McMaster eBusiness Research Centre

# A Comparison of Telehomecare Delivery Models for Congestive Heart Failure In Three Canadian Jurisdictions

By

Carina Andreatta and Ann McKibbon

McMaster eBusiness Research Centre (MeRC)

**WORKING PAPER No. 52**
**April 2015**

# A COMPARISON OF TELEHOMECARE DELIVERY MODELS FOR CONGESTIVE HEART FAILURE IN THREE CANADIAN JURISDICTIONS

*By*

**Carina Andreatta and Ann McKibbon**

**MeRC Working Paper #52**
April 2015


**DeGroote School of Business**
**McMaster University**
**Hamilton, Ontario, L8S 4M4**
**Canada**

mckib@mcmaster.ca

## ABSTRACT

The quality of health care is suffering as Canadians are experiencing a rise in chronic diseases, adding pressure to the existing inefficient health care delivery system and contributing to the increase in health care costs. Advances in information technology and e-Health initiatives have enabled the creation of Remote Patient Monitoring (RPM), which assists individuals in self-managing their own chronic diseases; this paper discusses three Canadian RPM implementations in Ontario, British Columbia and Alberta that support self-management for patients suffering from congestive heart failure (CHF).

The Ontario Telemedicine Network (OTN) acts as project manager to a province wide Telehomecare Expansion Project; the project allows Local Health Integrated Networks (LHINs) to run a telehomecare (THC) program through appropriate host organizations, such as hospitals or Community Care Access Centres (CCACs). In British Columbia (B.C.), the Vancouver Island Health Authority (VIHA) plans, manages and delivers Home Health Monitoring (HHM) to residents living in the region. HHM is a THC collaboration between the VIHA Home and Community Care and the Heart Health Departments. Both the OTN THC Expansion Project and the B.C. HHM programs utilize Telus Health RPM as a solution to enable home care for patients with CHF. In Alberta, health care is planned and provided through Alberta Health Services. In partnership with GE Health Solutions, Alberta Health Services established the MyHomeHealth Program to remotely monitor patients with CHF. The OTN and VIHA THC projects yielded significant decreases in hospitalizations, length of stay and improved patient satisfaction and self-management abilities. The MyHomeHealth Program has made no progress since its establishment.

THC is an effective way for people with CHF to self-manage their chronic conditions, and improve their quality of life. The evaluations discussed in this paper provide evidence that THC leads to reductions in provincial health care costs; however, independent evaluations of actual costs should be conducted to provide transparency on funding allocations. For these reasons, all Canadian jurisdictions should investigate implementing a THC Delivery Model that is suitable to their health care system framework.

## LITERATURE REVIEW

Over the past decade, the Canadian health care system has been transforming how it delivers care to its patients. Population ageing is occurring because of longer life expectancies and older people are more prone to developing (often more than one) serious chronic illnesses. Consequently this has led to many people living longer with chronic illness(es). This increase in the number of patients has created the need for more efficient, accessible and cost-effective health care delivery. More than half of Canadians are living with at least one chronic disease, and more than one in four Canadians has two or more chronic conditions[1]. Five percent of patients account for two-thirds of health care costs; these are usually patients with multiple chronic conditions who are in need of more efficient care[2]. In 2010, the economic burden of chronic diseases in Canada reached $190 billion, which is more than 42% of direct Canadian health care costs[3], revealing an unsustainable health care system. Information technologies can improve health care delivery by allowing health care clinicians to continuously monitor their patients[2]. More than 80% of chronic disease management is self-care and people with chronic diseases want to become active participants in managing their health[4-5], but lack the appropriate skills and tools necessary to do so. It has been proven that technologies can be utilized as a way for patients with chronic diseases to self-manage their chronic conditions or illnesses[5]. THC programs can increase patient self-management behaviours leading to a higher quality of care at a perceived lower cost for each Canadian jurisdiction and the patient[4].

Telehealth by definition is a component of e-Health where the information or data generated through the related discipline of health informatics are used in some form of direct or indirect interaction with a healthy citizen, ill patient or health care provider in any location[6]. Telehealth encompasses all remote health interactions; it refers to providing care and support to patients with different conditions, educating and training health care providers and conducting administrative meetings[6-7]. Telemedicine specifically refers to remote clinical programs and services, which includes telehomecare, teledermatology and telepsychiatry[7]. COACH (Canada's Health Informatics Association) defines THC as a program that offers remote monitoring and interactive recognition support for patients with chronic illnesses. Home-based monitoring devices provide services to those seeking care in their place of residence to improve and manage health; the devices are used to monitor vital signs such as pulse, blood pressure, blood sugar levels and weight and to transmit data securely for review and assessment by a clinician in another location[8-9]. In addition to remotely monitoring the patient, the clinician teaches the patient how to properly manage their chronic disease through coaching sessions; the sessions involve setting goals that will help achieve greater health[4-5]. RPM is the technological application or device, specifically the electronic transmission of patient data to a provider[10]. THC, also referred to as home telehealth, RPM and HHM is a part of a patient-centred care model and enables shared decision making between the provider and his or her patient[11].

Historically, telehealth and THC focused on improving access to care for those in rural and remote areas[11]. Now, the focus has shifted to quality improvement and health care sustainability in both rural and urban areas[12]. Congestive heart failure (CHF) is a chronic, progressive condition in which the heart muscle is unable to pump sufficient blood to meet the body's need for oxygen and nutrients[12]. When the heart muscle is weakened, it compensates by developing more heart muscle or pumping faster and diverting blood away from less important tissues to maintain blood flow to

more vital organs[12]. A THC meta-analysis revealed CHF to be one of the top three most common chronic diseases between 2001 and 2007[4]. Patients with CHF must engage in daily self-care behaviors that include checking blood pressure and blood oxygen levels, and weight to ensure the body is functioning properly despite a decreased blood flow[7,10,11]. The THC meta-analysis generated a moderately positive relationship between telehealth and CHF outcomes; none of the studies found significant negative outcomes[4]. THC in patients with CHF is practical if the THC program can efficiently follow the patient remotely through RPM technology, is easy to use, accepted by both the patients and clinicians and is economically feasible[13]. THC is clinically proven to be an efficient, timely and seemingly cost-effective way for individuals to self-manage their chronic disease(s)[4,14,15]. This program has resulted in a significant reduction in unnecessary hospital admissions and has a positive impact on chronic disease management, specifically for patients with CHF[9,14-16].

This paper will compare three THC programs designed for patients with CHF. CHF is the leading cause of hospitalization for people over the age of 65, has a six-month hospital readmission rate of 50% and one-year mortality rates as high as 40% after diagnosis[15]. CHF can create a poor quality of life and short life expectancy and a high mortality rate[11]. In industrialized countries, the direct costs of CHF treatment account for two to three percent of total health care expenditures[13]. In Canada Health Infoway's evaluation of existing THC programs, strong evidence suggests that THC can lead to reductions in emergency room visits, decreases in hospital admissions and increases in patient satisfaction and quality of life[10]. Additional evidence relating specifically to patients with CHF related issues showed reductions in the length of stay for patients were readmitted to the hospital, improvement in self-management, early-detection of complications after the hospital stay and a maximization of clinician efficiency[17].

Canada Health Infoway's RPM Framework (Figure 1) outlines the four stages of RPM. The objective of a THC program is to improve and sustain a patient's health while still at a low risk of hospitalization, by providing information relating to a patient's condition through information websites and patient portals (e.g. a care plan or a medication regime) and by providing self-monitoring programs where a patient can report health information to a provider through enabling technology[10]. An early intervention by the THC program can slow down or eliminate chronic disease progression into stages that eliminate self-monitoring and require constant supervision from a health care clinician (e.g. assisted and environmental monitoring); these stages involve significantly more healthcare human resources and funding[10]. THC can provide a more accurate picture of a patient's health as more data can be collected over a shorter period of time than traditional care[9]. According to the 2013 Canadian Telehealth Report[9], THC endpoints or points where THC is being delivered or being received, have increased across Canada since 2010; however, the rate of growth in THC is still below the rate of growth for telehealth services overall.

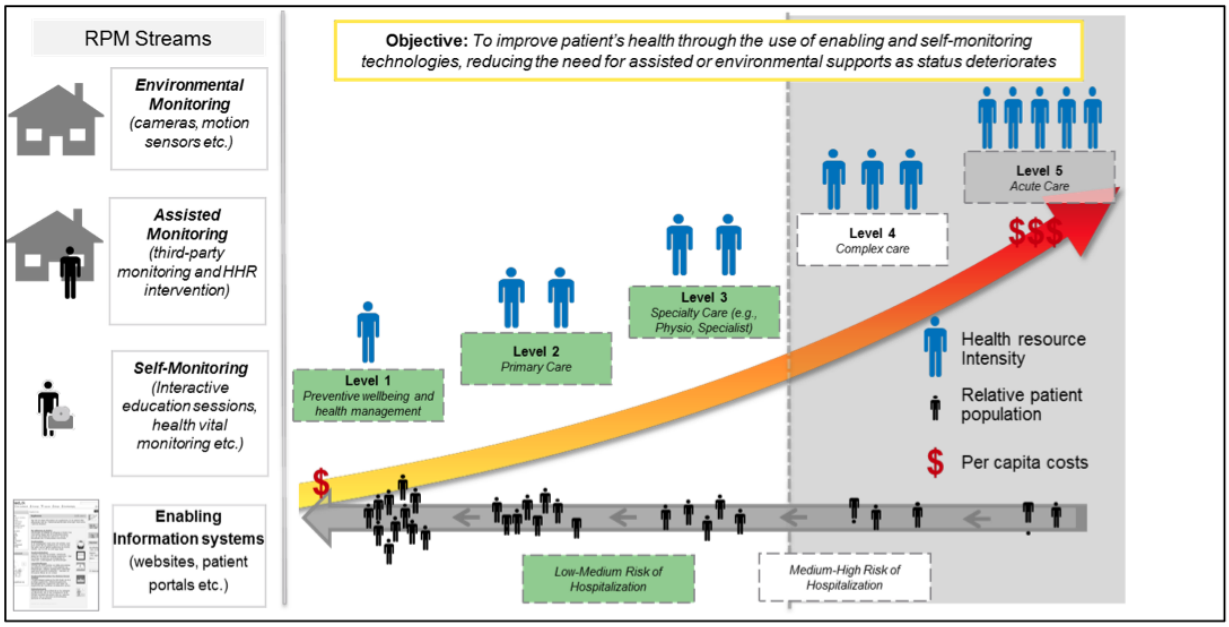



**Figure 1: Canada Health Infoway RPM Framework[10].**

In Ontario, individuals receiving the THC service are referred to as patients and in B.C. they are referred to as clients. The Telus Health RPM Solution mentioned later in this paper is comprised of two components: patient software that connects medical devices to a PC, laptop or tablet and clinician software that displays all home care patients in one view or "dashboard" at the clinic. The Telus solution allows clinicians to create individualized care plans, view past, present and future interventions and capture data and standardize THC processes[18]. The solution also has best-practice guidelines and customized alerts and reminders for both the clinician and patient[18].

## RESEARCH OBJECTIVE

THC is a viable solution for patients managing chronic diseases, contributes to efficient and cost-effective health care delivery and sustainability, so it is worth investigating[19]. In 2013, THC programs had been established in British Columbia, Ontario, Quebec, New Brunswick and the Yukon Territory[9]. The THC program delivery models differ among the Canadian jurisdictions. Since the release of the 2013 Canadian Telehealth Report[9], other THC programs have come into fruition. The objective of this research is to evaluate the THC delivery models for CHF that have been implemented in the Ontario THC Expansion Project, the Vancouver Island Health Authority (VIHA) THC HHM Program and the Alberta MyHomeHealth Program. The models will be compared on the following indicators: pilot project adoption, clinical effectiveness, and eligibility criteria for patients or clients interested in THC, delivery process, program structure, privacy, roles and responsibilities, and funding.

### Ontario Telemedicine Network (OTN)

The OTN is an independent, not-for-profit organization, funded by the Ontario Ministry of Health and Long-Term Care (MOHLTC); it is responsible for developing and supporting telemedicine

solutions in Ontario that enhance health care quality[7]. The OTN is one of the largest telehealth networks in the world; it is the OTN's mission to achieve mainstream telemedicine adoption from health care providers and organizations across Ontario[7,14]. The OTN is constantly expanding; currently they offer many telemedicine programs including THC, telepsychiatry, telestroke and a telemental health and addictions program[7]. Their original mandate was to support remote clinical operations by providing communication services to link local care providers with specialist supports in large urban facilities. These services have been used extensively to support clinical education; currently their largest user of clinical services is telepsychiatry and telemental health.

**Telehomecare Pilot Project**

In 2007, the OTN launched the Phase One - THC Pilot Project, one of the largest THC programs in Canada to date[14]. The THC Pilot Project focused on chronic disease management and patient self-management, specifically for patients with CHF and chronic obstructive pulmonary disorder (COPD)[14,20]. The OTN, founded on evidence-based research, estimated that the pilot project would empower patients to live healthier lives with their chronic conditions resulting in significant savings on government health care expenditures[14].

The OTN ran the THC Pilot Project through eight Ontario Family Health Teams and enrolled 813 patients; the pilot provided THC for an average of four months to patients with either CHF or COPD[14,21]. After the pilot implementation, the OTN[14] conducted a formal evaluation and rated the pilot as a success. The evaluation demonstrated that Family Health Teams who utilized physician champions to promote THC and support patient engagement and those who collaborated with other providers had a higher rate of adoption than those who did not. All of the Family Health Teams demonstrated positive impacts with THC on patient quality of life and chronic disease self-management[14]. To improve the Ontario THC delivery model the process needed standardization to maximize efficiency and the OTN needed to exercise change management methodologies to maximize adoption for providers and patients[14].

The pilot was a success, but the Family Health Teams could only provide THC access to patients enrolled with their providers. [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4] The OTN decided to expand to a LHIN wide THC service delivery model that would expand access to all health care providers across Ontario[21]. Ontario is made up of 14 local health integrated networks (LHINs) that plan and fund health care for their specified regions[22]. In the THC LHIN-wide delivery model, the OTN would act as project manager for the THC projects in each LHIN; the THC would be delivered through a host organization within that LHIN, either a CCAC or hospital[14].

**Telehomecare Expansion Project**

The THC Expansion Project started in 2010; it is one of three RPM programs in Ontario and as of March 2015, the project has enrolled approximately 4,600 patients[10,21].[Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4] The THC Expansion Project has three strategic goals[14]: to offer support to patients living with complex chronic diseases; to create a new provincial chronic disease management care model through existing resources and providers and to create a continuum of care through collaboration. Currently, the expansion project only enrolls patients with CHF and COPD; however, upcoming pilot projects for people with diabetes and for people who need post-acute care are in development. [Wilson, Rhonda. Conversation with: Carina

Andreatta. 2015 March 4] The MOHLTC provided funding for three LHINs to implement THC programs in their corresponding host organizations, Toronto Central LHIN and its Community Care Accesss Centre (CCAC), North East LHIN and its CCAC, and the Central West LHIN and the William Osler Health System[20]. Currently, seven of the 14 LHINs and a total of eight host organizations administer THC programs. In addition to the three LHINs previously listed, the new projects are the Central LHIN and its Southlake Regional Health Centre and its CCAC; North West LHIN and its CCAC, Erie St. Clair LHIN and its CCAC and the North Simcoe Muskoka LHIN and its CCAC[20].

**Patient Eligibility**

A patient registered with THC Expansion Project can participate in a free three to six month program if he or she meets the OTN eligibility criteria[23]. The MOHLTC will fund patients who are over 18 years of age; residing in Ontario; living with COPD or CHF, have had frequent emergency room visits or hospital admissions in the past year due to their conditions; are capable of learning and understanding instruction or have assistance from a care provider and live in a residential setting with access to a functional telephone line[20]. The host organization (usually a CCAC or hospital) will accept THC program referrals from a specialist, primary care provider or a patient self-referral[23].

**Delivery Model**

The OTN's THC delivery model strives to make self-care easy to manage for the patient, their families and the provider, and the model encourages patient empowerment[14]. The host organization delivers the THC equipment to a patient's home (on loan); the equipment requires the use of a phone or the Internet for a short period of time each day[14,20]. The patient, in his or her home, is connected to a registered clinician through the THC equipment. The technology, consisting of a tablet, blood pressure cuff, scale and pulse oximeter is mostly touch screen and user-friendly[14,20]. Patients submit vital signs and answer short health questions each day through the Telus Health RPM solution[12]. The RPM solution receives the patient's data and based on the condition and clinical protocols and evidence, provides the THC clinician with a snapshot of the patient's health status[10,18].

**Clinician Training, Resources and Support**

All of the THC clinicians have specialized training in chronic disease management and health coaching; the clinicians follow the Stanford Model for Chronic Disease Self-Management to help patients monitor and control their chronic conditions. The self-management techniques included in the model are how to deal with emotional stress caused by their condition (e.g. frustration, anxiety), how to exercise appropriately with their condition, medication management, nutrition and how to communicative effectively with others in their circle of care [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4] The coaching sessions occur on weekdays and last approximately seven minutes; the sessions are educational for the patient and their families and are considered an integral part of chronic disease self-management. The coaching sessions also provide an opportunity for the clinician to assist patients in setting goals that align with his or her personal interest and beliefs[20]. The ultimate goal of the THC sessions is to demonstrate to the patient that self-care is easy, their involvement is important, and goal setting can lead to improved health outcomes[20]. Each THC clinician has a caseload of approximately 50 to 75 patients; the THC

clinician will monitor a patient's health status electronically and will notify the care team of any substantial health status changes[14-15].

All of the OTN THC clinicians must complete a THC curriculum to certify that they are equipped with the appropriate skills and up to date nursing best practices. The curriculum is three days long and involves a combination of in-person and online training. The THC curriculum is composed of five key competencies; clinical; self-management support, privacy and support; processes and tools; and practicum[14].

The OTN offers many resources to inform the public and interested organizations on the THC Expansion Project. The OTN provides an implementation toolkit for new host organizations that contains THC procedures, policies and resources. The OTN website contains a social networking page, updated with discussions from subject matter experts and containing different platforms for THC colleagues to interact[14]. Ideally, the OTN would eventually like to provide interested organizations with a consolidated, standardized THC implementation "in a box". [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4].

## ACCOMPLISHMENTS

Integrated care pathways are outlined care plans that provide timelines and expectations for providers and patients[14]. The expansion project is developing integrated care pathways for CHF and COPD to improve care delivery for patients[14]. The Registered Nurses Association of Ontario has acknowledged the OTN THC Expansion Project as a 2012-2015 Best Practice Spotlight Organization[14]. The expansion project was selected through a request for proposals process (that occurs every three years) to implement and evaluate the Registered Nurses Association of Ontario's best practice guidelines[24]. Best Practice Spotlight Organizations are recognized for combining clinical expertise with each patient's values and preferences and appropriate research to help the patient to appropriately manage health needs and improve quality of life[24].

### Roles and Responsibilities

The expansion project framework aligns with a provincial reference model created by the MOHLTC, which provides the overall vision and key objectives for the THC program and identifies areas for growth[14]. The MOHLTC provides executive oversight for the THC program and conducts appropriate evaluations to ensure cost-efficiency and value for patients and clinicians[14].

The OTN is the THC project manager and provides leadership and overall support for THC implementation[20]. The OTN monitors each LHIN and their corresponding host organization to make sure the appropriate resources are available to provide high-quality care[14]. The OTN ensures the RPM solution is functional and compatible in the patient's home and at the host organization, guaranteeing that all health information is being transmitted electronically, offering clinical process leadership and business process support and providing expertise in change management[14]. The OTN also coordinates with each LHIN to improve program engagement and adoption[14].

Each LHIN utilizes the funding provided by the MOHLTC and Canada Health Infoway to create a sustainable THC program for their region[20]. The THC program must align with both provincial goals and local priorities[14]. Each LHIN provides local governance and leadership over the THC

program; they define enrolment targets based on regional demographics and set goals to meet their funding allocations[14]. Each LHIN will develop a regional THC delivery model that is transparent to the public to identify accountability[14]. The host organization delivers the THC service to patients through their THC clinicians and services[20]. The host organization is responsible for day-to-day operations, controlling human resources and workflows and ensuring stakeholder engagement[14]. As of March 2015, several LHINs, specifically Central West and Central, teamed up with their corresponding Health Links to deliver THC services. [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4]. A Health Links[2] is a network of providers in the community who work within the region to provide coordinated care to those with complex conditions. When a THC program and a Health Links program work together it creates an opportunity collaborative learning [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4]

**Evaluation**

Similar to any government-funded program, the THC Expansion Project must continuously demonstrate value and cost savings to its stakeholders. According to an early systems usage survey[23], THC programs for CHF in the Toronto Central CCAC, William Osler Health System and Southlake Regional Health Centre have demonstrated a positive short-term impact, a 37%-48% reduction in emergency department visits, and a 44%-57% reduction in hospital admissions. The William Osler Health System[23] reported significant long-term reductions in system usage, notably a 70% inpatient reduction 6 months after THC discharge, a 53% reduction in emergency department visits after THC discharge and a 4% reduction in length of hospital stay 6 months after THC discharge (all results are compared to pre-THC usage). The Toronto Central CCAC[23] demonstrated positive patient experience post-THC implementation, indicating 87% of patients surveyed would recommend the program to others and 98% of THC patients felt that the clinicians understood what was important to them. Patients felt that the THC program taught them valuable lessons in chronic disease management, specifically medication management[23].

**Privacy**

The THC program is protected under the OTN's strict privacy regulations. The personal health information of each and every THC patient falls under the 2004 Personal Health Information Protection Act[25]. The Act states[25] that a patient's personal health information is only available to his or her primary care provider, THC staff and other health professionals in their circle of care. Limited access to personal health information may be necessary when helping staff solve a problem or when providing statistics to the MOHLTC for evaluation[25]. The OTN protects personal health information through many safeguards, including policies, procedures, and encryption and monitoring technologies[25].

**Costs and Resource Allocation**

The OTN THC Expansion Project receives 75% of its funding from Canada Health Infoway and the remaining 25% from the MOHLTC. [Wilson, Rhonda. Conversation with: Carina Andreatta. 2015 March 4] According to Canada Health Infoway[26], the expansion project remained within their planning budget of $691,500 and implementation is currently under budget as well at $4,709,275. An RPM study conducted by Canada Health Infoway[10] investigated the long-term sustainability for large-scale RPM implementations across the nation. The THC Expansion Project supported a large number of patients, which enabled them to facilitate a larger-scale implementation. The point of sustainability and the percentage of maximum capacity takes into account the threshold required for benefits to outweigh the costs and the expansion project was

able to maximize benefits for patients to achieve long-term sustainability (Figure 2)[10]. The expansion project has an estimated cost avoidance of approximately $7000 per CHF patient per year[17].

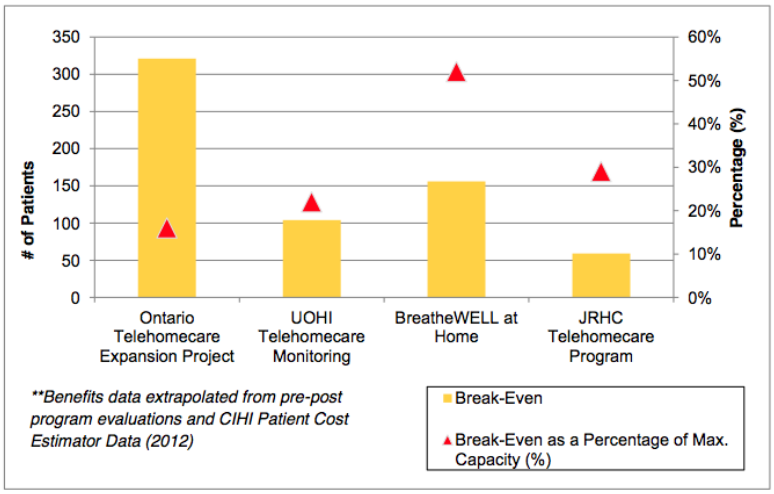



**Figure 2: Return on Investment Analysis for Canadian RPM Programs[10]**

## CONCLUSION

The OTN strives to provide high-quality care to patients with CHF through an efficient and cost-effective delivery process. The OTN's involvement at each LHIN ensures that THC delivery is efficient and of high quality, tailored to each patient's specific needs. The Registered Nurses Association of Ontario recognizes the THC Expansion Project as a best practice spotlight organization. The OTN teams up with CCACs and Health Links to deliver the best possible care to each patient in the three to six month THC program to enable patients with self-care behaviors to manage their CHF. The expansion project is recognized as a leader in chronic-disease self-management and contributes its success to ensuring patients know that THC is important, valuable and easy to use. The OTN is well on its way to achieve their goal of mainstream telemedicine.

## VANCOUVER ISLAND HEALTH AUTHORITY (VIHA)

B.C. has a Provincial Health Services Authority to oversee and coordinate provincial programs and is divided into five Regional Health Authorities that plan regional care across the province; the Regional Health Authorities focus on patient-centred, high-quality care delivery[27]. In B.C. telehealth is available in 20 clinical program areas with 200 facilities providing access to telehealth services[28]. B.C.'s diverse geographical landscape creates many rural areas that can make quick access to health care difficult for patients living in many parts of the province. Vancouver Island has one of the oldest populations in Canada with more than 67,800 people over the age of 75 living in the region[29]. It is common knowledge that older residents often require increased access to health care and use a portion of the health care budget that is larger proportionately than their numbers would indicate.

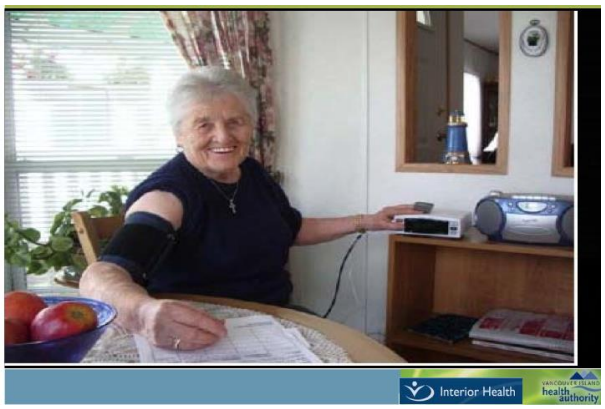
On Vancouver Island, travel time is a major factor in care delivery for both clients and providers[15]. In 2006, the B.C. Ministry of Health released "Telehealth in B.C.: From Vision to Action," a strategy for utilizing telehealth to provide health services to those in remote and rural locations and those with certain chronic diseases. In B.C., approximately 90,000 residents are currently living with CHF, costing the provincial health care system over $500 million annually[17]. In 2011, the VIHA population was 768,000 and of that 15,965 individuals were CHF clients[15]. B.C. has six THC programs supported by the Regional Health Authorities; the programs manage different conditions, including CHF, COPD and diabetes[10].

**VIHA Telehomecare Pilot Project**

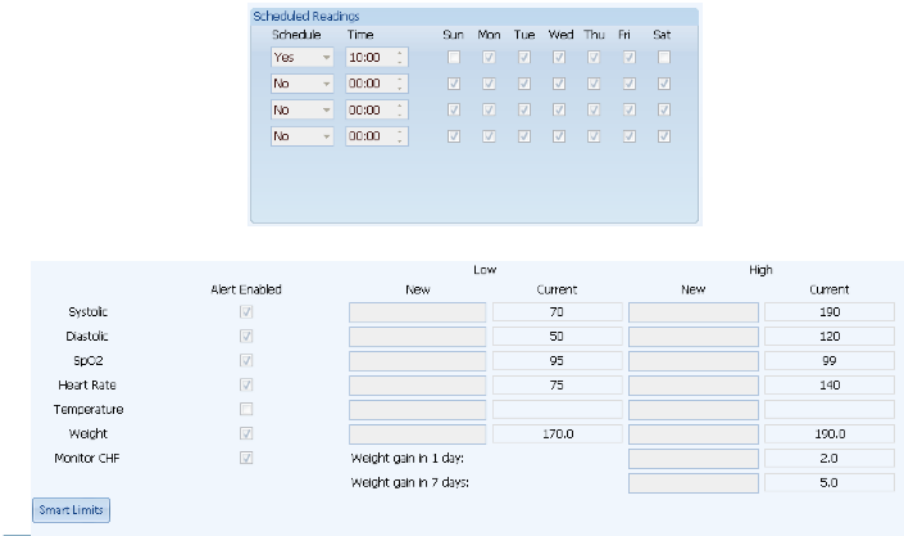
In 2009, the VIHA implemented the THC Pilot Project in South Vancouver Island for residents of Greater Victoria, Saanich and the Gulf Islands[17]. The pilot project was co-funded by the B.C. Ministry of Health and Canada Health Infoway[17]. VIHA initiated the pilot to support their five-year strategic plan that placed chronic disease management as a priority[17]. The THC Pilot Project would allow clinicians to closely monitor their clients in an effort to reduce disease complications and empower clients to become more active in their own chronic disease self-management[17]. The pilot project was intended to create quicker hospital discharge, reduce hospital and emergency room visits, and improve care continuity[17]. The VIHA also prioritized cost savings and improvements in efficiency and care access, specifically for clients with CHF; the priorities also aligned with the B.C. Ministry of Health's vision for THC[17].

In 2009, there were not enough primary care physicians to support the increasing chronically diseased population and only a limited amount of self-care resources to educate clients on chronic disease management[15]. The THC Pilot Project clients were recruited by referrals through physicians in the Seniors at Risk Integrated Network (SARIN) network and later extended to clients from non-SARIN physicians[17]. The project recruited 87 clients, more than initially intended and utilized 50 THC monitoring units[15,17].

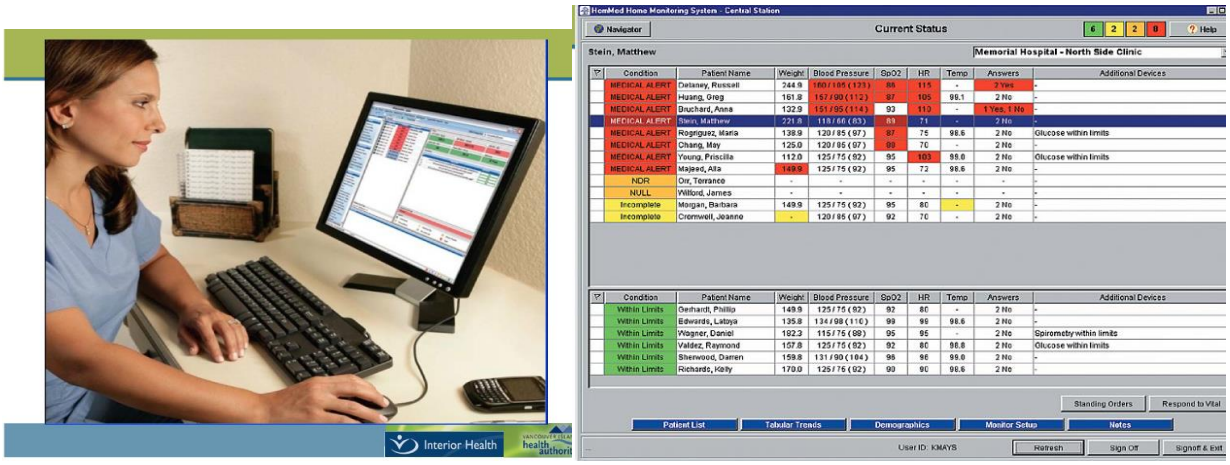
The THC Monitoring Units consist of a scale, blood pressure cuff, and oximeter that a client uses regularly to measure their blood pressure to avoid exacerbation of their CHF[15].


The client enters their daily readings into the installed tablet device and the information is shared electronically with the client's provider[14]. The device monitors scheduled readings for systolic and diastolic pressure, SpO2, heart rate, temperature, and weight[14].




The provider will review the client's daily inputs and respond to any significant changes in the client's condition. The THC monitor allows for early intervention by the provider, preventing unnecessary hospital visits[14]. The readings are colour coded in terms of severity so it is easy for the provider to monitor multiple clients at one time and allows for early intervention[14].




The THC monitors enable providers to work effectively with CHF clients in assisting them to better manage their own illness and stabilize their health, regardless of where they live[14].

VIHA[17] conducted a post pilot implementation survey in the fall of 2012, three years after the pilot start up; 68 responses were received and evaluated. The results indicated that 100% of participants were satisfied with the THC program; 87% agreed or strongly agreed that the THC monitor helped them manage their condition(s); 97% agreed or strongly agreed that the THC monitor was easy to use and 94% of respondents felt more involved in their care by participating in the program[17]. The survey indicated a 65% reduction in CHF-related emergency visits, a 61% reduction in CHF-

related hospitalizations and a 75% reduction in the number of days in hospital for CHF-related issues[17]. The average cost of CHF hospitalization is estimated at $8,575, and combined with reductions in hospital admissions, could suggest that THC can increase value in the funds expended by the B.C. Government and lead to better utilization of scarce resources within the system[17]. However, this does not necessarily imply a reduction in health care costs for the province[17]. Further investigations must be conducted to analyze the corresponding costs. The benefits of decreased travel were not analyzed in this specific post-pilot study, but we can assume that some patients travelled significant distances to the health centers from certain parts of the Island[17]. In that case, THC could save clients and providers travel time, and therefore make more time available for monitoring clients.

On average, each client received three in-person visits, one to setup the THC equipment, another for education and support and a final visit for equipment removal and discharge[17]. The three-month program is meant to teach clients with CHF how to develop and maintain self-care behaviors that will improve their health and relieve pressure off of the health care delivery system. Ninety-eight percent of the clients adhered to self-monitoring at the scheduled time; the clients attributed their compliance to quick responses from their THC nurse and immediate feedback from the monitors. Eighty-seven percent of SARIN physicians were satisfied overall with the THC pilot and all of the THC nurses agreed that the program was a successful strategy for CHF self-management[17].

VIHA's post-pilot evaluation[17] deemed THC an overall success and highlighted areas contributing to the positive interventions and processes in need of improvement. An evaluation framework was necessary to measure quality and ensure the program continues to demonstrate value[15]. Clear communication channels between VIHA and referrals was necessary for seamless program integration and recruiting clients prior to hospital discharge would improve adoption rates[15]. A recommended introductory project management course is encouraged for stakeholders, primarily the VIHA telehealth employees, to define leadership roles, understand employees and to increase THC program efficiency. Pilot project success factors included collaboration between the practitioner, nurse and client as partners in care, consistent support and follow up for client self-management, information sharing within the continuum of care, the use of physician champions and clear identification of roles and responsibilities[15].

**VIHA's Home Health Monitoring Program**

As a result of the pilot project's clinical success, VIHA sought to implement the HHM Program for integrated chronic disease management[30]. The VIHA applied to a provincial funding opportunity, the Telus Strategic Investment Fund. The recipient organization of the funding would receive several million dollars to put towards their transformative, provincial project[30]. The B.C. Ministry of Health submitted an application for HHM Enabling Services and successfully received the funding[30]; VIHA also received funding from Canada Health Infoway[17]. The HHM Program provided THC services to the same local health areas as the pilot project received with the addition of the Sooke region[17]. In 2011, the HHM Program managed over 172 patients and 50 monitoring units; typically, one monitoring unit is used for approximately four patients[15]. The program is managed in partnership between Vancouver Island's Home and Community Care Program and the Heart Health Program[31].

## Client Eligibility

Currently, the HHM service is provided to eligible clients with a physician confirmed diagnosis of CHF with either Class II (mild) or Class II (moderate) symptoms (Figure 3), and/or if CHF makes cognition, activities of daily living, mood or behavior patterns unstable[31]. The client must also be at risk of using hospital services or has had an admission within the previous three months, or is about to be discharged home for management of CHF, and the client or their caregiver is physically and cognitively able to manage the HHM equipment[31]. The client (or a family member) must also be willing to participate in self-management, consent to participate, and have a general practitioner or primary care practitioner. The client must reside within the geographic boundaries for community referral[31]. Clients are referred to the program by various sources, including the hospital inpatient unit; home and community intake; family physician; heart function clinicians and self-referral[30].

**Client Selection Criteria**

1. Client has physician confirmed diagnosis of Heart Failure (HF) with the following:
   - New York Heart Association Classification II or III

| Class | Patient Symptoms |
|---|---|
| Class I (Mild) | No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea (shortness of breath). |
| **Class II (Mild)** | **Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.** |
| **Class III (Moderate)** | **Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.** |
| Class IV (Severe) | Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased. |

**Figure 3: Vancouver Island HHM Program –Selection Criteria for Clients with CHF**

## Clinician Support

The HHM nurses are trained on the RPM technology and they follow the B.C. Heart Failure Guidelines (available to B.C. Health Care Providers) to provide self-management support and assist CHF clients in goal setting[33]. The HHM nurses provide education for their clients and their families and caregivers on medication management, vital sign self-monitoring, exercise and nutrition. [32] The VIHA Home and Community Care program has a self-management Learning Hub to support orientation and ongoing learning for HHM nurses[33].

## Delivery Model

The program is free and lasts approximately three months; VIHA considers this an appropriate amount of time for a client to learn self-management behaviors (some patients may stay in the program longer if necessary)[30]. After a client exits the program he or she is expected to continue chronic disease management on his or her own[30]. The program is meant to enable clients with the appropriate skills and resources to continue HHM on their own. The HHM nurse conducts an initial education session with his or her client. Upon completion, the HHM nurse will arrange for the Telus Health RPM technology to be set up in the client's home[31]. The HHM Monitors include tablets, currently without any video or audio[30]. The HHM nurse installs the device and trains the client in his or her home. Following implementation, the nurse monitors and responds to the

client's data and provides support and education virtually on weekdays[31]. The monitors guide the clients through the daily processes of recording their weight, blood pressure, heart rate and oxygen saturation levels[31]. The clients must also enter a series of customizable subjective questions regarding their CHF management[31].

The information is sent to a nurse who monitors and looks for changes in health status. The software colour codes the client's data and indicates when the responses are outside of the pre-set parameters (customized as per provider direction)[31]. The HHM nurse follows up with the provider and client when appropriate. The purpose of the HHM program is for the client and his/her family or caregiver to understand the signs and symptoms of CHF and develop self-care strategies at home (e.g. medication management, proper nutrition and exercise) in order to increase his or her quality of life[31]. Early problem detection will prevent unnecessary hospitalizations, increase client satisfaction and promote healthy living[31]. VIHA offers a complementary, reader-friendly guide to the public 'Living Well with Heart Failure' (Figure 4) containing recommendations, warnings and steps to follow when monitoring heart health at home.

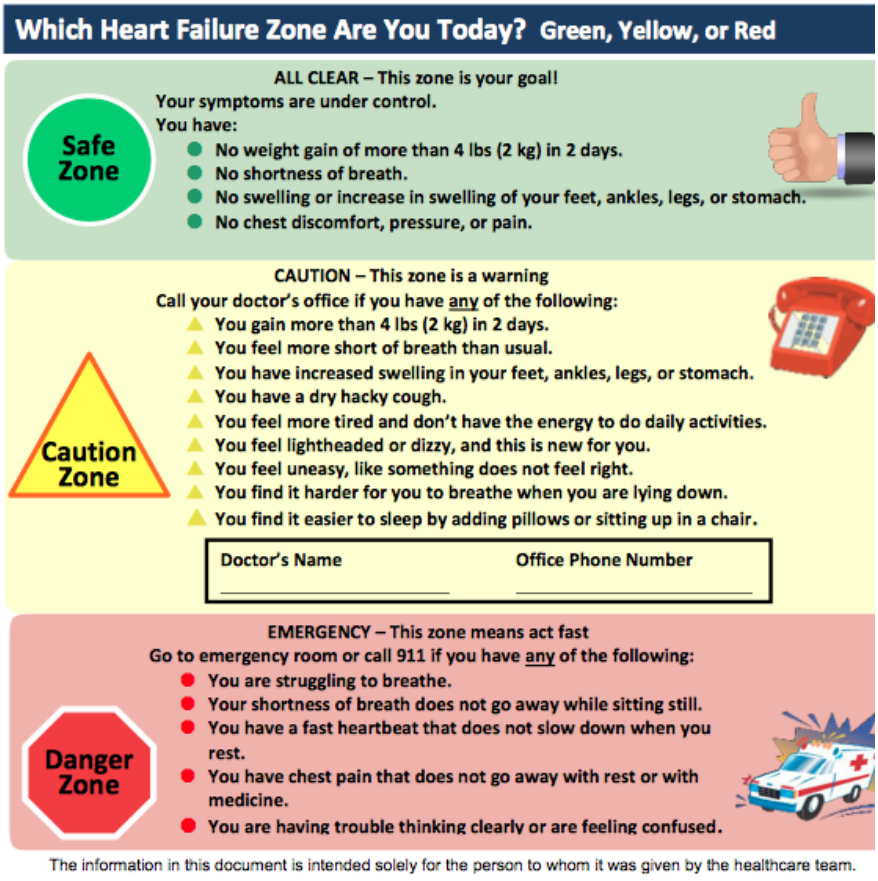



**Figure 4: B.C.'s Guide to Living Well with Heart Failure – Page 1**

**Roles and Responsibilities**

The B.C. Ministry of Health negotiates the Strategic Investment Fund agreement for VIHA's HHM program. The Ministry of Health also provides executive oversight and evaluation for the program to maintain consistency across the region, ensure value for providers and clients and to guarantee the program meets the Strategic Investment Fund requirements. The Provincial Health Services Authority has no role in the program planning or funding[30]. VIHA acts as the project manager and telehealth clinician lead for the HHM program. Its partner, Island Health Home and Community Services program provides HHM nurses and other resources that support the HHM program throughout the region.

**Privacy**

Client information is collected and used only for the provision of care or health care related services[31]. The personal health information of each client is secure and confidential and handled according to B.C.'s Freedom of Information and Protection of Privacy Act under VIHA's data sharing agreement[30,31]. The HHM Program successfully completed a privacy impact assessment in consultation with the VIHA Regional Information and Privacy Office and Information Systems Security Office prior to implementation[30,31].

**Costs and Resource Allocation**

The pilot project was co-funded by Canada Health Infoway and the B.C. Ministry of Health. The program costs $336,350 with annual operational costs of $105,000. The program costs include hardware, deployment and project management[15]. Currently, the HHM is funded by various sources, including Island Health Information Management Information Technology, Island Health Home and Community, and the Telus Strategic Investment Fund[30].

## CONCLUSIONS

The VIHA implemented the HHM program to align with provincial initiatives to increase access to care for those living in rural and remote areas and improve management of chronic diseases and their impact on health care system efficiency and costs. Additionally, the program was implemented to improve access to those in rural parts of the Island. VIHA did not specifically evaluate transportation, but many other factors led to the program's success. The HHM Program focuses on educating patients on CHF self-management behaviors and patient-centred goal setting, which has led to improved health outcomes and reductions in health care costs.

## ALBERTA HEALTH SERVICES

Alberta Health Services governs, plans and coordinates health care for the entire province. In Alberta, 80% of residents over the age of 45 report having at least one chronic condition and 35% report having two or more chronic conditions[35]. In 2000, chronic disease management, including COPD and CHF accounted for $1.07 billion of Alberta's health care costs[35]. Albertans with one chronic condition consume up to four times more health care resources compared to healthy individuals[35].

### MyHomeHealth Pilot Project

In May 2013, the Alberta government, in partnership with GE Canada and Alberta Health Services, collaborated on the Alberta MyHomeHealth Pilot Project[36]. The pilot planned to remotely monitor 250 patients over 50 years of age living with CHF in the Sherwood Park-Strathcona County Primary Care Network[36]. According to the Alberta government[36], the project will use Intel-GE Care Innovations Guide, a remote care device with touch-screen, so patients can monitor their CHF from their home and connect virtually with their virtual care nurse and primary care team. The virtual care nurse will connect with patients over the phone or by videoconferencing and work with the primary care physician to provide the patient with better care and self-management techniques[36].

Unfortunately, information on the Alberta MyHomeHealth project is limited. The homepage for MyHomeHealth and the subsequent links available on the Alberta Health website that link to http://www.myhomehealthcanada.com lead to an inaccessible website. The GE Healthcare Canada website also has link that leads to an inaccessible MyHomeHealth website. A source from Alberta Health Services disclosed that there would be other formalized telehealth initiatives coming in the near future[37].

## CONCLUSIONS

As a former 2015 National Telehealth Report Committee member, through employment at COACH, I can say that THC is gaining momentum. Since the 2013 National Telehealth Report, there has been an increase in the use and discussion of THC initiatives and RPM technologies across all Canadian jurisdictions. The OTN is a province wide organization responsible for developing and implementing Ontario telemedicine solutions. The OTN's leadership and expertise has driven the Ontario THC Expansion Project's success throughout the LHINs that have adopted it. The OTN focuses on improving access as well as quality to both rural and urban areas. In B.C., VIHA is a regional government body responsible for providing care within their geographic boundaries; VIHA is considered a leader in telehealth initiatives across B.C. and THC aligns with B.C.'s provincial plan. The VIHA HHM Program is delivered through a partnership between the Home and Community Care Program and the Heart Health Program. The HHM Program goals are to reduce barriers to accessing care and eliminate the burden of chronic diseases on quality of life and reduce health care system costs.

The OTN and VIHA programs are co-funded by the respective provincial ministries of health and Canada Health Infoway[14,31]. Additionally, VIHA has received a lump sum from the Telus Strategic Investment Fund. The THC Expansion Project enrolls patients for six months maximum, whereas the HHM Program enrolls clients for three months maximum[23,30]. The goal of each program is to establish self-care behaviors through education and training that will lead to lower health care system utilization and better health outcomes for the patient or client. Both THC programs have demonstrated clinically significant reductions in hospitalizations, length of stay, emergency department visits and improvements in patient satisfaction and ability to self-manage[10, 14-17].

The THC Expansion Project reaches a wider population compared to the HHM Program in South Vancouver, and therefore requires more resources and funds. Both programs utilize the Telus Health RPM solution to conduct their THC monitoring; however, audio and video functionalities in VIHA are limited[12,25,30]. Both THC programs have a tremendous impact on the quality of care, perceived cost savings and chronic disease management. It is likely that THC program delivery will spread more widely across Canada to improve care and health care system delivery for Canadians in all jurisdictions

## REFERENCES


1. Health Council of Canada. How do sicker Canadians with chronic disease rate the health care system? Results from the 2011 Commonwealth Fund International Health Policy Survey of Sicker Adults, Canadian Health Care Matters. Bulletin 6. Toronto: Health Council of Canada; 2011.
2. Ontario Ministry of Health and Long Term Care. Transforming Ontario's Health Care System: [document on the Internet]. 2015 [cited 2015 Mar 13]. Available from: Government of Ontario, Ministry of Health and Long Term Care Web site: http://www.health.gov.on.ca/en/pro/programs/transformation/community.aspx
3. Public Health Agency of Canada. Canada Signs UN Declaration on Preventing and Controlling Chronic Diseases. 2011 [cited Mar 12, 2015]. Available from: http://www.phac-aspc.gc.ca/media/nr-rp/2011/2011_0919-eng.php
4. DelliFraine JL, Dansky KH. Home-based telehealth: a review and meta-analysis. *J Telemed Telecare*.2008 [cited Feb 28 2015];14(2):62-66. Available from: http://jtt.sagepub.com.libaccess.lib.mcmaster.ca/content/14/2/62.full
5. Vickery DM, Kalmer H, Lowry D, Constantine M, Wright E, & Loren, W. Effect of a Self-care Education Program on Medical Visits. JAMA. 1983 [cited Feb 28 2015];250(21):2952-2956. Available from: http://jama.jamanetwork.com/article.aspx?articleid=388868
6. Canada's Health Informatics Association. CTF: The Canadian voice for telehealth. [document on the Internet]. 2014 [cited 2015 Feb 13]. Available from: https://www.coachorg.com/en/communities/Canadian-Telehealth-Forum.asp
7. Ontario Telemedicine Network. OTN: Ontario telemedicine network. [document on the Internet]. 2015 [cited 2015 Feb 13]. Available from: https://otn.ca/en
8. Canada's Health Informatics Association. Home Telehealth CoI. [document on the Internet]. 2014 [cited 2015 Feb 13]. Available from: https://www.coachorg.com/en/communities/Home-Telehealth-CoI.asp
9. Canada's Health Informatics Association. 2013 Canadian Telehealth Report. Toronto (ON): Canada's Health Informatics Association; 2013 June [cited 2015 Feb 23]. Available from: http://bit.ly/1BuCVeu
10. Canada Health Infoway. Pan-Canadian study on remote patient monitoring [document on the Internet]. Toronto: Ernst & Young LLP; 2014 [updated June 2014; cited 2015 March 1]. Available from Canada Health Infoway: http://bit.ly/19iHuvh
11. Bashsur RL, Shannon GW, Smith BR. The empirical foundations of telemedicine interventions for chronic disease management. *Mary Ann Liebert Inc.* 2014 [cited 2015 March 22];20(9):769-794. Available from: http://online.liebertpub.com.libaccess.lib.mcmaster.ca/doi/pdfplus/10.1089/tmj.2014.9981
12. 12. Telus Health. Telemedicine: Ed Brown, CEO, Ontario Telemedicine Network's point of view [video file]. 2013 Oct 11 [cited 2015 March 1]. Available from: https://www.youtube.com/watch?v=Ko-clvuf4K0
13. Martinez A, Everss E, Luis J, Rojo-Alvarez JL, Figal DP, Garcia-Alberola A. A systematic review of the literature on home monitoring for patients with heart failure. *J Telemed Telecare.* 2006 [cited 2015 March 22];12(5):234-241. Available from: http://jtt.sagepub.com.libaccess.lib.mcmaster.ca/content/12/5/234.full.pdf+html

14. Poole L. Transforming chronic disease prevention and management through telehomecare [Internet].2012 [2012 December 18; cited 2015 Feb 12]. Available from: http://bit.ly/1Gvo3Lf
15. Loyola M, Zilm L. TeleHome monitoring a BC perspective [Internet]. British Columbia: British Columbia Alliance on Telehealth Policy and Research; 2011 [2011 June 14; cited 2015 Feb 20]. Available from: http://bit.ly/1ButHi5
16. Ontario Telemedicine Network. How Telehomecare Works [Internet]. Ontario: Ontario Telemedicine Network; 2015. [cited 2015 February 1]. Available from: http://bit.ly/1DbeHAF
17. British Columbia. Ministry of Health. Benefits evaluation report: telehomecare heart failure pilot projects [document on the Internet]. Victoria: BC Ministry of Health; 2013 [cited 2015 Feb 28]. Available from Canada Health Infoway: http://bit.ly/1y2HlSS
18. Telus Health. Remote Patient Monitoring [document on the Internet]. 2014 [cited 2015 Feb 23]. Available from: http://www.telushealth.com/health-solutions/telehealth-and-home-care-monitoring/remote-patient-monitoring
19. Ontario Telemedicine Network. Evidence Review: Telehomecare executive summary [document on the Internet]. Toronto: OTN; 2012 [updated 2012 June 10; cited 2015 March 12]. Available from: http://bit.ly/1ButXhh
20. Ontario Telemedicine Network. Telehomecare [document on the Internet]. Toronto: OTN; 2015 [cited 2015 Feb 24]. Available from: http://telehomecare.otn.ca
21. Telehomecare in Ontario [Internet]. Ontario: Accreditation Canada; 2007 [updated 2013 April 12; cited 2015 Feb 20]. Available from: http://www.accreditation.ca/telehomecare-ontario
22. The Government of Ontario. Local Health Integration Network (LHIN). [document on the Internet]. 2014 [cited 2015 Feb 30]. Available from: The Government of Ontario, Local Health Integration Network Web site: http://www.lhins.on.ca
23. Wilson, R. Rolling out telehomecare across Ontario: lessons learned [Internet]. Ontario: Canada's Health Informatics Association; 2014 [updated 2014 October 21, cited 2015 Feb 23]. Available from COACH's Adobe Connect Site: http://bit.ly/19Nga9n
24. Registered Nurses Association of Ontario. Best Practice Spotlight Organizations (BPSO): Registered nurses association of Ontario [document on the Internet]. 2015 [cited 2015 Feb 26]. Available from: http://rnao.ca/bpg/bpso
25. Ontario Telemedicine Network. Privacy: Telehomecare.otn.ca. [document on the Internet]. Ontario: OTN; 2015 [cited 2015 Feb 19]. Available from: http://telehomecare.otn.ca/patient-privacy
26. Canada Health Infoway. Projects [document on the Internet]. Ontario: Infoway; 2015 [cited 2015 February 1]. Available from: http://bit.ly/UQi8NO
27. British Columbia. Ministry of Health. About BC's Health Authorities: British Columbia health authorities. [document on the Internet]. British Columbia: The Ministry of Health; 2015 [cited 2015 Mar 1]. Available from: Government of British Columbia, Ministry of Health Web site: http://www.health.gov.bc.ca/socsec/about.html/
28. British Columbia. Ministry of Health. Telehealth [document on the Internet]. British Columbia: The Ministry of Health; 2015 [cited March 1 2015]. Available from: http://www.health.gov.bc.ca/ehealth/telehealth_project.html

29. Aylott M, Loyola M, Moric M, Saffaraek L. Telehealth benefits Vancouver Island seniors. Canadian Healthcare Technology [Internet] 2014 Oct [cited 2015 Feb 10]. Available from: http://bit.ly/1ArJN9S
30. Loyola, Margarita. Masters Research on Telehomecare [Internet]. Message to: Carina Andreatta. 2015 March 12 [cited 2015 March 18]. [3 paragraphs].
31. Government of British Columbia. Vancouver Island Health Authority. Home and community care home health monitoring service [Internet]. Vancouver Island: Vancouver Island Health Authority; 2014 [cited 2015 Feb 2]. Available from: http://bit.ly/1BcOWmZ
32. Vancouver Island Health Authority. Home health monitoring service [pamphlet]. Vancouver Island: Vancouver Island Health Authority; 2015.
33. Saffarack, Lisa. Masters Research on Telehomecare [Internet]. Message to: Carina Andreatta. 2015 March 16 [cited 2015 March 22]. [1 paragraph].
34. Vancouver Island Health Authority. Living Well With Heart Failure. [document on the Internet]. 2011 [cited 2015 Mar 23]. Available from: http://www.viha.ca/NR/rdonlyres/10352A32-DE01-4621-81C0-F9FA37F27469/0/living_well_with_heart_failure_v55.pdf
35. Alberta Health Services. Chronic Disease Management [document on the Internet]. 2015 [cited 2015 Mar 10]. Available from: http://www.albertahealthservices.ca/10356.asp
36. Government of Alberta. Backgrounder: MyHome Health pilot project [document on the Internet]. 2013 [cited 2015 Mar 1]. Available from: http://www.health.alberta.ca/newsroom/news-bkgd-2013-05-02-MyHome-project.html
37. Roberge, Bonnie. Masters Research on Telehomecare: Alberta contact? [Internet]. Message to: Carina Andreatta. 2015 March 6 [cited 2015 March 12]. [4 paragraphs].

McMaster University
1280 Main St. W. DSB A202
Hamilton, ON
L8S 4M4

Tel: 905-525-9140 ext. 23956
Fax: 905-521-8995
Email: ebusiness@mcmaster.ca
Web: http://merc.mcmaster.ca