta. The biggest use of the telehealth system is the provincial program which conducts its provincial meetings by videoconference. According to interviewees, although telehealth is probably not exploited to the extent that other provinces have to date, there appears to be a fair amount of utilization and acceptance of the technology by health care providers and patients.

Cancer Care Manitoba is the largest user of the provincial video conferencing network. There is extensive use of the telehealth network for conducting physician and health professional visits at a distance, particularly in the smaller communities. There is also a significant use of the system to deliver education programs to physicians, nurses

and patients. In terms of other technologies, the province is moving more aggressively into a system where all of the drug ordering can be done electronically and it has recently piloted the use of portable tablets for physicians. There is also considerable use of the telephone for informal patient follow-up (as well as for formal counselling sessions conducted by the psycho-social clinicians for patients in rural Manitoba) because there is no one in the smaller communities to provide this service. The clinicians also use videoconferencing for this purpose although less frequently than the telephone for counselling and support.

Saskatchewan uses videoconferencing primarily for education purposes (e.g. sessions on drug updates, general cancer education, technical issues, and cancer management related topics). There is access to video conferencing but there is currently no active patient management via this technology because of limited infrastructure and funding. Videoconferencing occurs mostly between Regina, Saskatoon and the 16 community oncology centers and is supplemented by regular site visits by specialists and the use of the telephone by liaison nurses who maintain contact with individual patients.

4.2.2.4 Uptake and adoption factors contributing to technology use.

Availability. One of the most frequently cited reasons by interviewees that led their institution (i.e. the broader institution to which they report) to adopt ICT was the actual availability of the service. For example, the infrastructure was available for other projects and thus cancer programs could consider using the system for their own clinical or education use.

Local champion. The other most frequently cited reason by interviewees that led their institution to adopt ICT was the presence of a local champion. For example,

someone who uses the technology themselves in their cancer care practice and promotes its use among their colleagues contributed to people adopting technology and integrating in their practice.

Efficient service. A third factor that led institutions to adopt ICT was a belief that ICT could help in providing a more efficient service in terms of an improved ability: (a) to access records quickly from multiple locations and (b) to store data. Many programs currently face challenges in terms of providing physical space to store massive amounts of paper records and must also deal with the confidentiality issues that are associated with this type of storage. Related to efficiency was a strong desire to move away from a paper-based system that was seen as fraught with problems (e.g. missing records, medical errors, and transcribing errors) to an electronic format that can assist in addressing some of these issues. Interviewees noted that efficiency also includes possible savings to the patient or the health care system.

Quality of care. A fourth factor was a belief that ICT could lead to an improvement in the overall level of quality of care through the use of improved information and clinical systems. For example, there is an opportunity to improve the quality of care for patients who have difficulty travelling because of health concerns and who can receive care closer to home through the application of ICT (e.g. telehealth). Associated with this is the issue of geographical challenges to access, and the need to provide the same quality of care to patients regardless of where they are located. Interviewees suggested this can be addressed by using technology to bring health care workers and specialists to rural and remote areas through audio and video conferencing (e.g. telehealth). As interviewee B stated:

And one of the...important fallouts of doing all this work – when you collaborate with other partners, it's a learning process and it's a lifelong learning process, so the physicians who want to engage in this, they often become the cancer leaders and the cancer care providers in the community where none existed before, and you are able to provide a level of cancer care that doesn't exist at all... sometimes will never exist because we'll never get an oncologist there.

Another challenge that was highlighted that impacts the quality of care is the current lack of a cancer care service that is primarily due to the difficulty of retaining oncologists in satellite clinics. Interviewee B references this challenge:

It was important for us to partner with communities in order to... coordinate the care better and provide the expertise that's resident in our Center to distant patients. I think it was reactive...oncologists left and there was crisis management, but the key players agreed it was a priority to preserve and maintain these services for the needs of cancer patients in our region.

Interviewees suggested that this challenge may also be addressed by adopting technology to facilitate the provision of a service where it previously did not exist. For example, the technology can either bring the oncologist to the community through audio or video conferencing, or be used to support other local health providers remotely in the delivery of cancer care services in their community by connecting them with specialists who can guide them in their delivery of cancer care. It was also noted that because cancer treatment has become so complex, there is a drive to better utilize technology to improve the integration of information systems involved in the delivery of care and subsequently improve the quality of care.

Support. A fifth factor relates to support, specifically the availability of training delivered in multiple formats and at varying times. Interviewees suggested that the

availability of this support contributes to the user's increased comfort in deploying and supporting the implementation of technology in the practice setting.

Input. The final factor noted by respondents as assisting in increasing adoption rates among users is ensuring users are provided with the opportunity to have input into the development and implementation of the technology into their practice. It was felt that if users had this type of input into the design ensuring it was user friendly and non-invasive, then they would be more likely to support the technology implementation.

4.2.2.5 Challenges to ICT use in cancer care. There were three challenges related to the use of ICT in cancer care that were consistently highlighted by interviewees: (1) resistance to change; (2) funding and resources; and (3) leadership.

Resistance. The challenge noted most frequently was dealing with resistance to change by health professionals. Some of this resistance was manifested by individual physicians indicating they have no interest in using technology as their current way of delivering care is working fine for them, and others who perceived it as an additional burden to learn a new system when they are already overworked and have little time to do what they have to do. The following quotes from two of the interviewees illustrate this point. "*The main things that my colleagues are saying is that it's very difficult to the transition from a paper to a desktop, and they're reluctant... I think that all this goes with the learning curve* (Interviewee E)." Interviewee F says, "*I think it's getting better...it's slow and I'm not so sure why it's so slow...Things just don't move as quickly and that's a bit of a problem and I'm not sure how you'd fix that.*" Some interviewees indicated that this resistance is not as prominent in recent medical school graduates who expect technology to be available in their practice or in those who have practiced in

centres where they have been exposed to the use of technology. Interviewee F suggests this:

> *I think that's true for the two new people...they come from Centers where there's a lot more resources in IT...so that drives it...I think younger patients...or young staff tend to be a little more familiar with it than people who have sort of been here for quite a long time, or people who have come from other Centers and seeing what else happens.*

Also, it was noted by some that patients did not experience the same levels of resistance and were most often quite supportive of care being delivered through the use of technology. Interviewee B highlighted this support, "*Over four years we found that our telehealth activities have been very well received by patients. It supplements the other options that we have.*" Another interviewee also noted the support from patients:

> *I think some patients have been a little uncomfortable, but most of them jumped onboard of it very, very quickly... I actually get a lot of people from the remote area actually request it so they don't have to come to [the clinic]... so they're quite happy with it* (Interviewee F).

Funding and Resources. The second challenge noted was related to funding and resource issues. Funding was seen as an issue in terms of the ability to support the development of any new ICT system or program or to sustain systems that have already been established. Lack of continuous funding inhibits maintaining new, state of the art technologies and unfortunately cancer services quickly fall behind when the technology they are using is not kept current. This was emphasized by interviewee F.

> *So I think a lot of this is just from...wrong people making decisions and not enough thought... there's got to be a lot of resources. We're such a technically complicated discipline... the IT part has got to keep up and...that's where the problem is. I think we just need to build a lot more resources and attention to this.*

Human resources to support the development and operation of technology is also critical. Senior administrators and bureaucrats must provide the technical and operational resources required, as opposed to relying on physicians to try to support the technology in addition to maintaining their own clinical practice. Interviewee F highlighted the need for support from senior administration.

> *I think what's a whole lot more important...is that, again, it's got to come from the other end. It's got to come from kind of administration and from the top down and you've got to build it so that people will come...you've got to have a really solid infrastructure or people just aren't going to play ball from day one.*

Leadership. Thirdly, a lack of leadership is seen as a challenge. The lack of leadership or desire at all levels of the organization, from administrators to physicians, to support the establishment and use of technology was considered a major challenge to its use in cancer care. Some felt that the leadership needed to come from the highest level of administration, who in turn, need to promote and support technology use in order for it to be integrated into cancer care at the service delivery level.

4.2.2.6 Challenges impacting sustainability. Numerous challenges to sustainability were noted by interviewees but the two main challenges that were highlighted included funding and incentives.

Funding. Lack of funding as an issue was summarized by Interviewee C:

> *So it all comes down to resources, and I find in dealing with the government people here and in our agency, everybody has this sort of naïve idea that... if you build it they will come; and, in fact, it's not true. You have to build it and fund it, basically.*

Incentives. Interviewees expressed frustration with the lack of incentives for caregivers to participate in technology supported programs.

> *A lack of incentives for people to get onboard and I think an example of that is, when looking at things like the video clinics... I'm not sure even now if fee-for-service can be remunerated for because of the billing structure here, so there's very little financial incentive for fee-for-service doctors to do this* (Interviewee F).

> *I guess they have a system that's working okay, and the teleoncology, telehealth thing represents a sort of a leap into the future, and... I think they realize it's not going to necessarily save them any money, and so there doesn't seem to be any great, you know, incentive forward* (Interviewee C).

4.2.2.7 Best practices in implementing ICT. Interviewees highlighted numerous best practices or lessons learned in their experience of implementing ICT in their cancer service. Lessons that interviewees learned related to those in the area of: (1) leadership, (2) planning, (3) stakeholder involvement, (4) technical support, (5) training, (6) staged implementation, (7) system integration, (8) information sharing, (9) collaboration, (10) economics and (11) necessity.

Leadership. Interviewees suggested that from the outset, there needs to be strong leadership at all levels of practice i.e. from practitioners to administrators, as encouraging physicians to adopt the technology is a big challenge and requires large amounts of support. For example, one of the major struggles some institutions faced was the reluctance to move wholeheartedly into an EHR and as a result many continue to operate a dual system with both electronic and paper charts. Interviewees noted that this can be a very expensive duplication process and therefore leaders should "bite the bullet" and overcome the reluctance as quickly as possible.

Planning. Interviewees stressed that adequate planning must be done prior to the implementation of technology in order to ensure that the process is well thought out. For example, conducting a proper needs assessment, identifying outcomes, determining how data will be used, identifying the infrastructure required, and identifying the resources required for both implementation and long term sustainability, are all critical components of the planning process. This detailed planning is promoted by Interviewee C.

> *Do your homework and really have thought things out. Have a proper needs assessment and outcomes of how you're going to look at the data and...have the infrastructure and the resources... otherwise, you're just going to be spinning your wheels...something like 70 or 80 percent of pilots in telehealth and teleoncology never go on - they're nipped in the bud or they don't carry through, and that's chiefly the reason. That people don't do their homework, and they don't... think things through in terms of...what's ultimately ahead.*

Stakeholder involvement. Early involvement of stakeholders is also related to planning. Interviewees noted that one of the important ways to ensure buy-in from stakeholders is to involve them in the early stages of the design and implementation process and ensure that the system adapts to the actual work that is being done by the health care providers. Obtaining feedback from users and stakeholders early and often in the development process ensures that the necessary modifications and adaptations can be made which will in turn create a better product and possibly contribute to an increase in the adoption rate of the technology by the users. Also, some noted that making changes after the fact can be costly and possibly decrease the budget allocated to the delivery of care.

Technical support. The primary lesson identified by interviewees related to technical support and the need to have this support in place in order to deliver a

successful service. Interviewees noted that it is critical that adequate technical support be provided in terms of engaging experts in the operation of the ICT system and providing support to users of the system. It is also important to have dedicated support staff that know the technology and are available to troubleshoot the system at any time the system is used. Some interviewees also suggested it was critical that those with training experience be onsite for a significant period of time following implementation of the technology when users are beginning to engage with it and facing challenges related to its use. While the technical support costs should decrease over time, it is important to have this cost well supported at the early stages of implementation. The presence of adequate technical support can have a huge impact on satisfaction levels and therefore ultimately impact the uptake and continued use of the technology by health care providers. Interviewee F highlights this need:

> *I think one of the obvious challenges is the IT support. The people there are really good but my own opinion is that we don't have enough people in IT, not enough resources dedicated to it and there's a big hole.*

Training. Interviewees highlighted training as a critical component that needs to be provided to everyone in a flexible manner that addresses the specific requirements of health care workers (e.g. ensuring it can be accessed at different times). As Interviewee D suggests, sometimes the interest is there but the skill is lacking.

> *To be honest with you, it's not that they don't want to use it, it's just that they don't know how. I've seen that people in the health business, they – and I don't want to be condescending – but they're almost chronic illiterates when it comes to using technologies.*

Shared implementation. Interviewees noted that it is important that those responsible for system implementation not implement it too rapidly but roll it out in discreet functions or to discreet groups of people within the institution. *"I think it's been important to achieve what's achievable and not try to roll it out too rapidly in too many areas of the institution. I think that was a good lesson"* (Interviewee A). Interviewee B also supports doing it incrementally, *"We did it a Center at a time, so part of it was developing a slow but steady process"*.

System integration. Interviewees also highlighted the need to integrate multiple systems so that physicians dealing with patients either in the clinic or at a distance have all the clinical information they require in one location. This integration would support the delivery of the patient's treatment process in the most efficient way possible.

Information sharing. The importance of increased awareness of the rules and regulations governing information sharing amongst providers and between institutions was also highlighted. While some institutions had the technology available to support information sharing, they were not able to implement it because of the internal regulations concerning privacy and confidentiality between providers and the institutions.

Collaboration. Interviewees highlighted that telehealth is a very collaborative process involving many professionals who support each other. Its use demonstrates that it is feasible to work as a team and provide cancer care services regardless of distance (e.g. patients may visit their oncologist at a distance using telehealth technology, a general practitioner with limited oncology expertise may deliver cancer treatment in the community with support from an oncologist at a distance). It was suggested that telehealth in cancer care can be used as a model in the development of ICT in other

services (e.g. nephrology, surgery). In terms of collaboration between regions and institutions, one interviewee felt that collaboration on inter-regional communication initiatives should be increased rather than developing things independently.

Economics. Many interviewees cautioned that from an economic perspective, it is important to recognize that implementing a technology program in cancer care will not necessarily result in huge cost savings. It was noted that one of the outcomes of impact analyses is that patients are the biggest winners of the investment, as the financial outcome tends to be almost revenue neutral from an institutional perspective.

> *You have to realize that in terms of cost saving, overall efficiency...this kind of thing doesn't really pan out. I mean, you might save a little bit, but the major benefactor – all of this – is the patient. It isn't necessarily the health care providers or the health care system. Well, until I really got involved, I didn't realize it either. You know, I had the same sort of naïve idea – well, we're going to streamline the system and save all... we'll introduce all these efficiencies and, you know, we'll improve this and we'll improve that; but, in fact, it doesn't. You know, it just changes where patients are seen and treated* (Interviewee C).

Necessity. Finally, one interviewee noted the importance of necessity as a best practice. Interviewee B suggested that "*...necessity is the mother of invention... and when the need is there, if you create a process that works, it will prove itself, it will be sustainable*". This interviewee went on to also say:

> *We looked at some...literature...also we've invented it as we went along. We just said – well, here's the need, here's what we have, here's some of the equipment, what can we use out of it? So part of it was just a learning process and part of it was just like, let's just try the damn thing because what have we got to lose* (Interviewee B).

4.2.2.8 Potential for ICT. Interviewees highlighted a number of initiatives or areas that had potential for expanding the use of existing and emerging ICT in cancer care

services in their institution or jurisdiction. These potential initiatives are highlighted in Table 18 and clustered into five categories: (1) information systems, (2) clinical applications, (3) research applications, (4) educational applications and (5) administrative applications.

Table 18
Potential Initiatives for Expanding ICT Use in Cancer Care

Information systems	1) Develop an electronic database to link province by electronic health/electronic medical record 2) Provide patient access to an information system to enable them to manage their care 3) Develop a decision support system for clinicians
Clinical applications	1) Use of web-based videoconferencing to enable patients meetings with care providers 2) Provide peripheral clinics and telehealth clinics 3) Use of portable devices and Internet to provide care 4) Develop local "communities of practice" to provide specialist care 5) Provide wireless Internet access in institutions
Research applications	1) Develop a web-based system for data collection to conduct in house research and clinical trials
Educational applications	1) Develop a web-based learning system for ehealth professionals 2) Develop a web-based information system that provides general information about possible services, treatments and supports available to patients 3) Develop local television broadcasts that would enable cancer centres to develop a greater media presence
Administrative applications	1) Develop a website for institutions to post opportunities for outside vendors to provide services rather than using internal resources

Information systems. The development of an electronic database that could link the entire province by a seamless electronic health/electronic medical record was identified as having great potential for expanding the use of ICT. Such a system would enable all the health information collected on a single patient to be filed in a single document that could be accessed from anywhere in the province. It was suggested that this would enhance the security of information and the quality of care, as the issues that currently prevent access to patient information from one institution to another could ultimately be overcome. An additional benefit noted was that an electronic file could also contribute to a completely filmless and paperless environment.

A suggested second initiative is providing patient access to an information system where patients could actually oversee and manage their own care. Such a system would provide them with the ability to monitor how their information is moving through the system by enabling them to track the information flow process in the health system (e.g. when test results or appointments are not delivered in a timely manner alerts or prompts would be issued to patients suggesting they follow up with their care provider).

A third potential initiative is the development of a decision support system for clinicians that addresses the liability issue in its design. The provision of solid support and guidance to health care workers could help prevent liability issues arising from errors made in practice.

Clinical applications. Interviewees identified five potential clinical initiatives that could be used to increase the use of ICT. One initiative is the potential use of web-based videoconferencing which would enable patients to meet with their care providers in their own home as opposed to having to travel to a videoconference site in their community in

order to connect with their care provider. It was suggested that an additional benefit to this initiative, besides reduced travel time, may be reduced stress for patients, as it is expected that patients are more likely to be relaxed and comfortable in their own environment.

A second potential clinical initiative, is the provision of an appropriate mix of peripheral clinics (i.e. the physician is travelling to communities) and telehealth clinics (i.e. patients and health care providers meet at a distance through videoconferencing) as complementary ways to provide care which could also help with increasing the use of ICT. The most appropriate mix of care delivered face-to-face or at a distance would be determined by identifying what is most effective for caregivers (e.g. local caregivers, nurses, doctors and other allied health professionals) and for patients and their families.

A third clinical application that could increase ICT use is the use of portable devices and the Internet to provide care, thereby enabling physicians to access and update information, and deliver care outside of their physical clinic or institution. The attraction for health care providers would be their ability to assess patients and access their clinical information regardless of location or time. For example, those with academic teaching appointments in addition to their clinical positions can still attend to their clinical responsibilities while physically away from the hospital and located in a university classroom.

A fourth potential initiative is the development of local "communities of practice" which can provide specialist level care in communities that currently have no specialist resources. For example, cancer care could be provided from outreach centers or clinics that are staffed by a health team that has sufficient expertise and knowledge in cancer

care to deliver a basic service, but who would receive additional support and guidance via ICT (e.g. web conferences, video conferences) from specialists at major cancer centres in urban locations. In this way, the same level of quality care can be provided in smaller communities as in the larger regional cancer centres, and patients can be managed and treated at a distance, thereby minimizing the travel for patients.

A fifth initiative that could be used within the institutional environment to encourage the expanded use of ICT is the provision of wireless internet access for both patients (e.g. enabling use within the cancer clinic or their hospital room) and health care workers (e.g. enabling text messaging, blackberry and cell phone use for information access and exchange). It is suggested that by addressing the ease of access issue through the use of wireless technologies and hand held devices, users will be more likely to engage in technology use.

Research applications. One of the potential initiatives in the research area is the development of a web-based system for data collection that would foster opportunities to do in-house research and to participate in larger clinical trials that are not possible to do with paper charts. It was suggested that analysis of this type of information is useful for many things such as reviewing complications associated with assigned treatments from a quality assurance perspective, monitoring performance, and following treatment progress and success. This information could also be used to enhance the education and training experience of health care workers.

Education applications. The development of a web-based learning system for health professionals that is accessible to everyone, wherever they are located and whenever they want, was highlighted as having the potential to contribute to the increased

use of ICT. For example, specifically highlighting local activity in cancer care services and how new technologies are applied can be a vital part of the learning process for health professionals, as local material is often not widely disseminated or available to those practicing in under serviced areas. It was suggested that ICT can make the delivery of this material possible to professionals wherever they practice.

A second initiative is the development of a web-based information system that could provide general information about the possible services, treatments, and supports available to cancer care patients and their families. This patient resource information could also be made available on a DVD.

A third education initiative is the development of local television broadcasts that would enable cancer centers to develop a greater media presence in their community. For example, many institutions have a captive audience in their wait rooms and many of these rooms are currently equipped with televisions. It is suggested that this presents a significant opportunity to broadcast programs that focus on patient education, fundraising and general awareness issues about cancer. This initiative has the potential for provincial and national collaboration, as it has application beyond regional or provincial borders.

Administrative applications. Many hospitals and health care institutions are currently located in aging buildings that create challenges in the delivery of health care. Therefore, there is an opportunity to explore different ways of delivering health care services. For example, an outsourcing process could be developed to identify opportunities that can be contracted to an outside vendor rather than providing the service internally. A possible activity may be the development of a website that would post opportunities and requests for internal services that would be accessible to external

providers who may be interested in matching the request. For example, rather than using internal resources for review of laboratory tests, the x-ray or lab results could be analyzed by a group external to the institution who would review the material and report back to the organization.

Chapter 5: Discussion

The survey and interviews conducted in this study assist in developing the context of ICT use in cancer care delivery in Canada. It is important to have a good understanding of the current use of ICT in cancer care services in Canada and to learn from these experiences to develop a successful ICT strategy. The discussion chapter is divided into three sections: (1) a discussion of the response rates and sample characteristics for the key informant interviews and the survey; (2) a discussion of the findings according to the study questions; and (3) a discussion of the strengths and limitations of the study. Where possible, the discussion will include comparisons and references to other similar studies.

5.1 Response Rate and Sample Characteristics

5.1.1 Key informant interviews. Interviews were conducted with ten individuals representing ten Canadian provinces. Nine of the interviewees were male and one was female and they all held senior clinical and administrative positions.

5.1.2 Survey. There was no descriptive information collected on the respondents to the survey other than information on their cancer care program which is discussed in the next section. The response rate for the survey was fairly low at 33% (representing 45 returns out of a total of 138 eligible surveys) and significantly lower than 61% which many report to be the average rate of a mail out survey (Cummings, Savitz & Konrad, 2001). The low response rate is not surprising as some suggest the most important reason for non-response is lack of time (Sudman, 1985; VanGeest, Johnson, Welch, 2007). Time is a critical factor with physicians. The specialists surveyed tend to use their time to see patients or attend to other important tasks - completing a survey is

likely not considered a critical activity to them. Another issue impacting response rate relates to the saliency of the study - physicians are more likely to respond to a study if they are interested in the research topic or perceive it to be a topic of value to their practice (Sudman, 1985). This may be also be a contributing factor to a low response rate as the use of ICT in clinical care is still basically in its infancy and therefore probably not seen as an topic of great interest to physicians. VanGeest, Johnson & Welch (2007) in their systematic review of methods to improve response rates in surveys of physicians suggest that mixed mode formats provide physicians with more choice. Despite the use of mixed modes available with this survey (i.e. mail, telephone, fax and online), the response rate remains fairly low. Some note that there is a growing consensus in the literature that lengthy field periods may be necessary to maximize physician participation (VanGeest, Johnson & Welch, 2007). This notion is supported by this study - the responses rate was nil up to three weeks after the initial mailout but this increased to 33% after five contact attempts over a 20 week time period.

5.2 Discussion of Findings

5.2.1 Current state of technology use in cancer care in Canada. Two of the research questions addressed in this study concern the state of ICT use in cancer care in Canada, specifically, the types of ICT being used in the delivery of cancer care services and the extent to which these technologies are being used. This section discusses the current state of technology use as it relates to the general use of ICT, the use of the EHR/EMR, the use of telehealth, and the extent of ICT use in the delivery of cancer services in Canada.

As noted earlier, there is a lack of research on technology use in cancer care services. This research makes a contribution to the literature in that it provides a basic understanding of what and how ICT is currently being used in cancer care service delivery across the country. This study has demonstrated that there are pockets of activity across the country where health regions are instituting a significant ICT program to support work in the cancer care system. In some regions the cancer care programs are experiencing success with the application of ICT in clinical care (e.g. the outreach clinics in BC and the teleoncology program in Newfoundland) and in education applications (e.g. Manitoba uses their telehealth network extensively for education programs). All of the regions have begun to use electronic medical/health record systems to some extent, although many are still only available within the cancer care centre.

While this study is not conclusive and the generalizability is limited by low response numbers, the environmental/contextual scan does enable us to begin to sketch out a general picture of the use of ICT in cancer care services in Canada. It has the following characteristics:

- a large majority of cancer care services are currently involved with ICT in some form;
- many users have been involved for over five years;
- less than half of the respondents indicated that their programs had formal policies and guidelines concerning the practice of teleoncology;
- the ICT systems are used predominantly for educational and clinical purposes;
- many respondents use a personal digital assistant (PDA) in their facility;
- videoconferencing is the technology used most often;

- the most common peripheral used in programs is cameras;
- the use of the telephone medical consult is still prominent;
- the most common factors contributing to the uptake of technology were funding, ease of access and user friendliness;
- the most common factors contributing to sustainability were funding, integration into health care program and incentives to participate;
- the most common factors that led institutions to adopt ICT were the presence of a local champion and the actual availability of the service (i.e. the fact it was there);
- the primary challenge to implementation of ICT is the overall level of resistance to change; and
- the primary lesson learned by those involved in ICT was the need to have technical support in place in order to deliver a successful service.

5.2.1.1 Types of ICT in use. In summary, all provinces use technology in some capacity. The type of ICT used throughout the country ranges from the simple use of telephones and fax machines to the more sophisticated use of videoconferencing and electronic medical records. The most common type of equipment used and its associated peripherals (i.e. desktop computers and videoconferencing) is not surprising and is supported by the researcher's professional experience. The most common application of technology is for clinical and education purposes where respondents primarily use desktop computers and videoconferencing.

According to the 2007 National Physician Survey (NPS) nearly 20% of family physicians or general practitioners in Canada noted that access to cancer care services for their patients was fair or poor (The College of Family Physicians of Canada, 2008).

Many of the provinces that have a distributed population recognize the power of technology as one of the means to address access issues by breaking down geographic and time barriers, and therefore use ICT as a means to provide a more efficient and better quality service to patients. Availability of personnel is a key concern for specialists and recognized as a key impediment to care (Royal College of Physicians of Canada, n.d.). To address this issue, ICT is an important vehicle to extend the reach of health personnel and to provide support to extended health care providers. For example, many of the provinces provide initiatives such as videoconferencing services to support the delivery of cancer care services. Physicians utilize videoconferencing to meet with patients thereby reducing the need for travel. They also use it to meet with other local and non-local health professionals, thereby providing support to those who are located at a distance from major cancer centres but who are assisting in the local delivery of treatment services (e.g. chemotherapy administered by family doctors in the patient's home community). It appears this support from specialists will need to continue as the recent NPS (2007) indicated that while second year residents intend to treat cancer patients as a component of their future practice, many feel unprepared to do so (The College of Family Physicians of Canada, 2009).

An important observation from the key informant interviews was that when questioned about their use of ICT, interviewees almost always referred to their experience with the EHR/EMR. Other forms of ICT usage such as the simple use of computers, or telehealth or teleoncolcogy applications, were rarely mentioned unless prompted by the interviewer. Technology use in this environment seems to be predominantly associated with electronic records; perhaps this is because older technology such as the telephone,

fax and computer have become so seamlessly integrated into routine use that people tend to overlook them.

Also noteworthy from the survey findings is the high level of PDA use by physicians (48.9%). This is consistent with the findings of Garritty and El Emam (2006) who found that in the last decade there is clear evidence of an increasing trend in PDA use. Garritty and El Emam suggest that, "The adoption rate is now at its highest rate of increase according to a commonly accepted diffusion of innovations model [Ro gers Model]" (par. 5).

EHR/EMR Use. In terms of EHR and EMR use, while most provinces do not have a full province wide health record, many individual institutions, cancer programs or regions have implemented some sort of an EMR and/or EHR, or are planning for future implementation. While most of the provinces across Canada have made a move toward implementation in their province, the adoption of an EHR by many institutions is still in its infancy (Hryniuk et al, 2008).

With respect to an EMR, a large majority (79.2%) of this study's survey respondents indicated they currently use an EMR. This is much higher than the finding from the 2007 NPS, which found that approximately half of the specialists are using electronic charts to keep patient records, although not exclusively (National Physician Survey, 2007a). While some of the interviewees in this study suggested they use an electronic record in their main cancer centre, many indicated the electronic record was supplemented by other methods for recording patient information particularly when service is delivered through their tertiary clinics. This input is also consistent with: (a) findings that 34.8% of specialists use a combination of paper and electronic charts

compared to 6.9% that use electronic charts exclusively (National Physician Survey, 2007a) and (b) the high percentage of specialists using a combination of paper and electronic charts should be seen as an indicator of hospital based practices where a hybrid of record keeping systems is often employed (Rich, 2008). Family physicians on the other hand, are more likely to use one or the other, but not a combination of both (Rich, 2008).

For those who perceived the use of an EMR to be a benefit, the most common benefit highlighted was efficient storage and retrieval. This issue of a pronounced need for efficiency is also supported by Simon, Rundell and Shortell (2005) who note that the growing population of those with chronic diseases has increased the time demand and workload on physicians, many of whom are practicing at multiple sites. The challenge of sharing clinical information and coordinating patient care can be supported by an EMR that can help in managing information across multiple sites and with multiple users.

Telehealth. One of the key application domains for ICT in healthcare delivery includes telemedicine, telehealth and eHealth (Celler, Lovell & Basilakis, 2003). A primary application of telehealth is in cancer care delivery where patients and health professionals are often working in a distributed environment. Canada's vast and distributed geography creates the need to provide more equitable and timely access to quality health care to rural and remote communities. To this end, all of the provinces and territories have embraced telehealth technologies to some degree and most provincial or territorial governments are providing a leadership role in the deployment and coordination of networks. Telehealth is also beginning to integrate with other health networks and systems (e.g. EHR) thereby improving the quality and efficiency of the

service. According to the 2007 NPS, 31.8% of specialists have telemedicine/webcasting/videoconferencing (National Physician Survey, 2007b) and 26.6% use it (National Physician Survey, 2007c).

Despite the wide distribution of telehealth networks, not all of these networks are used for cancer care purposes. This lack of use in oncology may be due to a scarcity of research on the benefits of teleoncology particularly with the adult population. As Hailey et al (2007) suggest, "Clinical applications of telemedicine have been on the rise in many areas…It is reasonable to believe that a similar growth would have occurred in oncology, but documentation of the evidence related to the benefits of teleoncology for the adult population is lacking". It is important to caution that while cancer care services may not be using the telehealth networks (which often refer to the videoconferencing networks) to a great extent, the program may still be engaging in the use of ICT in many other ways and in other eHealth applications.

Coordination. Cancer care service delivery is mainly coordinated under the jurisdiction of provincial or regional cancer care programs with most of the programs receiving provincial funding support. In British Columbia, Alberta, Saskatchewan, Manitoba, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador, coordination is provided on a provincial level. New Brunswick and Ontario have regional cancer care programs. Some provinces such as British Columbia have a very sophisticated system of care delivery utilizing networks throughout the province to deliver care close to home for patients. Smaller provinces such as PEI have more centralized programs, as most patients are able to travel the short distance to these sites without incurring significant costs related to time or travel.

*5.2.1.2 **Extent of use of ICT.*** One of the key purposes of the study was to determine the level or extent of ICT use in cancer care services across Canada. It is not surprising that the majority of those who responded to the survey were "current users" of technology as the study would obviously be more salient to them. It is worth noting that the majority of those who consider themselves "current users" of technology have only been involved with ICT for less than ten years. This is significant in that it might suggest a willingness to change practice patterns to accommodate superior delivery methods.

This significant level of use is also supported by data from the 2007 NPS which suggests that a significant number of physicians are using IT in their practice (Rich, 2008). For example, almost three-quarters of specialists rate their skill level with computers as either intermediate or advanced (National Physician Survey, 2007d). Also, 75% say they have high speed access to the Internet in their main patient setting (National Physician Survey, 2007e) and 88% indicate they have such access in other settings (National Physician Survey, 2007f). Some suggest that this data actually challenges the thinking that physicians are reluctant to embrace technology (Rich, 2008).

Education, clinical and administrative applications represent the most common uses of the ICT system at well over 80% of the time. Research applications are used slightly less frequently as the system is used two-thirds of the time for this activity. This is not surprising as the respondents generally represent cancer care centres where it is expected that service delivery is the prominent activity as opposed to research activity. Also, as clinical use is a prominent activity, more than half of the respondents indicated that the system was used for clinical purposes over 50% of the time.

5.2.2 Facilitators and barriers to uptake of ICT in cancer care delivery. It is recognized that ICT has failed to achieve the same degree of penetration in health care as it has in other sectors such as finance, manufacturing and retail. According to some researchers (Urowitz et al., 2008), successful wide scale adoption of technologies in the health care environment requires a major shift in the culture to one that supports adopting new technologies. To facilitate this shift, there must be a strong understanding of what facilitates and what challenges adoption in the health care environment. This research supports the findings of a recent systematic review of factors that influence the adoption of ICT by healthcare professionals - perception of the benefits of the innovation is the most common facilitating factor and design, technical concerns, familiarity with ICT and time are the most frequent limiting factors identified (Gagnon et al., 2011) The third and fourth research questions helped to identify these factors in this study.

5.2.2.1 Factors that led cancer care institutions to adopt ICT. One of this study's research questions focussed on the identification of facilitators that contributed to the adoption and uptake of ICT technology in cancer care delivery. Two of the most commonly cited factors that led institutions to adopt ICT included the presence of a local champion and the actual availability of the service (i.e. the fact that it was there). Gagnon et al. (2012) also noted in their systematic review of factors influencing the adoption of ICT by healthcare professionals that one of the main ingredients for a successful ICT implementation strategy in a healthcare setting is using project champions. Early adopters can have a positive impact on championing a technology and influencing and encouraging its use among colleagues. Local champions not only influence the initial promotion of the technology within an institution but often serve as the informal "expert"

or "go to person" providing assistance for new users. This support can also be provided by appropriate education and training, and ongoing technical assistance. Some interviewees also suggested the fact that the technology was present in their clinic and ready to use encouraged increased use amongst practitioners.

It is interesting to note the differences between the survey and interview responses when participants were asked to identify adoption factors. The survey provided a choice of responses and the main elements identified by respondents were funding, ease of access and user friendliness. On the other hand, the most frequently cited reasons highlighted by interviewees were availability of the service and the presence of a local champion. It is difficult to explain the differences in these responses as the same group would have been respondents in both of these research instruments. It is also noteworthy that challenges such as lack of policy, confidentiality and security were less frequently cited than others as it appears that these elements are the priorities that the general public tend to be concerned about. According to Schirdewahn (2002), while technology is well accepted by patients and providers and plays an important role in health care delivery, when supporting an expanded role for ICTs, Canadians caution they have profound concerns about the erosion of personal privacy and the security of the Internet.

The adoption of new clinical behaviours is a result of many factors with research evidence being only one (Sanson-Fisher, 2004). Research on the diffusion or adoption of innovations suggest a number of factors are involved. Rogers' theory of diffusion (1995) specifically highlights five elements of a new clinical behaviour that will partly determine whether adoption or diffusion of a new activity will occur. These elements include complexity, compatibility, trialability, relative advantage and observability (refer to Sec.

1.1). This research has contributed to the general understanding of physician technology acceptance and supports many of the elements of technology adoption that Rogers suggests will contribute to whether or not adoption is likely to occur, as discussed below.

User friendliness. Respondents and interviewees supported Rogers' notion that "complexity" would impact whether the innovation would be adopted or not. This research found that if the technology is user friendly and therefore simple and well defined it will be more likely to be adopted.

Quality of service. This notion strongly supports Rogers' element of "compatibility", that is, the technology is seen as being compatible with the needs of the potential adopters and the needs of the adopters. That is, it addresses the issue of service provision and support to rural areas that is currently perceived to be a problem particularly as it relates to quality of service.

Ease of access. Rogers' notion of "trialability" is captured in the study findings in that one of the most frequently cited factors that contributed to technology uptake was the actual availability of the service - the simple fact that "the technology was there" and available encouraged its use. Often the infrastructure was already available because of other projects. This meant that the cancer program could trial and modify the system for its own use without a huge financial layout as the infrastructure was already in place. Many interviewees also spoke about the numerous pilots that had taken place with respect to telehealth and telemedicine that provided opportunity to experiment with the technology.

Local champion. This research also suggests that local champions are an important factor in increasing adoption rates and they also impact the perceived complexity of the technology by having people present who can promote and support its use.

Quality of care. Finally, this research highlighted the issue of quality of care as a contributing factor to the adoption of technology. This ties in well with Rogers' element of "relative advantage". From a user's perspective, an opportunity to improve the quality of care for patients who have difficulty travelling because of health concerns and who can receive care closer to home through the application of ICT (e.g. telehealth) was noted as critical. Also, the fact that some areas lack a current service due to the difficulty of retaining oncologists in satellite clinics supports the adoption of technology as it has a relative advantage, that is, it is perceived as better than having no service, which is the current reality for many remote sites. Having this advantage is important from the perspective of the interests of the patient, the clinician and the health care system. On the other hand, the main site (i.e. the urban or metropolitan site) that provides the service may not perceive the innovation (i.e. telehealth) as offering a relative advantage as the health professional at this site would be providing the service anyways and it would be the patient who would have to travel. Also, in terms of the structure of the organization, relative advantage may be more likely to be seen in the remote sites, as they are more likely to be familiar with the teamwork and collaboration that is required and the role adjustments that are sometimes associated with remote practice. Users (e.g. providers) at central sites may provide more resistance as the use of telehealth requires changes to traditional practice and roles.

*5.2.2.2 **Factors that challenge the use and sustainability of ICT.*** This research has also contributed to the general understanding of some of the barriers and challenges to physician technology acceptance. The challenge related to the use of ICT in cancer care that was noted the most frequently in this study was dealing with resistance to change by health professionals. When the technology is perceived as threatening professionals' autonomy and changing their role, then resistance can be expected (Gagnon, 2005). As Walker and Whetton (2002) note, "While some studies have shown that health professionals can act as innovators there is a considerable body of research which indicates that health professionals are conservative in their approach to technological innovation" (p. 74).

Developing and implementing an ICT system in cancer care or in any other service area is a resource intensive and challenging activity. Interestingly however, technology was not mentioned as a challenge by a single interviewee. This suggests that the technology has evolved to the point where it is not negatively impacted or limited by the quality issue or trust issue that has impacted it in the past, but it is now seen as a reliable support to the delivery of health care. The challenges mentioned by respondents range from internal factors such as resistance and unwillingness to share information to external factors such as funding and connectivity issues. Introducing technology in spite of these challenges will require a solid strategy that builds on understanding how adoption occurs within an organization and among health care providers. It will involve an understanding of how structure (e.g. administrative) impacts the process and how size and complexity (e.g. telehealth system) can contribute to success or failure. "Research shows that size and complexity have a positive influence on the diffusion of technology, while

formalization and centralization have a negative effect" (Walker & Whetton, 2002, p. 74). It may be more advantageous to begin the implementation of ICT in complex but more decentralized organizations that have the potential to introduce and adopt them more easily. Also, "a formalized structure, a lack of resources and limited management support combine to reduce participants' voluntary use of telehealth techniques. The extent to which 'voluntariness' influences users to adopt or reject a technology is linked to the characteristics of the organization" (Walker & Whetton, 2002, p. 74).

The lack of adoption of facilitation factors discussed in the previous section are often the barriers or challenges that are related to adoption and use of ICT. Therefore, the challenges will also be discussed as they relate to Rogers' elements of diffusion.

Resources. The most frequently cited challenge to sustainability of the technology program was lack of funding. Funding as well as human resources were noted as challenges to ICT use. As Rogers indicates, if the change is not seen as "compatible" with existing values and needs and is therefore not funded as well as other initiatives, there will be challenges to its adoption.

Lack of integration. The lack of integration of the technology into practice was a challenge. This relates to Rogers' notion of "trialability" in that the potential intervention may have had a limited ability to be tested and modified and therefore was challenged in terms of motivation to integrate it into the clinical process. This integration challenge may also be impacted by its "complexity", the element Rogers defines as the measure of the degree to which the innovation is difficult to understand and use.

Lack of incentives, quality, infrastructure and services. The lack of support (e.g. incentives to use, technical support) was identified as a challenge to adoption by some

respondents. A strong support system is required for success in implementation. For example, quality issues may arise as a result of limited "trialability" (e.g. the degree to which the innovation can be modified). If users do not have significant input into system modifications, the quality of the service can be impacted. The lack of incentives to motivate change in practice may be impacted by the element of "observatibility" (e.g. the limited degree to which the results of the innovation are visible to others and therefore not recognized and rewarded). Health care providers may be reluctant to take the time and initiative to introduce new technology into their practice if the change is not recognized as rewarded in some manner.

Convenience and lack of access. One of the challenges identified by respondents was the issue of convenience and lack of access. This directly relates to Rogers' notion of "complexity" as he states that if the technology is difficult to understand or difficult to use, the uptake of the technology will be low. These findings are similar to some of the barriers identified in a recent literature review of physician technology acceptance (Yarbrough & Smith, 2007) that is, the challenge of dealing with the interruption of traditional practice patterns (e.g. lack of integration, convenience/lack of access) and the many challenges related to organizational issues (e.g. quality, infrastructure and services, and lack of incentives).

Resistance. Resistance was another factor cited as a challenge to the increased uptake of the technology. Many want to continue to practice the way they have been taught. For others, financial implications and the cost of technology, as well as the uncertainty regarding reimbursement for services provided through the use of technology, contributes to resistance. The resistance may be due to elements such as "complexity" -

the degree to which the new innovation is difficult to understand, "compatibility" - the degree to which the innovation is compatible with the needs of its adopters and "relative advantage" - the degree to which the innovation is perceived as better than the idea it supercedes. If the innovation is perceived as too complex, not compatible and has little advantage, it can lead to strong resistance on the part of the adopters.

Leadership. A lack of leadership is viewed as a critical challenge. If physicians and other health leaders do not buy in, it is difficult for the innovation to get any traction. The lack of leadership or desire at all levels of the organization, from administrators to physicians, to support the establishment and use of technology was considered a major challenge to its use in cancer care. Some felt that the leadership needed to come from the highest level of administration, who in turn need to promote and support technology use in order for it to be integrated into cancer care at the service delivery level. The innovation must be championed by someone who will promote the sense that the balance of power between or within professional groups will not be altered in a negative way otherwise the innovation may not be implemented. This relates to Rogers' concept of "relative advantage" in that, if the proposed change alters the power balance between/within professional groups in a negative way, it will not likely be implemented. If there is strong leadership around an innovation and it has high "visibility", others will often adopt very quickly, particularly if there are perceived disadvantages to being left behind.

5.2.2.3 Diffusion theory and its relationship to adoption of and challenges to ICT use.

A major objective of this study was to determine how the assumptions of Rogers (1995) diffusion of innovation model relate to the diffusion and adoption of ICT

that has been identified in this research. The theoretical framework proposed by Rogers (1995) is supported by others as a good model for understanding the diffusion of telemedicine (Helitzer et al., 2003). In relating the characteristics that this research noted were important to the diffusion of change to those that Rogers (1995) theory of diffusion identified as important, one can conclude that Rogers theory is well supported by the findings of this research. Other research has shown that "relative advantage" and "compatibility" in particular are important in the adoption of innovation in the health sector (Walker & Whetton, 2002). Four of Rogers elements necessary for diffusion can be supported by this research: (1) the element of "complexity" was identified, as this research found that if ICT is user friendly and has local champions who can promote and support its use, it is more likely to be adopted; (2) the element of "compatibility" can be linked to comments from this research that the technology must be seen as being compatible with the needs of the potential users and address the issue of service provision and support to rural areas where it is currently perceived to be a problem; (3) the element of "trialability" was supported as one of the most frequently cited reasons that contributed to technology uptake was the actual availability of the infrastructure from other projects that had secured it, meaning that the ICT system could be trialed and modified for its use within the cancer program without a huge financial layout for infrastructure; and (4) the element of "relative advantage" was highlighted in the lack of a current service (i.e. the difficulty of retaining oncologists in satellite clinics) that focuses attention on the advantage the innovation provides in terms of using technology to provide cancer care services at a distance and thereby enhancing patient access.

5.2.3 Best practices and lessons learned. A fifth research question related to identifying the best practices and lessons learned from the adoption of ICT in cancer care delivery. This section discusses the best practices and lessons learned from the adoption of ICT in cancer care, as highlighted by the interviewees and respondents.

Interviewees highlighted the importance of planning, stakeholder involvement and leadership that can be identified as the initiation phase of change. From the outset, there needs to be strong leadership at all levels from practitioners to administrators, as encouraging physicians to adopt the technology is a significant challenge and requires large amounts of support both from colleagues and from the organization where the users work. Gagnon et al. (2011) also recognized this and noted that one of the main ingredients for a successful ICT implementation strategy in healthcare is the use of project champions and other key staff. For some institutions, one of the major struggles they faced was the reluctance to move wholeheartedly into an EHR and as a result many continue to operate a dual system with both electronic and paper charts. This can be a very expensive duplication process and therefore leaders should "bite the bullet" and overcome the reluctance as quickly as possible.

Planning is another important element in successfully implementing the innovation. Ignoring this process is often what contributes to many pilots in telehealth and teleoncology never continuing to long term implementation or what some researchers (Kanter, 1983; Fullan 2001) identify as phase 3 of the change process - the institutionalization phase where the change gets built in as an ongoing part of the system.

Stakeholders have to be involved in the planning and implementation of the innovation. As two interviewees suggested, stakeholders have to see the innovation as

having the element of "relative advantage" as change is more likely to be embraced if it is perceived as better than the idea it supercedes. Gagnon et al. (2011) support this notion and recognize the involvment of users at different development and implementation stages as key to successful ICT implementation.

Ultimately, as Fullan (2001) notes there are no set rules but a set of suggestions or implications given the contingencies specific to local situations. The uniqueness of the individual setting is the critical factor and while we can learn from change in each of the settings that were studied, the best practices should not be seen as a blueprint for application of ICT but more as a set of guidelines for helping practitioners and planners make sense of initiating, implementing and monitoring change and innovation in their own settings.

5.3 Study Strengths and Limitations

This study had both strengths and limitations. In terms of the study's strengths, it used a mixed methods approach which helped to balance the limitation associated with any individual method. For example, the use of surveys helped balance the limitation of individual interviews with respect to emphasis on the participant's point of view (Morgan, 1988). Also, because multiple methods yield different data, a richer data set is produced. In terms of validity, the use of multiple methods allows for a cross validation of themes (Morgan, 1988) and enhances generalizability (Madriz, 2000). According to Morse (1994), different perspectives result from the use of different methods and therefore more than one method helps provide a more holistic view of the topic.

Another strength of this study is that it consisted of both qualitative and quantitative components. Specifically, the first and second research questions were addressed by the

quantitative portion and involved a pan-Canadian survey of 160 health care professionals and administrators at cancer care centers across Canada. Questions 3, 4 and 5 were addressed by the qualitative portion that involved conducting a total of ten key informant interviews with a cancer care provider from each province in Canada. In addition, both the interviews and the survey had representation from each Canadian province which contributes to the strength of this study and its associated dataset.

In terms of limitations, the study has five limitations that should be highlighted. One of the limitations of this study concerns participant involvement. It is possible that those who choose to participate in either the key informant interviews or the survey have certain characteristics (e.g. they may have had positive experiences with telehealth, be experienced technology users, have a higher education) which may result in the data being non-representative of the ICT environment, or the opinions, attitudes and choices of the wider population. In addition, recruitment bias may also extend to the Advisory Committee who assisted with identifying and engaging potential participants in the survey.

Second, interviews and surveys required self-reported responses, and as such, results may be subject to a social acceptability bias. The innovative nature of ICT and its increased activity level in the country, may cause participants to give responses that they feel they "should" (e.g. socially, morally, ethically) give, not necessarily those that reflect their actual opinions or individual decision making processes.

A third limitation of the design concerns both the level of control over the data generated and the uncertainty of the accuracy of the data generated. Using structured interviews and surveys provided an element of control but there was opportunity for open

discussion where control may have been lost. Data accuracy is a particular concern with the data generated in the interview as it was conducted in an unnatural setting (i.e. by telephone) which according to Morgan (1988) can ultimately contribute to the uncertainty about the accuracy of what participants share.

Fourth, the response rate for this survey was relatively low and may not be representative of ICT use in cancer care services in Canada. As such, it may reduce generalizability.

The fifth limitation is the limited perspective of the participants. As many of the participants had a limited knowledge of technology, the research may have yielded richer results if someone in the department of health informatics or information technology within the cancer centre had been involved. Such individuals may likely have had a much better understanding of the ICT initiatives in their provincial cancer programs than the providers and also may have had a better understanding of the barriers. A review of the caner agencies' websites may also have yielded some information on the ICT initiatives that were not identified.

Chapter 6: Conclusion

6.1 Summary of the Study

The purpose of this study was to examine the current and potential uses of information and communications technology (ICT) in the provision of cancer care services. Specifically, it reviewed the use of technology in cancer care delivery in Canada, outlined issues related to the diffusion and adoption of ICT in cancer care in Canada, and examined the potential for expanding the use of existing and emerging ICT. It used both qualitative and quantitative methods (i.e. a Canada wide survey and key informant interviews with health care professionals working in cancer care service delivery across Canada) to develop a general picture of the use of ICT in cancer care services in Canada. The study found that a large majority of respondents currently use ICT and it is predominantly used for educational and clinical purposes. Videoconferencing is the technology used most often but the telephone consult is still common. While having the technology available and a local champion that supports it encourages the uptake of the technology, resistance to change remains the primary challenge to the implementation of ICT.

6.2 Implications of the Findings

ICT has the potential to transform the delivery of healthcare, improve population health and improve the overall efficiency and effectiveness of healthcare. ICT has changed the way that medicine is currently practiced and taught. With respect to cancer care, ICT has specific implications for enhancing cancer education, research and clinical practice (Andela, 2006). The high prevalence of the disease and the rising incidence in the global population; the complexity, variable outcomes, and high burden of care; and the high motivation (due to the life threatening nature of the disease) of patients and care providers

to seek information all contribute to an opportunity for ICT to address the gaps in cancer care and the resulting disparities (Hazin & Qaddoumi, 2010; Institute of Medicine, 2010). The development of resources such as telecommunications infrastructure can provide access to information and link institutions and professionals so that the challenges of access to education, specialities, diagnostic facilities and treatment infrastructure that currently exist can be addressed.

This study has a number of implications for practitioners, administrators, researchers and educators who work within this new environment whether it be in general healthcare or specifically in cancer care. First, future physicians need to be better prepared to deal with the new type of patient they are seeing – one who is more informed than ever before. Patients increased use of ICT means they are consulting the Internet before they meet with their physician, learning more about their medical condition and networking with others (i.e. patients and specialists) around the world who also have experience with such a condition. This has resulted in a shift in the doctor-patient relationship, as physicians are no longer seen as the only ones possessing expertise about a condition. While this may be uncomfortable and perceived as threatening to some physicians, for others the increased use of ICT can mean patients are more empowered and therefore are more accountable for their health.

Second, it is important that medical students and practitioners learn to use ICT. Patients want clinicians to use ICT in the provision of care (Car & Sheikh, 2004). Medical schools and those responsible for continuing medical education programs should consider how they can integrate technology use into their curriculum and motivate students and physicians to use ICT. The use of e-learning, virtual resources and communities, simulations and 3D animations represent the plethora of new technology tools used in

teaching that educators must now consider.

Third, ICT can be used to improve the quality of care delivery and improve the organization of the health care system itself. This research has demonstrated how ICT can be particularly useful when dealing with patients who do not have access to specialists in their home community. Telehealth has provided a way to improve care delivery by enabling remote consultation, diagnosis and treatment. For example, the delivery of cancer treatment in local communities by general practitioners, overseen by specialists at a distance, has created a way to address the access to care issue. Telehealth also facilitates follow-up services if a patient has received treatment outside of their local community. Collaborative web-based protocols that are used in many areas of telehealth can also be more broadly applied to teleoncology to address challenges with professional development with care providers and patients. This has significant potential for teaching others as communities strive to develop local capacity in the face of a projected shortage of cancer care specialists. The use of ICT to develop and implement the EHR and EMR in practice has begun to improve the quality of care as access to patient information is immediately available wherever it is the patient receives their health care or their cancer service. The continued and improved use of such technology can further increase access to care and improve quality of care. Oncology can benefit from the knowledge of many other disciplines that have already developed and implemented ICT systems and demonstrated success with improved care for their patients.

Fourth, there is a need to increase activity in the policy arena as it pertains to ICT use. Policy development is required that will support the use of technology in clinical applications (e.g. telehealth, EHR, EMR), education applications (e.g. medical school curriculum, CME)

and in administrative applications (e.g. financial and human resource systems).

A fifth implication of this research relates to the challenge of having the technology available for use in clinical settings. One of the factors most frequently cited by interviewees that led to the uptake and adoption of the technology was the actual availability of the service. The development of such infrastructure has financial implications and support implications which are major challenges within systems that are already stretched with their current resources.

6.3 Concluding Remarks

One of the key developments in health care in the last 25 years is the proliferation of information and communications technologies (Heath, Luff, & Svensson, 2003). The practice of medicine, particularly cancer care, has become more complex and it is more difficult for physicians to provide the right care every time without the use of information technology support (Davis, Doty, Shea & Stremikis, 2009). Health information and communication technologies can have a critical and transforming impact on the health care sector (Chaudry et al., 2006). Information technology has been shown to improve quality of care by improving adherence to clinical guidelines, enhancing disease surveillance and decreasing medication errors. Furthermore, ICT provides the physician with the ability to document and follow-up on adverse events, contributes to the physician's confidence in their ability to manage patients with chronic diseases, and enhances their capacity to be more responsive to patients (Davis et al., 2009, Chaudry et al., 2006). Despite acknowledging its potential it is important to recognize that "eHealth is more than a technological initiative; it also requires a major paradigm shift in healthcare delivery, practice and thinking" (Wickramasinghe, Geisler, Schaffer, 2006, p.

320).

While these are developments that all of Canada's population can benefit from, it is important to recognize the unique challenges that those living in rural areas of the country experience and which ICT can impact. Those living in urban centres generally have access to large cancer care centres but those living in smaller communities, which represents about 20% of Canada's population, have a very different type of access to such services (Government of Canada, 2008). They are often managed and treated by a multi-disciplinary team that may be located in multiple locations, as their care is provided by community outreach clinics that are overseen by the cancer centres in urban settings (Hryniuk, 2008). ICT is critical to this population, as it is a tool that provides not only access to services for patients but also access for providers to the type of consultation and guidance support that those who provide treatment at a distance require. ICT is also important in urban settings, as it can provide access to information databases, help urban cancer centres support members of the treatment team who are located in rural areas, or provide access to information resources required by patients and health care providers.

The groundwork has been laid for an ICT based system in healthcare and physicians are continuing to embrace new technologies, although the uptake varies across jurisdictions and specialty disciplines (Canadian Medical Association, 2011). The latest National Physician Survey (2010), suggests that there have been significant increases in the use of information technology by physicians from 2007 – 2010. In 2010, 38% of physicians reported having paper charts only, 34% use a combination of paper and electronic records, and 16% reported the use of electronic records instead of paper charts

– all of which represent significant increases from the prior survey in 2007 (Canadian Medical Association, 2011).

In conclusion, developing a culture shift in health care regarding technology use might seem like a huge challenge but it is one that is already beginning with the new generation of medical school graduates. According to the 2010 NPS, use of electronic records and all electronic applications was most prevalent among younger physicians (Canadian Medical Association, 2011). This is not surprising - recent graduates and new entrants into medical school have no knowledge of a world without computers and very likely have no practical memory of what society was like before the Internet. Many of them already make effortless use of mobile devices both in their personal and professional lives. They have different demands and expectations of ICT use in their practice than their more experienced colleagues who have not had the same exposure to technology. Whether it is through increased exposure to technology at medical school or capitalizing on the new graduates as champions, there is an opportunity to influence the increased adoption and subsequent integration of technology in cancer care. Developing a strategy that focuses on supporting the champions that are already in practice, fostering the development of new champions currently in medical school and overcoming the types of challenges highlighted in this thesis, could provide a significant launching pad to increase the use of ICT among physicians in cancer care services.

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Appendix A
Advisory Committee Members

A. M. House, O.C., M.D., F.R.C.P.C.
Principal Investigator
Professor Emeritus, Faculty of Medicine
Memorial University

Jonathan Greenland, M.D., F.R.C.P.C.
Co-Investigator
Radiation Oncologist
Clinical Assistant Professor of Medicine
Faculty of Medicine, Memorial University

Kara Laing, M.D., F.R.C.P.C.
Co-Investigator
Medical Oncologist and Clinical Chief of Cancer Care for Eastern Health (NL)
Assistant Professor of Medicine (hematology/oncology)
Faculty of Medicine, Memorial University

Mr. Michael Mooney
Technology Consultant
Health Science Information and Media Services
Faculty of Medicine, Memorial University

Appendix B
Survey

eHealth Research Unit, Memorial University of Newfoundland
SURVEY OF USE OF ICT[1] IN CANCER CARE SERVICES IN CANADA
(MARCH 2008)

ID #

IF YOU WOULD LIKE TO COMPLETE THIS SURVEY ONLINE VISIT: www.med.mun.ca/ehru/ict.asp

Should you have any questions, feel free to contact Marian Elliott (709-777-8837 or melliott @ mun.ca) or A.M. House, M.D., FRCPC, Principal Investigator (maxhouse@mun.ca)

SECTION I – Profile

1. *Name of principal agency/institution to which your cancer care program reports:*

   _____

2. *The principal agency's/institution's affiliation (select one):*
   - ☐ academic medical centre
   - ☐ hospital based health care network
   - ☐ private company
   - ☐ regional health authority
   - ☐ independent hospital/cancer facility
   - ☐ non-profit organization
   - ☐ other specify _____

3. *Information about the organization that administers your cancer care program:*

   Program name _____

   Address _____

   City _____ Province _____ Postal Code _____

   Web address _____

4. *Within this organization, the type of facility that administers your cancer care program (select all that apply):*
   - ☐ hospital with over 250 beds
   - ☐ academic medical centre
   - ☐ cancer care facility
   - ☐ hospice
   - ☐ hospital with 100-249 beds
   - ☐ physician's private clinic
   - ☐ outpatient clinic
   - ☐ other mobile unit
   - ☐ hospital with less than 100 beds
   - ☐ nursing home/resident care
   - ☐ trauma care centre
   - ☐ other: specify _____

SECTION II – General Use of Information and Communication Technology (ICT)[1] in Your Program

5. *Describe your cancer care program's involvement with ICT (select one):*
   - ☐ past user but no longer active
   - ☐ current user (specify # of years _____)
   - ☐ considering future use
   - ☐ chosen not to use; specify why _____

6. *Select equipment/technology used in your cancer care program (select all that apply):*
   - ☐ desktop computers
   - ☐ laptop computers
   - ☐ telephony/voice over IP
   - ☐ not sure
   - ☐ videoconferencing
   - ☐ hand-held devices (e.g., cell, PDA)
   - ☐ other: specify _____

7. *Total number of active teleoncology sites (places teleoncology is conducted from):*
   - ☐ less than 25
   - ☐ 25-50
   - ☐ 51-100
   - ☐ 101-200
   - ☐ 201-500
   - ☐ 501+
   - ☐ not sure
   - ☐ not applicable

8. *Select your teleoncology program's sources of funding (select all that apply):*
   - ☐ provincial funding
   - ☐ federal funding
   - ☐ direct support from principal agency
   - ☐ fees
   - ☐ private grant
   - ☐ R & D grant
   - ☐ other specify _____

9. *Indicate whether your teleoncology program has formal policies/guidelines that govern its practice/utilization:*
   - ☐ yes
   - ☐ no
   - ☐ not sure
   - ☐ not applicable

[1] ICT: This includes technologies ranging from wireless and television to telephones (fixed and mobile), computers, software, peripherals and the Internet that are used to create, store, exchange and use information in its various forms. They facilitate communication and the processing and transmission of information by electronic means. In healthcare, the use of ICTs is commonly referred to as telemedicine or telehealth.

CLINICAL

10. Is your system used for **clinical** activities?	☐ Yes (Go to Q. 10a)		☐ No (Go to Q.11)		☐ Not sure
10a. If yes, what % of time is it used for **clinical** activities?	☐ 1-10%	☐ 11-20%	☐ 21-30%	☐ 31-40%	☐ 41-50%
	☐ 51-60%	☐ 61-70%	☐ 71-80%	☐ 81-90%	☐ 91-100%

10b. Specify the **activities** is it used for (select all that apply)	10c. Specify the **technology** used in each activity (select all that apply)				
	PACS[1]	**Store & Forward[2]**	**Audio/Tele Conferencing**	**Video Conferencing**	**Internet Conferencing**
☐ diagnosis	☐	☐	☐	☐	☐
☐ emergency services	☐	☐	☐	☐	☐
☐ mobile emergency services	☐	☐	☐	☐	☐
☐ facilitate patient/family visit	☐	☐	☐	☐	☐
☐ homecare	☐	☐	☐	☐	☐
☐ treatment planning	☐	☐	☐	☐	☐
☐ supportive care	☐	☐	☐	☐	☐
☐ patient follow-up	☐	☐	☐	☐	☐
☐ patient monitoring	☐	☐	☐	☐	☐
☐ rehabilitation	☐	☐	☐	☐	☐
☐ specialists clinics/specialist referrals	☐	☐	☐	☐	☐
☐ consultations	☐	☐	☐	☐	☐
☐ lab medicine	☐	☐	☐	☐	☐
☐ radiology	☐	☐	☐	☐	☐
☐ case conferences (e.g., tumor board)	☐	☐	☐	☐	☐
☐ other: specify _____ _____	☐	☐	☐	☐	☐

ADMINISTRATION

11. Is your system used for **administrative** activities?	☐ Yes (Go to Q. 11a)		☐ No (Go to Q.12)		☐ Not sure
11a. If yes, what % of time is it used for **administrative** activities?	☐ 1-10%	☐ 11-20%	☐ 21-30%	☐ 31-40%	☐ 41-50%
	☐ 51-60%	☐ 61-70%	☐ 71-80%	☐ 81-90%	☐ 91-100%

11b. Specify the **activities** is it used for (select all that apply)	11c. Specify the **technology** used in each activity (select all that apply)			
	PACS[1]	**Audio/Tele Conferencing**	**Video Conferencing**	**Internet Conferencing**
☐ demonstrations	☐	☐	☐	☐
☐ meetings	☐	☐	☐	☐
☐ supervision	☐	☐	☐	☐
☐ health records	☐	☐	☐	☐
☐ other: specify _____ _____	☐	☐	☐	☐

[1] Picture Archiving & Communications Systems (PACS) - the store & forward (acquiring, storing, transmitting & retrieving) of **radiological** imagery
[2] Store and Forward - includes the process of acquiring, storing, transmitting & retrieving **medical** data imagery

RESEARCH

12. Is your system used for **research** activities?	☐ Yes (Go to Q. 12a)	☐ No (Go to Q.13)	☐ Not sure
12a. If yes, what % of time is it used for **research** activities?	☐ 1-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ 41-50% ☐ 51-60% ☐ 61-70% ☐ 71-80% ☐ 81-90% ☐ 91-100%		

12b. Specify the **activities** is it used for (select all that apply)	12c. Specify the **technology** used in each activity (select all that apply)			
	PACS[1]	**Audio/Tele Conferencing**	**Video Conferencing**	**Internet Conferencing**
☐ evaluation research	☐	☐	☐	☐
☐ information gathering & dissemination	☐	☐	☐	☐
☐ protocol development	☐	☐	☐	☐
☐ data collection/analysis	☐	☐	☐	☐
☐ clinical trials	☐	☐	☐	☐
☐ other: specify_____	☐	☐	☐	☐

EDUCATION

13. Is your system used for **education** activities?	☐ Yes (Go to Q. 13a)	☐ No (Go to Q.14)	☐ Not sure
13a. If yes, what % of time is it used for **education** activities?	☐ 1-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ 41-50% ☐ 51-60% ☐ 61-70% ☐ 71-80% ☐ 81-90% ☐ 91-100%		

13b. Specify the **activities** is it used for (select all that apply)	13c. Specify the **technology** used in each activity (select all that apply)			
	PACS[1]	**Audio/Tele Conferencing**	**Video Conferencing**	**Internet Conferencing**
☐ training	☐	☐	☐	☐
☐ rounds (e.g. Grand)	☐	☐	☐	☐
☐ meetings	☐	☐	☐	☐
☐ continuing professional education	☐	☐	☐	☐
☐ conferences	☐	☐	☐	☐
☐ other: specify_____	☐	☐	☐	☐

14. Select the ***electronic peripherals*** *(i.e., electronic examination tools which interface with your ICT system) used in your cancer care program (select all that apply)*

☐ patient exam camera	☐ endoscope	☐ ECG/EKG
☐ video camera	☐ laryngoscope	☐ EEG
☐ digital camera	☐ microscope	☐ x-ray scanner
☐ document camera	☐ stethoscope	☐ PDA (e.g., Blackberry)
☐ dental scope	☐ ophthalmology related	☐ home care devices: specify_____
☐ dermoscope	☐ glucometer	☐ other: specify_____
☐ blood pressure monitors	☐ ultrasound	

[1] Picture Archiving & Communications Systems (PACS) - the store & forward acquiring, storing, transmitting & retrieving of **radiological** imagery

15. *What do you think are the main factors that contribute to the use/uptake of teleoncology (select all that apply)?*

- ☐ funding
- ☐ user friendly
- ☐ ease of access
- ☐ quality, infrastructure and services
- ☐ incentives for remote sites to participate
- ☐ seamless integration into current health care delivery
- ☐ human resources, skills and knowledge
- ☐ institutional support
- ☐ government policy
- ☐ planning (strategic and program)
- ☐ identified need
- ☐ existence of teleoncology policies/guidelines
- ☐ physicians
- ☐ health care professionals
- ☐ administrators
- ☐ other: specify_____

16. *What do you perceive as the challenges to your teleoncology program's sustainability (select all that apply)?*

- ☐ lack of funding
- ☐ lack of incentives to participate
- ☐ lack of specialist participation
- ☐ lack of policies
- ☐ security
- ☐ confidentiality
- ☐ lack of institutional support
- ☐ impact on HR (technical support)
- ☐ quality, infrastructure and services
- ☐ too difficult to learn
- ☐ convenience/lack of access
- ☐ integration of teleoncology into health care program
- ☐ other: specify_____

SECTION III – Health Records

17. *Is your cancer program currently participating in projects relating to the Electronic Health Record (EHR)[4] initiative by Canada Health Infoway?* ☐ yes ☐ no ☐ not aware

18. *What kind of health records system(s) does your organization use (e.g. Meditech/OPIS)?*
specify:_____

19. *Does your clinic currently use an Electronic Medical Record (EMR)[3]?*
- ☐ yes – specify: Name_____ & Vendor_____
  (Go to Q. 20)
- ☐ no – why: ☐ too expensive ☐ attempted to but failed ☐ no time to evaluate ☐ no perceived benefits
  ☐ other: specify_____
  (Go to Q.21)

20. *What do you feel are the benefits of your EMR (select all that apply)?*
- ☐ no benefits ☐ improved patient care ☐ efficient storage/retrieval of patient info
- ☐ increased productivity ☐ good vendor support ☐ improved communication with external facilities
- ☐ comprehensive features and functionality ☐ other: specify_____

SECTION IV – Other

21. *Other comments* _____

THANK YOU

[4] EHR: An electronic health record (commonly known as an EHR) is a secure and private lifetime record of an individual's health and care history, available electronically to authorized health care providers.

[3] EMR: A software system that securely maintains electronic health information for patients at a clinic or practice. The EMR incorporates the electronic chart that is used by the physician to store, retrieve and process information related to patient care. The EMR may include other administrative aspects such as billing and scheduling. A networked EMR may provide access to a patient's broader EHR.

Appendix C
Interview Protocol

The Use of Information and Communications Technology in the Delivery of Cancer Care Services in Canada

1. PROVINCIAL PICTURE
   - Can you describe how cancer care is delivered in your province using information and communications technology?

2. ADOPTION FACTORS
   - What factors led your cancer care institution to adopt various ICT?

3. CHALLENGES
   - What are/were some of the challenges related to the use of ICT in cancer care?

4. BEST PRACTICES/LESSONS LEARNED
   - What are some of your best practices and lessons learned as they relate to the adoption of ICT in cancer care?

5. POTENTIAL
   - What is the potential for expanding the use of existing and emerging ICT in cancer care services?
   - What is your wish list in terms of technology use in cancer care services?

6. OTHER
   - By targeting primarily cancer clinics in this study, are there other groups we may have missed (e.g. other cancer therapy groups outside cancer centres such as haematological oncologists, dermatology, surgical groups – urologists, plastic surgeons)?
   - Do you have any suggestions/feedback about the study or anything that you would like to add?

Appendix D
Survey Cover Letter

Survey ID Number

Faculty of Medicine

eHealth Research Unit
Level 1, Room 1775
The Health Sciences Centre, 300 Prince Philip Drive
St. John's, NL Canada A1B 3V6
Tel: 709 777 8837 Fax: 709 777 8838

March 7, 2008

Dear XX:

In Canada, we currently do not have a good understanding of what information and communication technologies (ICTs) are being used and how they are being used in the delivery of cancer care. The Lawson Foundation of London, Ontario, has provided funding to the eHealth Research Unit at Memorial University to help fill this void by conducting a comprehensive scan of the use and context of ICTs in the delivery of oncology services in Canada. We invite your participation.

The survey questionnaire, a copy of which is enclosed, is being sent to key Health Care Professionals and Administrators at Cancer Centres across the Country. It also includes a few questions on the use of electronic health records in the delivery of cancer services. We recognize that the language of telemedicine and teleoncology is still developing and we hope you will make allowance for this.

The survey can be returned in the self-addressed envelope provided, faxed to 709-777-8838, or completed online at **www.med.mun.ca/ehru/ict.asp** by **March 31, 2008**. To ensure confidentiality, your survey has an assigned ID number which will allow us to determine who has completed the survey without being able to identify respondents to individual surveys. If you would like to participate in a telephone interview on this topic at a later date please indicate your contact information on the back of the enclosed postcard and return it to us.

Participation is voluntary and confidentiality will be ensured. Consent to participate is implied via completion and return of the survey. Should you have any questions, feel free to contact us through Marian Elliott (709-777-8837 or melliott@mun.ca

We will make the results of the survey available to all participants as soon as possible after the completion of the survey.

Your completing the survey will provide valuable input to our collective understanding of the current and potential use of ICTs in cancer care. We look forward to your early response.

Yours sincerely,

Kara Laing, M.D., FRCPC
Director of Medical Oncology

Jonathan Greenland, M.D., FRCPC
Radiation Oncologist

A.M. House, O.C., M.D., FRCPC
Principal Investigator
Professor Emeritus and
Honorary Research Professor

Janice Cooper, B.A., B.S.W.,
MSc Student

Appendix E
KII Participation Postcard

eHealth Research Unit
Faculty of Medicine
Memorial University of Newfoundland
Health Sciences Centre
St. John's, NL A1B 3V6

If you are interested in participating in a telephone interview to discuss the use of ICTs in Cancer Care please provide the information below.

Name:

Province:

Phone:

eMail:

Appendix F
Survey Reminder Postcard

eHealth Research Unit
Faculty of Medicine
Memorial University of Newfoundland
Health Sciences Centre
St. John's, NL A1B 3V6

Recently, you received a survey in the mail re. the Use of ICT in Oncology Services in Canada. It would be greatly appreciated if you would complete this survey and send it back to us in the envelope provided. If you have already returned the survey, thank you, and please ignore this reminder card.

«Prefix» «First_Name» «Last_Name»
«Title_»
«Company»
«Address_»
«City», «Province»
«Postal_Code» «Next Record»

Appendix G
Reminder Letter

Faculty of Medicine

eHealth Research Unit
Level 1, Room 1775
The Health Sciences Centre, 300 Prince Philip Drive
St. John's, NL Canada A1B 3V6
Tel: 709 777 8837 Fax: 709 777 8838

March XX , 2008

Dear :

Re: Newfoundland Labrador Teleoncology Program (Teleoncology Program)

The Newfoundland Labrador Teleoncology Program which saw the concept phase begin in early 2003, has just been completed and we have prepared a report of the project's external evaluation for those organizations, agencies or individuals who contributed to the funding and/or who participated in the implementation of the Program.

The main objectives of the Teleoncolcogy Program were to bring to the Provincial cancer care system the following benefits:

- **Enhanced access to clinical services**: The program will provide patients in geographically dispersed areas with faster and more effective access to provincial or regional clinical services. It will also provide regional cancer care teams with more direct access to resources in the St. John's site.
- **Enhanced access to support services**: Access to a wide variety of cancer support services would be enhanced, leading to benefits for patients and their families closer to home.
- **Enhanced public access to education and knowledge**: Will provide wider scale access to cancer related educational programs and information services for cancer patients, their families and the public.
- **Reduction in travel costs**: The provision of the opportunity for patients to receive clinical and support services much closer to their community could reduce the costs to the patient and their families (both in terms of time and finances), as well as reducing the costs to the health care system.

- **Enhanced education and knowledge for cancer care teams in the regions**: The program will improve the informational and professional resources available to the regional teams, as well as providing an opportunity for regular interaction and education.
- **A validated model that could be utilized in other primary health care areas (e.g. diabetes management, pulmonary and kidney disease, arthritis):** The service delivery and support model, could be transferable to the enhancement of primary health care service delivery to rural communities in a number of different areas, particularly those currently dealing with shortages of health care professionals outside the urban areas.

A copy of the Executive Summary of the Program's Evaluation Report, done by the Health Research Unit (HRU), Faculty of Medicine, Memorial University, is attached for your information. The complete Evaluation Report can be accessed at www.med.mun.ca/eHRU/pages/projects.asp.

The Evaluation Report noted:

- Widespread support and satisfaction with the use of telehealth services to deliver oncology services. The Teleoncology Program was found to be acceptable to both patients and health care providers in the delivery of clinical services, as well as a substantial resource for continued education programs, particularly to health professionals practicing in rural and remote areas of the Province.
- A list of ways to improve the problems which were identified.

Since June 2006 when Newfoundland Labrador Centre for Health Information assumed responsibility for the direction of the clinical program they, and participating agencies, have made considerable progress.

The Survey (The Use of ICT in Cancer Care Services in Canada) in which you have recently been invited to participate was initiated as a result of the positive impact of the Teleoncology Program. (In the event that you are interested in completing the survey, but have not had the opportunity to do so, we are resending a copy for your convenience. If you have already returned the survey thank you.)

If you wish you may obtain additional information on the Teleoncology Program by accessing the eHealth Research Unit Web Site at [www.med.mun.ca/eHRU/pages/projects.asp] or by contacting the undersigned.

Sincerely yours,

A.M. House, O.C., M.D., FRCPC
Professor Emeritus and Honorary Research Professor
Principal Investigator

e-mail: maxhouse@mun.ca
Tel: (709) 777-8837
Attachment

Appendix H
Survey Reminder e-Mail Letter

From: Elliott, Marian
Sent: April 9, 2008 3:10 PM
Subject: FW: RE: Survey - Use of ICT In Cancer Care Services in Canada (March 2008)

This message is being sent by bcc function.

Good Afternoon:

On March 7, 2008 a copy of a Survey, the "Use of ICT in Cancer Care Services in Canada" was mailed to you. Even though the indicated deadline was March 31 your participation would still be appreciated.

In the event that you are interested in completing the survey, but have not had to opportunity to do so, attached is a copy of the letter and survey for your convenience. The Survey can be sent back via mail, fax, or completed on line – **www.med.mun.ca/ehru/ict.asp**

If you would like to complete on line please use the ID number which was assigned to you – this was displayed on the top right hand corner of the survey. (If you do not have the original survey just let me know and I will forward your ID number to you).

If you have already returned the survey thank you.

Marian Elliott

Marian Elliott
Secretary
e-Health Research Unit
Faculty of Medicine
Memorial University of Newfoundland
Level 1, Room H1775, Health Sciences Centrre
300 Prince Philip Drive, St. John's, NL A1B 3V6
Tel. (709)777-8837 Fax (709) 777-8838
e:mail: melliott@mun.ca

Appendix I
Survey Reminder Fax Letter

eHealth Research Unit
Faculty of Medicine
Fax: (709) 777-8838

ATTENTION

This facsimile may contain PRIVILEGED AND CONFIDENTIAL INFORMATION only for use of the Addressee(s) named below. If you are not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, please be aware that any dissemination or copying of this facsimile is strictly prohibited. If you have received this facsimile in error, please immediately notify the sender to arrange for the return or destruction of this document. Thank you for your cooperation.

Date: April 17, 2008	
Fax To: Dr.	
NO. OF PAGES (INCL COVER): 8	**FAX NO:**
FROM: MARIAN ELLIOTT (FOR DR. A.M. HOUSE)	**TELEPHONE #:** 777-8837

	Urgent		**Confidential**		**For Review**		**Please Comment**

Dr. XX:

On March 7, 2008 a copy of a Survey "The Use of ICT in Cancer Care Services in Canada" was mailed to you. The indicated deadline was March 31 but your participation would still be appreciated. The survey can also be completed on-line @ **www.med.mun.ca/ehru/ict.asp (your ID number is xxx).**

Your completing the survey will provide valuable input to our collective understanding of the current and potential use of ICTs in cancer care.

Thank you in advance for your response.

IF YOU ARE NOT THE APPROPRIATE PERSON TO COMPLETE THIS SURVEY, WOULD YOU KINDLY FORWARD IT TO THE APPROPRIATE PERSON IN YOU ORGANIZATION OR REGION. THANK YOU.

Marian Elliott **(for Dr. A.M. House)**
Secretary
e-Health Research Unit
Faculty of Medicine
Memorial University of Newfoundland
Level 1, Room H1775, Health Sciences Centrre
300 Prince Philip Drive, St. John's, NL A1B 3V6
Tel. (709)777-8837 Fax (709) 777-8838 e:mail: melliott@mun.ca

Appendix J
Key Informant Interview Telephone Script

Prior to the start of the interview

Hello _____

My name is Janice Cooper and I am calling from the e-Health Research Unit at Memorial University. I am calling about a survey on the use of information and communications technology or ICT in the delivery of cancer care services. Thank you for agreeing to participate in the interview this morning/afternoon/evening.

Before proceeding any further, I would like to read the following consent statement to you to make sure that you understand our study.

The e-Health Research Unit wants to gather information about the use of ICT in providing cancer care services and is trying to develop a profile of this across the country. Your name has been provided to us as someone who has a sense of what is happening in cancer care services in your province. This interview will only take about 30 minutes to complete.

The interview will be audio taped and transcribed. All personal information will be deleted from transcripts and your identity will be kept in strict confidence. Of course, at any time you may refuse to answer any questions. The information may also be used as part of my research thesis for graduate studies.

In summary, your participation will help us develop a sense of the landscape in terms of cancer care provision in Canada and understand what the challenges and facilitators are to people using technology in the delivery of this service.

Would you mind answering these questions now?

Thank you.

After the interview

Thank you for your time and participation.

Appendix K
Letters of Request and Approval – Human Investigation Committee

MEMORIAL

Date: 12 August 2008

To: Ms. Janice Cooper, M.Sc. (Med) student in Applied Health

From: Donald W. McKay, Associate Dean

Re: Human Investigations Committee approval for your thesis project

I am writing this memorandum at your request. This memo confirms my understanding that Human Investigations Committee (HIC) approval is not required for your thesis programme provided that:

1) Your thesis programme is limited to the project entitled: "An Environmental Scan of the Current and Potential use of Information and Communication Technologies in the Delivery of Oncology Services in Canada" whose Principal Investigator is Dr. M. House

2) The aforementioned study is not altered in such a way that HIC approval is required.

My understanding is based on the 12 March 2008 e-mail that you received from Dr. Richard Neuman, HIC Co-chair, in which he states: "As the main project does not require ethics review and there is no change in what you will be doing then you will not require ethics review for your piece of the project."

Donald W. McKay, Ph.D.
Associate Dean
Research and Graduate Studies
Faculty of Medicine

RE: HIC request - Janice Cooper
Wed, March 12, 2008 9:27:36 PM

From: "Richard.Neuman@med.mun.ca" <Richard.Neuman@med.mun.ca>
To: jcooper@nl.rogers.com
Cc: hic@mun.ca; Linda.Purchase@med.mun.ca

Janice:
I did receive your email but it got buried in my inbox. As the main project does not require ethics review and there is no change in what you will be doing then you will not require ethics review for your piece of the project.
I would print out my email and keep it for your records.
Sorry for the delay in responding.

Richard Neuman, Ph.D.
Professor of Pharmacology
Co-Chair, Human Investigation Committee
Faculty of Medicine
Memorial University
St. John's, NL
A1B 3V6
P-709-777-6887
F-709-777-7010

From: Janice Cooper [mailto:jcooper@nl.rogers.com]
Sent: Wed 3/12/2008 8:06 PM
To: Neuman, Richard; hic@mun.ca
Cc: Elliott, Marian
Subject: HIC request - Janice Cooper

Dr. Neuman, I understand HIC has recently moved and since I haven't heard back from anyone yet regarding this request, I thought I should resend it since it may have been misplaced in the shuffle of things. Please see message below.

Janice

Janice L. Cooper
jcooper@nl.rogers.com

----- Forwarded Message ----
From: Janice Cooper <jcooper@nl.rogers.com>
To: rneuman@mun.ca
Cc: hic@mun.ca; Max House <maxhouse@mun.ca>; Marian Elliott <melliott@mun.ca>
Sent: Monday, March 3, 2008 9:33:56 AM
Subject: Fw:

Dr. Neuman, I dropped by the HIC office last week and they suggested that I contact you directly. I am a grad student (Community Health) who has recently decided to work on the Lawson Project (principal investigator - Dr. House) that is looking at the use of information and communications technology in the delivery of cancer care services. The project submitted a letter to HIC last year and was told that ethics approval was not required (see attached).

I am wondering what we need to do now that I have become involved as a students who will use some of the work as part of my graduate thesis. The project has not changed in any way from the original intent and my involvement will be with the surveys and the key informant interviews. Do I write a letter to attach to the file to note my involvement or do I need to submit an application? Note that both Dr. House and Dr. Neville are on my supervisory committee.

Thanks.

Janice

Janice L. Cooper
jcooper@nl.rogers.com

MEMORIAL UNIVERSITY St. John's Campus

Faculty of Medicine

[redacted]
www.med.mun.ca/hic

July 5, 2007

Reference #07.105

Dr. A.M. House
Principal Investigator, Newfoundland Teleoncology Program
Professor Emeritus/Honorary Research Professor
Faculty of Medicine
Memorial University of Newfoundland

Dear Dr. House:

Your application entitled "**An Environmental Scan of the Current and Potential use of Information and Communication Technologies in the Delivery of Oncology Services in Canada**" was reviewed by the Co-chair of the Human Investigation Committee and concluded that ethics approval from the HIC is not required for this project.

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

JDH;RSN\jed

(July 18/07)
C. Amy C. Dr. K. Laing
Cathy P. Dr. J. Greenland
Trish D.

C. Dr. K. Laing - June 18/
" A. Caison - " "

MEMORIAL UNIVERSITY St. John's Campus

Faculty of Medicine

May 31, 2007

Reference #07.105

Dr. A.M. House
Principal Investigator, Newfoundland Teleoncology Program
Professor Emeritus/Honorary Research Professor
Faculty of Medicine
Memorial University of Newfoundland

Dear Dr. House:

This will acknowledge your email request for approval in principle of the research study entitled "**An Environmental Scan of the Current and Potential use of Information and Communication Technologies in the Delivery of Oncology Services in Canada**", please be advised that the Co-Chairs of the Committee have reviewed your request and commented as follows:

Because of the circumstances surrounding the funding of this study, the Co-chairs have granted approval in principle, of the application, **for a period of three months.** A formal application will have to be completed to the Human Investigation Committee for a detailed review before the study continues.

A detailed application and proposal must be received by the Human Investigation Committee no **later than September 1, 2007** for full board review. *If we do not receive the application on or before that date, the appropriate individuals will be notified and approval in principle will be revoked immediately, ceasing any further activity on this research project.*

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

C Ms. Debbie Barnes, Grants Coordinator
Office of Research