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Telecommunications and Technology in Cardiac Rehabilitation and Prevention

Is Telehealth a Feasible Option for Cardiovascular Prevention and Rehabilitation?

Sylvie Jetté, Ph.D., Associate Professor Université de Sherbrooke
Quebec City, Canada

INTRODUCTON

Telehealth offers many benefits for both clinicians and patients. The level of efficiency telehealth activities provide also makes it an attractive option in the face of limited health care budgets. However, it is important to remain vigilant to some of the human and organizational issues that telehealth can pose. In this article, we will briefly present the benefits of telehealth, the various components of this delivery method that is becoming increasingly prevalent within the healthcare system, as well as expose a few of the challenges that must be considered when developing and implementing telehealth services. We will conclude by providing an overview of the possibilities in terms of cardiovascular prevention and rehabilitation.

BENEFITS OF TELEHEALTH

Telehealth refers to the delivery of services by healthcare organizations using information and communications technology (ICT) solutions when the clinician and patient are not in the same location.[1] Telehealth provides many benefits including access to health care for individuals living in remote areas as well as for some patients who can receive care closer to where they live and in certain cases, in their homes. In addition to increasing the speed at which care is delivered, telehealth saves both time and travel costs for patients and clinicians. These savings enable clinicians to see more patients or focus on other important clinical tasks. The economic implications for the health care system are also significant, whether saving on clinicians' travel expenses or unnecessary patient transfers and admissions.

Inside This Issue

MULTIPLE FACETS OF TELEHEALTH

Telehealth is a broader term than telemedicine as it encompasses remote clinical tasks that reach beyond the scope of medical practice. For example, telehealth allows for patients to be monitored from home, a method of care referred to as telemonitoring. Telehealth also includes distance medical or professional education or tele-training, whereas providing remote patients with information on how to manage their health or condition is referred to as tele-education. Another component of telehealth pertains to tele-consultation, a remote meeting with a patient to determine a diagnosis or conduct a follow-up, while tele-discussion allows colleagues to consult one another to obtain a second or third opinion or to discuss a diagnosis as a team or follow-up in a patient's absence. Lastly, tele-intervention provides physicians and health care professionals the ability to implement interventions among remote patients. All specialities are likely to turn to telehealth to complement or enhance their care delivery options. Other activities therefore include telepathology, telecardiology, teleophthalmology, telepsychiatry, telespeech therapy (telepractice), telethrombolysis, tele-emergency, teledermatology, teleneurology, teleoncology, teledialysis and telesupport to help doctors in remote areas make decisions.

CHALLENGES ASSOCIATED WITH TELEHEALTH

Advancements in ICT have led to the development of various telehealth services over the past few years. Videoconferencing, for example, has allowed for real-time consultations and discussions with patients or colleagues. Storage and retransmission solutions make it possible to capture, store and transfer data, images or videos. Telemonitoring solutions provide a way to remotely transmit clinical data from home to hospital, thereby making it easier to conduct remove follow-up of patients. Although the technological hurdles are becoming less and less important, ethical and organizational concerns still remain. Necessary steps therefore need to be taken to ensure patient privacy, including restricted access to patient information as well as informed patient consent for this type of care delivery. Electronic communication between patients and clinicians must also be carried out on a secured network. It should be noted that several professional bodies have taken a clear position on the clinical practice of telehealth to enlighten their members.[2-3-4-5]

TELEHEALTH IN CARDIOVASCULAR PREVENTION AND REHABILITATION

Cardiovascular prevention and rehabilitation requires the involvement of several specialists (cardiologists, nephrologists, endocrinologists) as well as other health care professionals such as nurses, dietitians, pharmacists and kinesiologists. Efficient organization of services involving all these practitioners, for both the health care system and patients, may represent a challenge that telehealth may be able to overcome.

Here are a few examples to demonstrate this potential: In France, landlines or cellular phones can be used to transfer patient data to clinics, allowing clinicians to remotely monitor certain indicators.[6] The physician in charge is notified if problems arise in order to decide on the treatment to be administered. According to one study,[7] this method of telemedicine demonstrated a significant benefit in terms atrial fibrillation-related hospitalizations, incidence of related embolic strokes and a 36% reduction in the number of follow-ups at cardiac implant centres.

In Canada, the TeleCardiology[8] program in Vancouver enables patients to consult cardiology and internal medicine specialists who can take their pulse remotely using telehealth technologies and digital stethoscopes.

In Europe, the Swiss Heart Foundation (Fondation Suisse de cardiologie)[9] recommends Cardiotest®, a mobile app that serves as a tool for cardiovascular prevention and awareness, and first-aid techniques.

Figure 1. Cardiotest® App

Although using Cardiotest® does not constitute a telehealth activity as such, there is a certain craze for mobile apps that allow users to collect and monitor health data that can then be transmitted to the clinician involved.

In addition to this growing interest among people to manage their health or condition using electronic communication devices, it is also apparent that people are willing to change how they access health care services.[10] With technology at the ready and patients more and more in favour of using it to manage their health, telehealth definitely constitutes an option to consider for improving or complementing cardiovascular prevention and rehabilitation services.

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INTERESTING LINKS

https://www.infoway-inforoute.ca/
http://www.ehealthontario.on.ca/en/
http://otn.ca/en

Dr Warner Mampuya, MD PhD FRCPC

From the Editor

In a world increasingly dominated by electronic technology, interventions for cardiac rehabilitation and prevention can be delivered using innovative technology tools to promote a better uptake, adherence, communication and coordination between multidisciplinary professionals.

There are several studies on the impact of telehealth that demonstrated improved access to care, lower cost of delivery and, ultimately, improved patient outcomes.

Telehealth and Telemedicine may appear to be very similar and the nuance between the two may be subtle. There are nonetheless some important differences. Telehealth is typically used as the more general term to describe remote healthcare education and administration. It involves the electronic transfer of medical information for the purpose of patient care. Telemedicine on the other hand refers specifically to the use of technologies to deliver patient care services, i.e., remote clinical services.

Recent developments in physiological monitoring, information processing, and communication technologies have shown that these new technologies (internet, phone and other communication tools) can improve healthcare providers' ability to give multimodal feedback to the patients regularly and enable the use of other multimedia formats.

Emerging Opportunities For The Secondary Use of Data From The Electronic Health Record

Andrew Grant MB, ChB, MRCP, FRCPC, DPhil, FACMI, Collaborative Research for Effective Diagnostics, Faculté de Médecine et Sciences de la Santé, Université de Sherbrooke, Québec.

The electronic health record is becoming more and more a complete source of information about patient care. There are several ongoing imperatives that continue to improve data quality in health care institutions, and in the sharing of data between institutions as well as pharmacies,with the eventual goal that there is a single personal lifetime health record reflecting continuity of care.

Clearly data quality depends on respect of standards, such as those affecting terminology and communication.[1,2,3,4] In more technical language the aim is to achieve semantic interoperability, that is the receiver system of information understands exactly the sender system of that information.

Data in clinical care systems is operational and designed to enable transactions such as recording a clinical observation or prescribing a medication, however in general transactional systems have limited capacity to support data analysis. Secondary use of data refers to the exploitation of already existing data. The source data should be persistent, that is once recorded in the original system they should not be subject to change; for example if the blood pressure was different the next day this would be an additional data item. Source data can therefore be transferred to a complementary database more suited for analysis, sometimes referred to as a datawarehouse which is the name used in this article.

A clinical data warehouse (CDW) refers to a set of clinical data used for analytical purposes relevant to a health context.5,6 It can refer to a local, regional or wider context. It can be integrated with data from other relevant sources such as budget data. In planning a CDW there needs to be a sequence of meetings that identify the analyses likely of interest, then the categories (dimensions) of relevant data such as location of care, laboratory tests etc., and facts or measures tables such as length of stay should be specified. Data may need to be organised into a consistent format before uploading to the CDW.

Secondary data analysis essentially now enables, to some extent for the first time, feedback of the relation between interventions and outcomes in the real practice setting as distinct from experimental.[7] It provides opportunities at different levels, in particular a) practice data can be team reviewed from the perspective of quality assurance; b) it can be used to assess impact of introducing a new technology and is increasingly a tool for post-market surveillance; c) it can be used for surveillance such as prevalence of infections or variation in the use of antibiotics;[8] d) it can help policy making; e) it can lead to novel observations such as revealing an unexpected drug effect; f) it can support education.

The access to longitudinal data from the electronic health record also enables the description of the clinical phenotype that is to be able to distinguish how different persons vary in their response to disease and treatment and in their ultimate outcome. It is becoming a priority to be able to associate this phenotype data to genotype data from new genomic discoveries to eventually identify new biomarkers that will influence the choice of therapy, the goal of personalised medicine[9].

Because of their multidisciplinary nature, rehabilitation activities lend themselves particularly well to telerehabilitation, as well as to tele- expertise and teletraining.

This offers interesting prospects for the delivery and expansion of cardiacrehabilitation programs beyond the setting of super-vised, structured, and group-based rehabilitation, and will help increase enrolment, reduce risk factors and improve the benefit-cost ratio.

This edition of CV Edge explores different aspects of these new technologies and their impacts on cardiac rehabilitation and prevention. We have two featured articles.

In the first one, professor Sylvie Jetté summarizes the benefits and challenges of telehealth and its various components in cardiovascular prevention and rehabilitation. In the second article, Dr Grant talks about clinical, research and organisational benefits of efficient and effective secondary use of patient care data.

In the research in progress section, we have a study by Dr. Paredes and his team at the Sherbrooke University Hospital on the feasibility of a total remote follow-up of patients with pacemaker. This interesting study shows that remote follow-up without compromising patients safety is possible. Our program profile features the cardiac rehabilitation program at the University of Ottawa Heart Institute which added three new Tele-Rehabilitation Cardiac Exercise Programs to their menu to better serve their rural patients. This will certainly inspire more programs to move in that direction. It will be interesting to follow up on the results of this pilot project.

I encourage you to read the bulletin and continue to contribute to its improvement.

I hope you enjoyed the CACPR annual meeting in Vancouver. We will bring you the highlights in the next edition.[1]

Analysis can be from clinical or organisational perspectives or a mixture of both.[10] Figure 1 shows an experimental dashboard for cardiology. In the right hand screen ICD 10 codes for cardiology diseases, individual or grouped e.g. heart failure, can be selected as well as emergency room care only, hospitalisation, sex, age, date, time and hospital site. This will give sub-population of interest and the left hand block of screens access to information about their profiles of test and drug use as well as mean length of stay and rate of rehospitalisation.

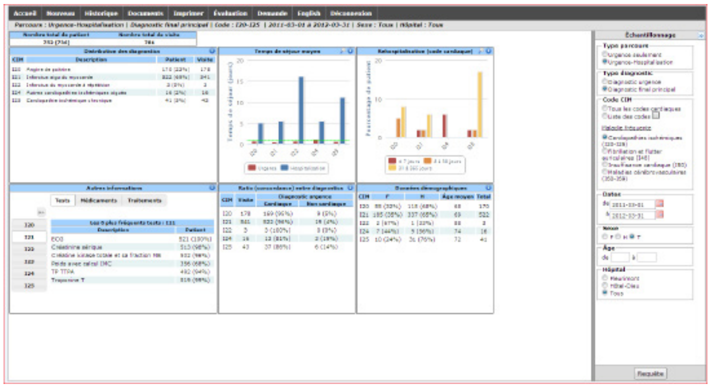

Figure 1: Cardiology dashboard

The dashboard is an easy to operate visual presentation of data relationships. Other query tools can be used to detect particular patient characteristics such as clinical trial eligibility and there are increasingly available sophisticated tools for data extraction and statistical and trend analysis.

The CDW needs to be under the supervision of a clear governance structure, that ensures patient and project confidentiality, responsible to the institution and in consultation with the ethics review board. Studies can be undertaken without accessing the patient identity (anonymized). Some studies need to regroup several data on the same patient in which case a patient can be given an arbitrary code number that can replace his identifier (pseudonymized).

A further essential is the maintenance of metadata i.e. data about the data in the CDW. This concerns any information to be understood for proper use of CDW data. For example, if a laboratory test changed its reference range this should be recorded so that data being obtained from the CDW about the same test before and after change of reference can be properly interpreted. Uncertainty about a diagnosis must be retained. Errors of recording source data that are subsequently corrected must be communicated to the CDW as a revision of previously provided data. These different metadata should be organised and be readily available to the CDW user. Furthermore a regular audit should be envisaged reviewing general patterns of data access and use, specific re-identification of pseudonymized data, security management processes and practices, and processes related to data quality and integrity.

There is no doubt that efficient and effective secondary use of patient care data and the clinical data warehouse now becoming possible will have profound clinical, research and organisational benefit.

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Research in Progress

Total Remote Pacemaker Follow-Up as Replacement of Standard Pacemaker Clinic

Tamas Z FULOP, MD, Marie-Christine LORD, MD; Marijke A. WOOTERLOOD, Mariano BADRA MD, Jean-François ROUX MD, Félix AYALA-PAREDES, MD, PhD, Department of Medicine, Cardiology Division, University of Sherbrooke, Quebec, Canada.

BACKGROUND

Pacemakers have been used to manage heart rhythms for more than 50 years. Evolution allowed for more settings, functions and store capabilities to offer better treatment to patients. In most of follow up (f-u) visits there is no other action than retrieval of device information and check of battery and lead integrity. The absolute need for an office visit imposes a heavy burden to patients, relatives and health system. When a device dysfunction is encountered, it is usually present weeks or months before the in office visits. Technical advances try to reduce the follow-up burden for patients and the related workload for hospital staffs. As of now, few studies are available, mainly in small series of patients that prove that remote monitoring is a safe and reliable replacement to standard pacemaker clinics [1-3] to ensure the good functioning of pacemakers and to timely detect clinical problems. However long-term data are scarce and their impact on workload is even less well documented.

METHODS

A retrospective cohort study was conducted at the Sherbrooke University Hospitals. The study population included all patients of the pacemaker clinic with a Biotronik pacemaker with Home Monitoring (HM) technology[7]. No funding from the company was given for this project nor did they overlook any part of the project.

Biotronik HM system consists of a transmitter device plugged near the patient's bed, with an automated algorithm, retrieving device information once daily, compiling information in a remote secure server easily accessed from any internet device, and with alerts programed by the physician in charge arriving to either the clinic or personal handheld device when a device malfunction is noted or a clinical condition is detected.

STUDY DESIGN

Once the device was implanted, the patient was scheduled for a wound and parameter adjustment visit between 6-8 weeks following the surgery; the explanation of the HM system and consent for remote monitoring was realised, and the patient was instructed either to come directly to the pacemaker clinic if a clinical need arose from his/her side (no appointment needed), or if a device alert prompted us to call the patient for an in office visit.

All patients had their EMR chart verified and all pacemaker visits were recorded as well as all other hospital and office visits. The online Biotronik's HM database was used to record all alerts and messages from the pacemaker. Patients refusing the HM system, or implanted after May 1st, 2011, were excluded. HM technology was available for ICD and selected pacemaker patients since 2005 and became available to all new implants and compatible pacemakers since the beginning of 2009. A follow-up period was at least demanded at the moment of data reviewing.

The number of alerts, clinical follow-ups and visits was compared to the usual follow-up visit schedule in use at the CHUS (Table 1); it includes a mandatory visit 6-8 weeks post-implant to assess the wound and one visit every six months thereafter. Alerts and messages coming from the HM system were sorted as Administrative (inscription, no message or HM deactivated) or Clinical with or without (phone call count as no visit) visit required.

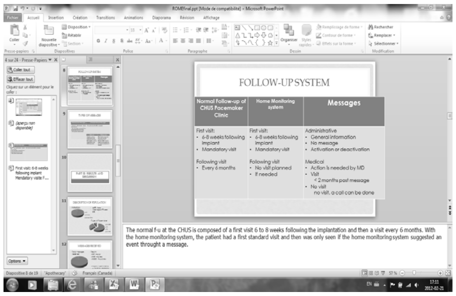

Table 1: Pacemaker follow-up at Sherbrooke University Hospitals

We sought to compare the number of medical visits needed in HM only patients compared to the standard f-up schedule.

STATISTICS

Analyses were made with the Statistics department of the CRC of Sherbrooke. The appropriate analyses for normally distributed data were performed. For the analysis of the results, Wilcoxon test was used and Z scores were calculated. The results are mean values with standard deviation and interquartile range (25-75).

RESULTS

The database was closed in December 2011 and all data is accurate as of that date. 234 patients received an HM capable Biotronik pacemaker. Of this number 45 patients were excluded on the basis of being deceased, being lost to follow-up (other province implants) or mostly by having their HM activated after May, 2011. The remainder 189 patients were included in our study (Figure 1).

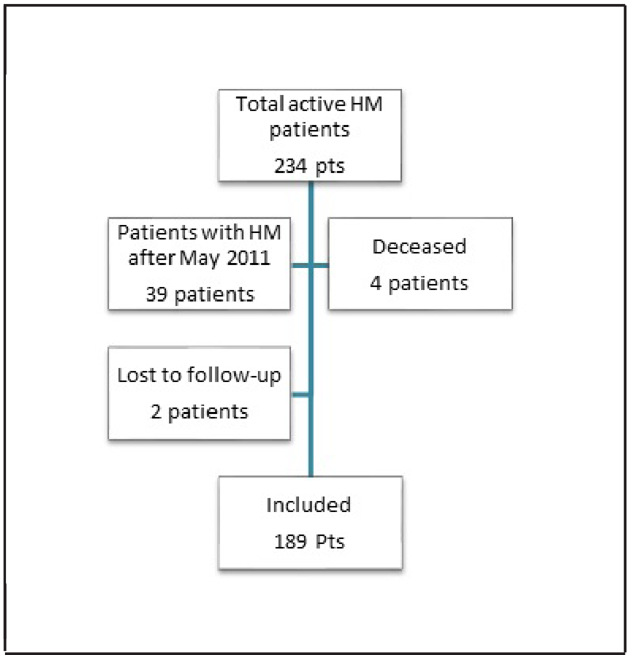

Figure 1: Study population inclusion process
(HM: Home Monitoring)

The mean age was 72.9 years (± 11.9 yrs, median 76 yrs, range 66-81 yrs) with the extremes being 23 and 92 years old. The majority of the patients were men (60.8%)(Table 2).The mean follow-up with home monitoring system was 20.6 months (± 8.7) with the maximum being 83 months. The mean delay before the HM activation was 5.0 months (±11.3). The mean number of visits expected for the duration of our follow-up for the conventional approach is 3.70 (± 1.45). In our population, the mean number of visit for the same period was 2.21 (±2.28) (Table 2). This result includes all the visits made to the cardiology department and/or when a pacemaker interrogation was needed no matter the reason. If we consider only the visits made due to a scheduled pacemaker visit or subsequently to a HM message we found a mean number of 1.80 (±1.74) visits. Visits demanded by the treating cardiologist, during an ED visit or before a surgery, represent a mean 0.41 (±0.97) visits.

Table 2. Characteristics of patients

Characteristics			
Age			
	Mean	72,9 yrs	± 11,9 yrs
	Median	76 yrs	66-81 yrs
	Extremes	23 - 92 yrs	
Sex			
	Male	115	60,8%
	Female	74	39,2%
Pacemaker			
	Cs-DRT	111	58,7%
	Evia	19	10,1%
	Philos	44	23,3%
	Ss	15	7,9%
Pacing			
	DDD	24	12,7%
	DDD-R	115	60,8%
	VVI	1	0,5%
	CLS	49	25,9%
Pacemaker Indication			
	Syncope	32	16,9%
	AV blocs	64	33,8%
	SSS	93	49,2%

With HM remote only schedule the patients saved at least one visit (1.49, $p<0.001$) over a period of almost two years (20.6 months) and an even greater reduction was noted for pacemaker only visits with close to two visits saved over the same period of time (1.90 absolute number of visits saved, $p<0.001$).(Table 3)

Caracteristics		Mean	± SD	IQR
HM delay				
	Month	5,03	11,3	
HM F-U				
	Months	20,6	8,7	14,52-25,25
Standard F-U				
	Visit	3,7	1,45	2,69-4,47
HM F-U				
	Visit (All)	2,21	2,28	1,0-3,0
	Visit(primary)	1,8	1,74	1,0-2,0
Message				
	Clin (no visit)	1,67	3,94	
	Clin (visit)	0,37	1,89	
	Adm	7,31	6,32	4,0-9,0

Table 3: Results
(F-U; follow-up, HM; home monitoring, clin; clinical, Adm; administrative)

Most of HM alerts during the study period were administrative ones with a mean 7.3 (± 6.3) messages par patient. There were few clinical alerts with a mean 1.67 (±3.9) and even fewer alerts required a visit with a mean of 0.37 (±1.9) per patient for the whole duration of the follow-up. Some patients had unnecessary visits scheduled due to late activation of the HM system on a compatible device installed before 2009. This was attributed to the automatic visit scheduling. These visits are included in our results.

No pacemaker dysfunction was noted and no inappropriate dysfunction message was received.

The time to initiate remote follow-up was done with a median 5.03 months after implantation. This result is higher than present numbers since we offer remote device at the first follow-up since 2009. However, patient with remote monitoring compatible device installed between 2005 and 2009 had longer period before being offered remote follow-up affecting our results.

DISCUSSION

The follow-up visits constitute a bothersome obligation for the active population and a stressful event for elderly pacemaker patients. In some occasion it can be a source of anxiety[8]. Older patients find it difficult to attend their appointments because of physical impairment, lack of transportation, forgotten or mistaken date or in our particular case, winter weather issues. These patients represent the vast majority of our population with a mean age of 73 years old. In this setting, offering an exclusively remote follow-up of the pacemaker seems a reasonable alternative.

Our results showed a significant reduction in total pacemaker visits compared to a usual expected. This reduction in visit schedule helps avoid missing work for younger patients and lowering transportation cost and accident risk for older ones. These improvements can facilitate treatment adherence and acceptance by lowering inconveniences[9]. We expect that the advantage of the HM system will become more important with longer follow-up time.

There were no pacemaker abnormalities noted with the HM systems and no patient had to be hospitalized for a pacemaker complication due to HM follow-up. On the other hand, there was no home monitoring missed complication, dysfunction or arrhythmia noted on pacemaker clinic, office or ED visits.

In the great majority of the cases, the number of messages received via the HM systems is quite similar to the literature reported average of 2-12/year[2].

The present results encourage us to continue to offer the HM device to all our eligible patients as soon as possible to reap the advantages. The mean activation delay for these patients was 5 months; beginning April 2009 all patients implanted with a HM pacemaker were offered remote only f-up included patients with implants old as 2005. From all compatible pacemakers available, around 10% of patients were deemed not eligible, refused remote only follow up. As the main advantage for the moment is in the patient's quality of life, remote only follow up should be reserved for the willing patient and a wish for the usual follow-up is always accepted (occurring in most cases in pacemaker replacement patients, used to standard follow-up for years and hesitating for a change). Activation of the remote monitoring probably should be realized at implant or during the mandatory first visit at 6-8 weeks.

There are limitations to our study. The follow-up period is still short and the number of patients is still low; this is a single center, retrospective cohort study with no control group. However, even with these limitations we are confident that our results are significant enough to show a clear trend toward the benefits that warrants the use of total remote monitoring of pacemaker devices to diminish follow-up burden in patients. These results could apply to any center offering pacemaker clinics and should show similar results. This remote follow-up technology is safe and efficient[9] and that has the potential to safely diminish medical visits as we showed with our results.

Telemedicine in cardiology would eventually help increase empowerment to our patients, as newer algorithms would eventually help close the circle, direct the information to the patient and let him or her to react to this information as a diabetic patient now adjust insulin doses without the need of a supervising physician.

CONCLUSION

It is feasible to conduct a total remote follow-up to pacemaker patients; it saves unnecessary time in office visits without compromising safety.

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E-counseling as an emerging preventive strategy for hypertension.

Nolan RP, Liu S, & Payne AYM. Curr Opin Cardiol. 2014; 29:319-323.

Management of hypertension consists of concurrent interventions including pharmacotherapy, lifestyle counseling for regular exercise and a healthy, low-sodium diet, smoking cessation, and stress management. The importance of engaging patients in their self-management of hypertension is recognized by Nolan and colleagues who examine in their paper the additional benefit gained from patient education when supplementary support is provided, particularly through e-counseling interventions.

Popularity in providing health care from a distance through telephone, email, or videoconferencing continues to grow. The Internet itself has opened doors to what is termed e-counseling; a self-guided, interactive, and tailored means of delivering patient education. The opportunity to interact with peers and health professionals and the use of multimedia further supports adult learning. This paper comments on supporting evidence from a meta-analysis showing an average reduction in systolic blood pressure by 3.8 mmHg from participation in self-guided e-counseling.

Patient adherence is a driving factor for both short-term and long-term success in the self-management of hypertension. The accessibility of self-guided e-counseling interventions developed by health professionals can be appealing to many patients. The challenge that remains, as Nolan and colleagues report, is in identifying standards for content and provision of regular feedback. Using cognitive behavioural therapy and motivational interviewing techniques as a guide, the authors suggest e-counseling activities such as goal-setting, self-monitoring, vicarious learning, managing barriers, and relapse prevention support should be included.

Nolan and colleagues present a good argument for the use of e-counseling to support patients' self-management of hypertension. Establishing standards for e-counseling would strengthen future intervention research and assist in expanding its use to other chronic disease risk factors. Further developmental considerations would include sensitivity to culture, language, and literacy levels.

Use of mobile device applications in Canadian dietetic practice.

Lieffers JRL, Vance VA, & Hanning RM. Can J Diet Pract Res. 2014; 75:41-47.

A survey was conducted by Lieffers et al. to determine the acceptability of smartphone application use among practicing registered dietitians in Canada. Quantitative and qualitative data were collected, examining reported use of smartphone applications, evaluation of available applications, perceived client interest, and endorsement.

Only 3% of eligible dietitians registered within Canada, consisting primarily of hospital (inpatient and outpatient) employees, responded to the survey. Close to 60% of the respondents reported to use applications at work for scheduling purposes and less so for practice-related information. The majority of clients who had asked the dietitians about smartphone applications were adults interested in weight loss, general healthy eating, or diabetes. The most popular request was for calorie/food tracker applications. Less than half of the respondents (40.5%) had recommended their clients to use a mobile device application in the past. Expressed concerns included the lack of credible applications supported by reputable organizations containing Canadian-relevant content, the loss of focus on healthy eating through the use of calorie tracking applications, and that the use was unsuitable for certain populations (e.g., seniors, long-term care patients). The need for a mobile device data plan was also a barrier to use of these applications.

Numerous applications, including risk stratification, screening tools, and behaviour tracking tools are available for download onto mobile devices. New applications continue to be developed, competing for popularity. Survey results and the low response rate suggest the acceptance of smartphone application use in clinical practice remains low.

While the accessibility and potential efficiency of smartphone application use can be appealing to health professionals in clinical practice, employers and professional organizations might consider backing credible applications to improve buy-in.

Program Profile

The University of Ottawa Heart Institute welcomes telemedicine technology with three new Tele-Rehab Cardiac Exercise Programs

Katelin Gresty, Jennifer Harris, Jennifer Reed, Judy King

It is well known that secondary prevention cardiac rehabilitation programs are underutilized in North America somewhat due to low referral rates and poor patient enrollment.[1,2] One of the reasons that contribute to this, is that patients living in rural areas find it difficult to regularly attend organized centre-based programs.[3] A possible solution to this problem that has emerged over the last 10 years is the use of telemedicine technology in Cardiac Rehabilitation. This new form of technology has the potential to facilitate participation in Cardiac Rehabilitation programs among the rural population.

Interventions provided over the telephone were one of the first forms of "telemedicine" used in Cardiac Rehabilitation programs. With some patients still not having regular internet access at home, telephone based interventions continue to be a viable option to support this clientele. In 2014, a systemic review concluded that telephone interventions can further improve the benefits of regular cardiac rehabilitation through greater changes in modifiable cardiovascular risk factors.[4] Today, the widespread use of smart phones and mobile devices have encouraged healthcare professionals to further embrace telemedicine concepts when developing interventions to expand their Cardiac Rehabilitation programs. Several controlled trials that have evaluated the efficacy of using mobile devices to complement regular programming have found that the use of mobile devices can result in greater improvements to exercise capacity and cardiac risk factor reduction than regular programming alone.[5,6] It has been suggested that this is due to the immediate feedback or reinforcement provided by the devices or due to the fact that the programs used by the devices can be highly personalized.[7] The internet is another medium that has been used to deliver telemedicine Cardiac Rehabilitation programs. Interventions involving online meetings where participants are asked to log in once per week to complete interactive education modules and online assessments have been shown to be beneficial for improving physical activity levels and result in few cardiovascular events.[8,9]

The Thunder Bay Regional Health Sciences Center was the first institution in Ontario to pioneer a form of program delivery using self-contained portable video units to connect with smaller centers in the region using the Ontario Telemedicine Network (OTN) to deliver education, counseling, and exercise programs. Inspired by the increased access to care that the OTN is creating, and learning from Thunder Bay's well established Tele-Rehab program that is serving their very large and very rural cardiac rehabilitation population, the University of Ottawa Heart Institute added Tele-Rehab to their menu of programs in attempts to better serve their patients who live rurally. Health care professionals at the St. Francis Memorial Hospital in Barry's Bay, the Winchester District Memorial Hospital in Winchester, and the North Hastings Hospital in Bancroft were trained at the Heart Institute to be able to deliver Tele-Rehab Cardiac Exercise program that would be otherwise unavailable to local residents.

These new programs provide an opportunity for local residents to attend supervised exercise programs in their own communities instead of having to make the long commute to Ottawa or other Cardiac Rehabilitation centres. The community based Tele-Rehab Cardiac Exercise programs run concurrently with the exercise programs at the Heart Institute and are connected via teleconferencing technology. This connection allows participants in the community based programs to be part of the on-site programming in Ottawa while at the same time allowing the healthcare professionals at each location to connect with one another. For many rural programs the numbers of participants at any given time is low, so being connected with the larger Ottawa program gives the sense of being part of a larger group.

The 8-week program consists of 2 sessions of supervised aerobic exercise per week followed by a short strength training circuit and educational session. The aerobic exercise portion of the session is provided by the on-site healthcare professionals where the strength training and educational portions of each session is facilitated by exercise specialists at the Heart Institute through the teleconferencing technology.

Although these programs are running well, being new pilot programs they have yet to be formally evaluated. The University of Ottawa in tandem with the University of Ottawa Heart Institute is currently in the process of completing a formal evaluation taking into consideration both the quantitative and qualitative components of the programs.

The aim of the first half of the evaluation is to determine whether there are any notable changes to participants' modifiable cardiac risk factors upon completion of the community based Tele-Rehab Cardiac Exercise programs. The second half of the program evaluation will aim to describe the overall experiences of the people who participate in the program as well as the administrators who provide the programs. With the information obtained from this evaluation the researchers will be able to provide personalized recommendations to each hospital site. By learning from this formal evaluation of the 3 local programs early on, the hope is that the model can be translated to other programs in the future.

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CACPR
Canadian Association of Cardiovascular Prevention and Rehabilitation

1390 Taylor Avenue
Winnipeg, Manitoba R3M 3V8 Canada
Telephone: (204) 928-7870
Web: www.cacr.ca
Email: admin@cacpr.ca