Cardiovascular risk reduction via telehealth: A feasibility study

Anne M PausJenssen MD MSc FRCPC, Betty Anne Spooner MD CCFP, Merne P Wilson RN MSc,
Thomas W Wilson MD MSc FRCPC FACP

AM PausJenssen, BA Spooner, MP Wilson, TW Wilson.
Cardiovascular risk reduction via telehealth: A feasibility study.
Can J Cardiol 2008;24(1):57-60.

BACKGROUND: Successful cardiovascular risk reduction (CVRR) requires ongoing care, which can be difficult for patients living outside urban areas. The authors tested the feasibility of CVRR using telehealth.

METHODS: Telehealth care (T group, n=9) was offered at three- to six-month intervals to patients referred from La Ronge, Saskatchewan (385 km northeast of Saskatoon, Saskatchewan). All patients who were referred to the project accepted. For the initial visit, the clinic travelled to La Ronge; all other visits were performed using telehealth (CommunityNet). Body measurements, blood pressure readings, fasting laboratory tests and food and exercise logs were completed in La Ronge. During the telehealth session, patients met with a nurse, a dietitian, a fitness consultant and a physician. Changes in medication were faxed or telephoned to the local pharmacy. The T group's outcomes were compared with a control group (C group, n=15), which was offered usual care from La Ronge and had been referred to the clinic previously. Change in Framingham risk score, as well as patient and provider satisfaction, was assessed.

RESULTS: The groups were similar in age (T: 44.3 ± 12.8 years, C: 48.3 ± 14.3 years) and initial Framingham risk score (T: $12.0 \pm 13.0\%$, C: $11.1 \pm 10.0\%$). All nine T group patients completed two or more visits, while only eight of 15 patients the C group did so. Both groups achieved a small reduction in Framingham risk score (T: $-1.9 \pm 5.0\%$, C: $-2.0 \pm 6.1\%$). Those with the highest initial Framingham risk scores tended to show the greatest reduction. The T group's patient and health care provider comments were generally positive.

CONCLUSIONS: CVRR via telehealth is feasible and compares favourably with usual care. In particular, more complete follow-up occurs.

Key Words: Cardiovascular disease; Multidisciplinary teams; Prevention; Telehealth

Approximately one-half of the decline in mortality rate from cardiovascular disease is due to improvement of known risk factors: hypertension, dyslipidemia, diabetes and smoking (1). However, success in long-term risk reduction depends on frequent follow-up (2). Saskatchewan is a large, sparsely populated province whose residents must travel long distances to access specialty services. Telehealth technology – the use of electronic information and communication technology to provide and support health care when distance separates the participants – may be an effective way to provide specialty care in Saskatchewan. Telehealth technology has previously been shown to help remote and underserved areas receive specialty care (3,4). Moreover, studies suggest that providing chronic disease management is feasible through the use of telehealth (5) and, in particular, telecardiology (6).

The Cardiovascular Risk Factor Reduction Unit was established in Saskatoon, Saskatchewan, in 1992 with prevention as a goal (7). More than 1600 patients have been assessed and followed. The clinic is multidisciplinary, and patients are assessed by general internists, a nurse, a dietitian and an exercise consultant. Patients are given

La réduction du risque cardiovasculaire par télésanté : Une étude de faisabilité

HISTORIQUE : La réduction du risque cardiovasculaire (RRCV) exige des soins continus, qui peuvent être difficiles à gérer pour des patients qui habitent à l'extérieur des régions urbaines. Les auteurs ont évalué la faisabilité de la RRCV par télésanté.

MÉTHODOLOGIE : On a offert des soins par télésanté (groupe T, n=9) à intervalles de trois à six mois à des patients de La Ronge, en Saskatchewan (à 385 km au nord-est de Saskatoon, en Saskatchewan). Tous les patients aiguillés vers le projet ont accepté. Lors de la visite initiale, la clinique s'est déplacée à La Ronge. Toutes les autres visites ont été effectuées par télésanté (CommunityNet). Les mensurations, les lectures de tension artérielle, les épreuves de laboratoire à jeun et les carnets d'alimentation et d'exercice ont été effectués à La Ronge. Pendant la séance de télésanté, les patients rencontraient une infirmière, une diététiste, un conseiller en forme physique et un médecin. Les modifications à la médication étaient transmises à la pharmacie locale par téléphone ou par télécopieur. Les issues du groupe T ont été comparées à celles d'un groupe témoin (groupe C, n=15) de La Ronge à qui on avait offert les soins habituels et qui avaient été aiguillés vers la clinique auparavant. On a évalué les modifications à l'indice de risque de Framingham ainsi que la satisfaction des patients et des dispensateurs.

RÉSULTATS : Les groupes étaient d'âges similaires (T : $44,3 \pm 12,8$ ans, C : $48,3 \pm 14,3$ ans) et présentaient un indice de risque de Framingham initial similaire (T : $12,0 \pm 13,0\%$, C : $11,1 \pm 10,0\%$). Les neuf patients du groupe T ont participé à au moins deux visites, par rapport à seulement huit des 15 patients du groupe C. Les deux groupes ont obtenu une légère diminution de l'indice de risque de Framingham (T : $-1,9 \pm 5,0\%$, C : $-2,0 \pm 6,1\%$). Ceux qui présentaient les indices de risque de Framingham initiaux les plus élevés tendaient à profiter de la plus forte diminution. Les commentaires des patients et des dispensateurs de soins du groupe T étaient généralement positifs.

CONCLUSIONS : La RRCV par télésanté est un processus faisable qui se compare favorablement aux soins habituels. Notamment, un suivi plus complet est assuré.

lifestyle recommendations and, if necessary, medication to improve their cardiovascular risk score. Patients are followed at regular intervals to ensure that target goals are reached.

Close to one-half of the patients in the clinic are from rural Saskatchewan, but most live within 200 km of Saskatoon. Directors of the clinic recognized that the northern population was under-represented in the clinic. Moreover, they recognized that long-term follow up in this population was often not achieved. Therefore, the primary goal of the present study was to assess the feasibility of using telehealth technology to provide long-term care to patients living in northern Saskatchewan. A second goal was to track patients' cardiovascular risk scores for improvement and compare them with those who were offered usual care.

PATIENTS AND METHODS

The site, clients and physicians

La Ronge, Saskatchewan, was chosen as the site for the present pilot project for several reasons. The town itself has approximately

Department of Medicine and the Cardiovascular Risk Factor Reduction Unit, University of Saskatchewan, Saskatoon, Saskatchewan

Correspondence: Dr Anne M PausJenssen, Department of Medicine, Royal University Hospital, 103 Hospital Drive, Saskatoon, Saskatchewan S7N 0W8.

Telephone 306-966-7963, fax 306-966-7970, e-mail anne.pausjenssen@saskatoonhealthregion.ca

Received for publication May 24, 2007. Accepted August 9, 2007

Figure 1) La Ronge, Saskatchewan

3500 people, but it serves a large area of over 20,000. It is 385 km northeast of Saskatoon (Figure 1), and is accessible by road and air. Telehealth infrastructure is excellent.

One author (BAS) is a long-serving family physician at La Ronge and knows the area and its people well. She acted as liaison between the program and the local physicians.

Physicians practising in La Ronge referred patients considered to be at cardiovascular risk.

The group of patients recruited for the telehealth experiment was compared with a control group of those referred from the same region between 1993 and 2004 via the usual process (initial and follow-up consultations in Saskatoon). All patients referred from La Ronge during that time were enrolled in the study, and the analysis was performed retrospectively.

Telehealth equipment

The connection from Saskatoon to La Ronge was made across CommunityNet, a broadband, high-speed, province-wide network dedicated to health-, executive government- and education-based connections (www.communitynet.ca/intro.html). The 768 kbps speed presented the quality in both sound and video image needed for successful clinical assessments. This real-time connection operates across a private Internet provider network that has security measures in place to govern access, creating secure communication between locations. A movable camera focused on the health care team or on one member and was shown to the patient. Another camera captured the patient's image for the health care team.

The La Ronge telehealth coordinator was able to weigh each patient, measure waist circumference and record blood pressure using a BpTRU device (BpTRU Medical Devices, Canada) (8).

Initial visit

At the initial visit, the entire study team, two physicians, two nurses, a dietician and a fitness consultant travelled by air to La Ronge. Patients had been prebooked and had completed laboratory testing. Each patient was seen by one nurse, one physician, as well as the dietician and the fitness consultant. Demographic, clinical history and physical examination data were collected using standard methods. This initial visit was completed in one day.

For each patient, goals were negotiated for weight, blood pressure, lipid profile, blood glucose and smoking cessation. The recommended body weight goal was a body mass index (BMI) of 25 kg/m² for those whose BMI was 25 kg/m² to 26.9 kg/m² and a 10% reduction for those whose BMI was greater than 27 kg/m².

Specific suggestions for food intake and exercise were provided. Blood pressure, lipid and glycemic goals were those recommended in published guidelines (9,10) and in www.diabetes.ca/cpg2003/recommendations.aspx. Each patient was offered nonprescription and prescription drug therapy as recommended by the physicians. Acetylsalicylic acid was recommended for all whose 10-year Framingham risk score for coronary artery disease was greater than 10% (11).

The dietician went to the local food store with patients to point out healthy food choices. The exercise therapist demonstrated several aerobic, strength and balance exercises.

Follow-up visits

At the time of the initial visit, patients were asked whether they agreed to be recalled at three, six, nine and 12 months, and all agreed. The exact date and time was communicated to patients by telephone approximately 30 days earlier. Laboratory requisitions for fasting blood tests and urinalysis were faxed to the local hospital or mailed to the patient.

The telehealth technician measured weight (using a digital scale), waist circumference and blood pressure. Patients, as a group, met with the nurse, the dietician and the fitness consultant. Data on medications prescribed, medication adherence, symptoms or other concerns were gathered. The physician then saw each patient alone so that distressing or confidential issues could be discussed.

Following each visit, a summary of findings and recommendations was faxed to the referring physician.

The authors' usual practice is to follow up all patients referred to the clinic within one year. All control subjects were sent letters advising them of an appointment date and asking them to confirm. Those who ignored the reminder were not contacted again.

Patient and health care team satisfaction

After each telehealth session, patients and health care team members filled out a brief, anonymous questionnaire, determining their impressions of the program in general and allowing for specific comments. This information was not obtained from those enrolled in the control group.

Data analysis

Patients were considered to be hypertensive if they were prescribed antihypertensive drug therapy, or if either systolic or diastolic pressure was above the goal (140/90 mmHg, or 130/80 mmHg for diabetic patients or those with renal disease). Similarly, dyslipidemia was diagnosed if the patient was prescribed lipid-lowering drugs, or if the low-density lipoprotein cholesterol or ratio of total to high-density lipoprotein cholesterol was above published goals (10). Diabetes and smoking were self-reported.

Patient data were entered into a database program (Microsoft Access 2003; Microsoft Corporation, USA). The program was developed to automatically calculate the 10-year Framingham risk for coronary artery disease using previously published equations (12). Because of the small sample size, a formal statistical analysis of outcomes was not conducted.

RESULTS

Baseline patient characteristics are shown in Table 1. The control group consisted of 11 men and four women, ranging in age from 24 to 71 years. The majority of patients were obese (BMI greater than 30 kg/m² in 10 patients), and their 10-year coronary artery disease Framingham risk varied from 1.0% to 36.2%. Three had a risk score greater than 20%. All the telehealth group patients were men, ranging in age from 24 to 58 years. Their 10-year coronary artery disease

TABLE 1
Baseline characteristics

	Telehealth group (n=9)	Control group (n=15)
Age, years (mean $\pm$ SD)	44.2 $\pm$ 13.0	48.8 $\pm$ 14.1
Body mass index, kg/m ² (mean $\pm$ SD)	45.3 $\pm$ 16.1	30.5 $\pm$ 3.7
Waist circumference, cm (mean $\pm$ SD)	127.3 $\pm$ 17.5	102.0 $\pm$ 11.0
Hypertension, n (%)	5 (56)	6 (40)
Dyslipidemia, n (%)	5 (56)	11 (73)
Diabetes, n (%)	2 (22)	3 (20)
Smoking, n (%)	2 (22)	2 (13)
Framingham risk score (10-year CAD rate in %)	12.7 (13.0)	12.0 (9.7)

CAD Coronary artery disease

Framingham risk was 1.5% to 33.3%; two patients had risk estimates above 20%. All were obese (BMI greater than 30 kg/m²), with waist circumference measurements of 115 cm to 157 cm.

In the telehealth group, all nine subjects completed at least one follow-up visit, and two completed four visits. Only eight control group patients completed two or more visits. The change in Framingham risk score for each is shown in Figure 2. Each group achieved a small reduction (telehealth group: $-1.9 \pm 5.0\%$, control group: $-2.0 \pm 6.1\%$). In general, subjects with the highest baseline risk scores showed reduced scores at follow-up. One telehealth subject reported having stopped smoking versus none in the control group. Two telehealth subjects lost weight (0.6 kg and 1.8 kg), one remained constant (within 0.5 kg) and the others gained 1 kg to 5 kg. Four control subjects lost weight and four gained weight.

Health care team members generally thought that the program was worthwhile. Their major concern was the apparent lack of privacy.

Patients also generally thought that the experience was positive. They remarked on the lack of a need for travel. They voiced no concerns over privacy or lack thereof.

DISCUSSION

The present small study confirms that cardiovascular risk reduction using telehealth is feasible in Saskatchewan. Using CommunityNet, a dedicated, secure, broadband provincial service, we were able to interview patients in real time, assess their progress and provide advice. Changes in, or renewal of, medications were made using telephone and fax lines.

We were able to gather most data needed for cardiovascular assessment. Symptoms can be voiced, medication adherence assessed, and routine anthropomorphic and vital sign data obtained. Laboratory data, including those of fasting blood and 24 h urine tests, were collected before the assessment and were made available to the health care team, the patient and the referring physician. Some physical signs, including edema, were easily assessed.

Patients seemed satisfied with the service and voiced no concerns over privacy. We provided an opportunity for them to meet one-on-one with a physician, with no other team members at either the remote or centre sites. In particular, patients stated that it was more convenient to have health care provided to them in this manner, and was cost-saving compared with travelling to Saskatoon. This perhaps contributed to the better follow-up rate seen in the trial group. This benefit to the patients has been well documented in many other telehealth studies (6).

Health care team members, including referring physicians, were satisfied with the process. Privacy and security were initial concerns, but became less so as providers learned about CommunityNet.

Our patients achieved a small net reduction in their Framingham risk score, which was comparable with that of our control group.

There are limitations to our study. Patients referred to the telehealth arm might have been interested in the program as described by

Figure 2) Change in Framingham risk score for telehealth and control subjects

the referring physician and might therefore have been more likely to follow-up in this manner. The control group was obtained retrospectively, which might have introduced bias between the two groups. Moreover, patients in the two arms of the study were referred to the clinic in different years, and in some cases, different decades. This is also a limitation of the study, because recent cardiovascular risk reduction guidelines are certainly tighter than they were 10 years ago. The study's duration was too short to determine whether the achieved health benefits were maintained.

To our knowledge, a program such as the one described does not exist elsewhere in Canada. However, several somewhat similar programs have been developed in the United States. Doolittle (13) described the necessary prerequisites for telemedicine in 2001, which included the necessary technology and cooperation of all health care team members, including referring physicians. An initiative in North Carolina targets 'disadvantaged' people using home telephones (14). Winters and Winters (15) described a program in Milwaukee that used various types of technology to assess and teach patients. They also found that patients were at least as satisfied with telehealth as with face-to-face encounters. The Stanford group (16) described a home, Internet-based program for coronary rehabilitation patients that targets exercise prescription and compliance. Most telehealth studies, as the present one, are feasibility studies, however, and it is still unclear whether it is truly cost-effective to provide care in this manner (17).

One other consideration is the time commitment and compensation for health care providers. Our clinic is funded through donations, so our nurses, dietician and fitness consultants are paid by the hour. Although we did not perform a formal analysis, we believe that the time commitment for these individuals is no greater than face-to-face meetings. Physicians in Saskatchewan have a fee code for telehealth sessions, which is comparable with a formal consultation fee.

CONCLUSION

We have shown that cardiovascular risk reduction via telehealth is feasible and at least as effective as usual care for patients living in remote regions. We were pleased to be able to achieve complete follow-up of our telehealth group, which is better than we had previously attained.

ACKNOWLEDGEMENTS: The authors thank Carol Henry and her telehealth group in Saskatoon Health Region, as well as Jay Vincent, telehealth technician in La Ronge, Saskatchewan, for their unswerving commitment. The study was supported, in part, by unrestricted grants from Merck-Frosst Canada Inc and the Royal University Hospital Foundation.

REFERENCES

1. Hunink MG, Goldman L, Tosteson AN, et al. The recent decline in mortality from coronary heart disease, 1980–1990. The effect of secular trends in risk factors and treatment. *JAMA* 1997;277:535-42.
2. Haskell WL. Cardiovascular disease prevention and lifestyle interventions: Effectiveness and efficacy. *J Cardiovasc Nurs* 2003;18:245-55.
3. Hogenbirk JC, Pong RW, Lemieux SK. Impact of telephone triage on medical service use: Implications for rural and remote areas. *J Agric Saf Health* 2005;11:229-37.
4. Jennett PA, Person VL, Watson M, Watanabe M. Canadian experiences in telehealth: Equalizing access to quality care. *Telemed J E Health* 2000;6:367-71.
5. Lemaire ED, Boudrias Y, Greene G. Low-bandwidth, Internet-based videoconferencing for physical rehabilitation consultations. *J Telemed Telecare* 2001;7:82-9.
6. Hailey D, Foerster V, Nakagawa B, et al. Achievements and challenges on policies for allied health professionals who use telehealth in the Canadian Arctic. *J Telemed Telecare* 2005;11(Suppl 2):S39-41.
7. Wilson TW, Quest DW, Wilson M, et al. A cardiovascular risk factor reduction clinic. *Can J Cardiol* 1999;15:887-91.
8. Campbell NR, Conradson HE, Kang J, Brant R, Anderson T. Automated assessment of blood pressure using BpTRU compared with assessments by a trained technician and a clinic nurse. *Blood Press Monit* 2005;10:257-62.
9. Khan NA, McAlister FA, Rabkin SW, et al; Canadian Hypertension Education Program. The 2006 Canadian Hypertension Education Program recommendations for the management of hypertension: Part II – therapy. *Can J Cardiol* 2006;22:583-93.
10. McPherson R, Frohlich J, Fodor G, Genest J; Canadian Cardiovascular Society. Canadian Cardiovascular Society position statement – recommendations for the diagnosis and treatment of dyslipidemia and prevention of cardiovascular disease. *Can J Cardiol* 2006;22:913-27. (Erratum in 2006;22:1077).
11. U.S. Preventive Services Task Force. Aspirin for the primary prevention of cardiovascular events: Recommendation and rationale. *Ann Intern Med* 2002;136:157-60.
12. Anderson KM, Wilson PW, Odell PM, Kannel WB. An updated coronary risk profile. A statement for health professionals. *Circulation* 1991;83:356-62.
13. Doolittle GC. Telemedicine in Kansas: The successes and the challenges. *J Telemed Telecare* 2001;7(Suppl 2):43-6.
14. North Carolina initiative targets CVD and diabetes with telehealth intervention. *Dis Manag Advis* 2006;12:127-9,121.
15. Winters JM, Winters JM. Videoconferencing and telehealth technologies can provide a reliable approach to remote assessment and teaching without compromising quality. *J Cardiovasc Nurs* 2007;22:51-7.
16. Moore SM, Primm T. Designing and testing telehealth interventions to improve outcomes for cardiovascular patients. *J Cardiovasc Nurs* 2007;22:43-50.
17. Hailey D. The need for cost-effectiveness studies in telemedicine. *J Telemed Telecare* 2005;11:379-83.