

Telehomecare for patients with multiple chronic illnesses

Pilot study

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ABSTRACT

OBJECTIVE To examine the feasibility and efficacy of integrating home health monitoring into a primary care setting.

DESIGN A mixed method was used for this pilot study. It included in-depth interviews, focus groups, and surveys.

SETTING A semirural family health network in eastern Ontario comprising 8 physicians and 5 nurses caring for approximately 10 000 patients.

PARTICIPANTS Purposeful sample of 22 patients chosen from the experimental group of 120 patients 50 years old or older in a larger randomized controlled trial (N=240). These patients had chronic illnesses and were identified as being at risk based on objective criteria and physician assessment.

INTERVENTIONS Between November 2004 and March 2006, 3 nurse practitioners and a pharmacist installed telehomecare units with 1 or more peripheral devices (eg, blood-pressure monitor, weight scale, glucometer) in patients' homes. The nurse practitioners incorporated individualized instructions for using the unit into each patient's care plan. Patients used the units every morning for collecting data, entering values into the system either manually or directly through supplied peripherals. The information was transferred to a secure server and was then uploaded to a secure Web-based application that allowed care providers to access and review it from any location with Internet access. The devices were monitored in the office on weekdays by the nurse practitioners.

MAIN OUTCOME MEASURES Acceptance and use of the units, patients' and care providers' satisfaction with the system, and patients' demographic and health characteristics.

RESULTS All 22 patients, 12 men and 10 women with an average age of 73 years (range 60 to 88 years), agreed to participate. Most were retired, and a few were receiving community services. Common diagnoses included hypertension, diabetes, cardiovascular disease, and chronic obstructive pulmonary disease. All patients had blood pressure monitors installed, 11 had wired weight scales, 5 had glucometers, and 5 had pulse oximeters. The units were in place for 9 to 339 days. Three patients asked to have the systems removed early because they did not use them or found them inconvenient. The other patients and their informal caregivers found the technology user-friendly and useful. Health care providers were satisfied with the technology and found the equipment useful. They thought it might reduce the number of office visits patients made and help track long-term trends.

CONCLUSION These pilot results demonstrate that telehomecare monitoring in a collaborative care community family practice is feasible and well used, and might improve access to and quality of care.

EDITOR'S KEY POINTS

- This article reports on a pilot study to investigate the feasibility and efficacy of home health monitoring of frail, at-risk patients in the community.
- There is a commonly held assumption that older people will be unable or unwilling to use technology; this study refutes that belief. The study found a high level of acceptance and use by patients, which suggests that the technology is suitable for primary care of elderly people.
- The overall effect of the program on patient health and lifestyle was very positive.
- Future applications could include integration of telehomecare data into electronic medical records, links with other health care providers, and expansion of telehealth applications beyond primary care.

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Télé-monitorage à domicile pour patients souffrant de plusieurs maladies chroniques

Étude pilote

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RÉSUMÉ

OBJECTIF Examiner la faisabilité et l'efficacité d'intégrer un monitoring à domicile dans un contexte de soins primaires.

TYPE D'ÉTUDE Méthode mixte, incluant entrevues en profondeur, groupes de discussion et enquêtes.

CONTEXTE Un réseau de santé familiale semi-rural de l'est de l'Ontario comprenant 8 médecins et 5 infirmières traitant environ 10 000 patients.

PARTICIPANTS Échantillon raisonné de 22 patients, tirés du groupe expérimental de 120 patients âgés de 50 ans ou plus dans un essai randomisé plus large (N = 240). Ces patients souffraient de maladies chroniques et étaient jugés à risque d'après des critères objectifs et l'évaluation du médecin.

INTERVENTIONS Entre novembre 2004 et mars 2006, 3 infirmières cliniciennes et un pharmacien ont installé des unités de télé-monitorage comprenant un ou plusieurs périphériques (p. ex., moniteur de tension artérielle, pèse-personne, glucomètre) chez des patients. Les infirmières ont inséré le mode d'emploi de chaque unité dans le plan de soin des patients. Les patients utilisaient les unités chaque matin pour recueillir les données et entraient les résultats manuellement ou via les périphériques. L'information était transférée à un serveur sécuritaire, puis téléchargée vers un logiciel sécuritaire sur le Web, que le soignant pouvait consulter de n'importe quel site muni d'un accès à Internet. Durant la semaine, les infirmières cliniciennes surveillaient les appareils depuis le bureau.

PRINCIPAUX PARAMÈTRES À L'ÉTUDE Acceptation et utilisation des unités, satisfaction des patients et des soignants à l'égard du système, et caractéristiques démographiques et sanitaires des patients.

RÉSULTATS Les 12 hommes et 10 femmes âgés en moyenne de 73 ans (60 à 88 ans) ont tous accepté de participer. La plupart étaient retraités; certains recevaient des services communautaires. Les diagnostics fréquents comprenaient: hypertension, diabète, maladie cardiovasculaire et maladie pulmonaire obstructive chronique. On a installé des moniteurs de pression chez tous les patients, 11 ont reçu des pèse-personne reliés, 5 des glucomètres et 5 des oxymètres de pouls. Les appareils sont restés en place pendant 9 à 339 jours. Trois patients ont demandé qu'on retire les appareils précocement, ne les utilisant pas ou les trouvant peu commodes. Les autres patients et leurs soignants ont trouvé le système convivial et utile. Ils croyaient qu'il pouvait réduire le nombre de visites au bureau et aider à identifier les tendances à long terme.

CONCLUSION Ces résultats préliminaires montrent que dans un réseau communautaire de médecine familiale en collaboration, le télé-monitorage à domicile est faisable et bien utilisé et qu'il pourrait améliorer l'accès et la qualité des soins.

POINTS DE REPÈRE DU RÉDACTEUR

- Cet article décrit une étude pilote sur la faisabilité et l'efficacité d'un monitoring à domicile de patients à la santé fragile et à risque.
- On croit généralement que les personnes âgées ne peuvent ou ne veulent pas utiliser la technologie: cette étude réfute cette croyance. Nous avons observé un haut niveau d'acceptation et d'utilisation, qui permet de croire que la technologie convient aux soins primaires des aînés.
- Dans l'ensemble, le programme a eu un effet très positif sur la santé et le mode de vie des patients.
- Les applications futures incluent l'intégration des données du monitoring à domicile aux dossiers médicaux électroniques, la création de liens avec les autres soignants et l'extension du télé-monitorage au-delà des soins primaires.

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Telehealth is “the use of information and communications technology to deliver health services, expertise, and information over distance.”¹ Telehomecare is an application of telehealth that brings health care services to patients in their homes. Telehomecare has great potential for improving both access to health care and health outcomes.²⁻⁴ Several small studies have demonstrated the feasibility, safety, and clinical benefits of telehomecare—for example, for managing hypertension and transitions from hospital to home.⁵⁻⁷ A recent systematic review of 306 reports of telehealth studies, which included telehomecare studies, showed that many benefits were derived from the technology, including improved access to care, and better quality of care and quality of life.⁸

Despite these initial promising results and the technological advances achieved in many areas of telehealth, including telehomecare,^{9,10} this technology has not been widely used in primary care settings.^{11,12} The purpose of this mixed-methods study was to examine the feasibility and efficacy of integrating home health monitoring into a primary care setting. This pilot project introduced telehomecare monitoring to a group of older patients with chronic diseases who were participating in a multidisciplinary study of secondary prevention and management of ongoing chronic diseases. In this paper, the term telehomecare applies specifically to the use of remote, home-based monitoring equipment linked to the offices of primary care providers.

METHODS

Setting

This study was conducted in a family health network

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in a semirural area of eastern Ontario. Family health networks are groups of family physicians working with nurses to provide comprehensive care with an emphasis on illness prevention.¹³ The practice, which was fully computerized, was composed of 8 family physicians and 5 nurses who provided care to approximately 10 000 patients. The study was nested in a large randomized controlled trial called the Anticipatory and Preventive Team Care (APTCare) project¹⁴; APTCare services were delivered by a team of nurse practitioners (NPs) and a pharmacist working as part of a multidisciplinary team with the family physicians between November 2004 and March 2006. The study was approved by the Ottawa Hospital Research Ethics Board.

Participants

Patients in the APTCare study were the most frail or at-risk patients in the practice. To be eligible, they had to be at risk for functional decline or physical deterioration, to be 50 years old or older, and to have a life expectancy of more than 6 months. Patients with severe cognitive impairment or language or cultural barriers were excluded. Each patient in the intervention arm had an individualized care plan developed collaboratively by a physician, an NP, and a pharmacist. The telehomecare technology was introduced to a purposefully selected subpopulation of the study group. Six months after the study began, the clinicians were asked to identify patients whom they thought could benefit from the additional care management provided by the telehomecare unit. Twenty-two such patients were identified from the APTCare study intervention group (n=120) and were invited to evaluate the units in their homes. All agreed to participate.

Telehomecare unit

We used the Care Companion telehomecare unit produced by the Neptec Design Group, Ltd, in Ottawa, Ont. The telehomecare technology was designed to meet the needs of a range of patients, from those requiring fairly minimal monitoring to those requiring increasingly sophisticated monitoring. The system consisted of a small unit to which 1 or more peripheral devices (eg, blood-pressure monitor, wireless or wired weight scale, wireless glucometer, wireless pulse oximeter, peak-flow meter, stethoscope chest piece) could be connected. The unit collected data on vital signs and health information from patients who entered values into the system either manually or directly through supplied peripherals. The data were transferred through patients' telephone lines to a secure server located at the manufacturer's data centre. The data were then uploaded to a secure Web-based application that allowed care providers to access and review patient information from any location with Internet access.

Procedures

A trained research assistant installed the units in patients'

homes and provided 60 minutes of training to each patient individually, to caregivers (when present), to the 3 NPs who participated in the study, and to the pharmacist. All patients were instructed to use their units every morning for collecting clinical data, such as blood glucose levels, blood pressure, and weight. Further patient-specific timelines were established according to patients' needs and conditions. The NPs incorporated individualized instructions for use of the units into patients' care plans and also monitored the clinical data received Monday through Friday at 9AM. They did not monitor the system on weekends. Patients were informed of this gap in coverage and were repeatedly instructed not to rely on the telehomecare system to provide critical information to their care providers on weekends or during emergencies at any time. Such information was to be telephoned in directly.

Alert systems were in place to detect trends and out-of-range and overdue data (ie, no data sent for more than 24 hours). Care providers were able to set safe limit values from the Web application for each patient. If patients' values fell outside these limits, care providers were e-mailed alert notifications. For example, if an NP was monitoring the effect of changes in medication on a patient's blood pressure, she could program individualized alert parameters specific to that patient.

Ongoing technical support was provided throughout the study by a research assistant. Major technical support was provided by the manufacturer. The communication strategy was well developed and was enhanced through regular on-site meetings. Core research staff and principal investigators met weekly to facilitate the execution of the project. This group also met monthly with project clinicians and co-investigators to discuss policies and procedures and to troubleshoot problems.

Data collection

Patients completed questionnaires that captured demographic information. We administered the Health Related Quality of Life instrument,¹⁵ Short form-36,¹⁶ and the Instrumental Activities of Daily Living questionnaire¹⁷ to identify quality of life indicators. We assessed the level of caregiver burden using the Zarit Burden Scale.¹⁸

We used mixed methods for evaluation: surveys, focus groups, and in-depth interviews. We initially assessed patients' and caregivers' perceptions of the program, including the telehomecare units, through a survey of all participants conducted by telephone. The survey addressed the technical reliability, use, and ease of use of the unit, as well as general satisfaction with the various components of telehomecare. Focus groups were conducted at 5 and 12 months into the study with the NPs and pharmacist, the family physicians, and the family practice nurses separately (3 groups) and together.

In-depth interviews were conducted with 3 key informants from the patient group and their caregivers

as well as with all 8 physicians, the 3 NPs, and the pharmacist. Interviews were conducted with users (patients or caregivers) and providers to elicit their experiences with the technology. The 3 key informants for the telehomecare study were chosen from among those in a previously selected group of 9 key informant patients and their caregivers. Each NP identified 3 patients for this process, using the following criteria: patients with complex care requirements, at least 1 patient without a caregiver, and at least 1 male patient. Interviews were structured and involved a combination of open-ended and closed questions.

Data analysis

Survey results were analyzed using a database created in SPSS (Statistical Package for the Social Sciences, version 12.0.1). Frequencies were run for each question to find and correct input errors. Descriptive statistics were run on all variables.

Qualitative data (from focus groups, survey comments, and in-depth interviews) were subjected to thematic analysis. Results were transcribed and analyzed using NVivo 2.0 software. Categories for the open-ended questions were created according to participants' responses. First, all responses were read, and related themes were combined into categories and subcategories. Then researchers looked at the responses, reviewed themes and categories, and compared results to see how emergent themes fit together.

Two researchers coded the data. One researcher reviewed the transcripts and used an open coding style. "In vivo" codes were used as much as possible to label categories using participants' words or phrases. These were developed into categories or themes to capture qualitative information. Inconsistencies were discussed and resolved by consensus.

To enhance the trustworthiness of the data, sessions were audiotaped and transcribed verbatim. Disconfirming evidence was consciously sought, and participants' thoughts and feelings were richly described through quotes and examples to confirm themes and patterns. Using multiple data sources allowed for triangulation to enhance the validity of results.

RESULTS

Patients' demographic characteristics

Patients' baseline characteristics are shown in **Table 1**. Their average age was 73 years (range 60 to 88 years); 55% were men. Most were retired. Only 2 were receiving community services.

Quality of life indicators are shown in **Table 2**.¹⁵⁻¹⁸ Patients' quality of life at the physical level was relatively poor, and they were moderately limited in their activities of daily living.

Common diagnoses included hypertension, diabetes mellitus, cardiovascular disease, and chronic obstructive pulmonary disease (Table 3). Patients with congestive heart failure were more likely than patients without this condition to have been selected for the telehomecare

Table 1. Demographic characteristics of patients: Mean age was 73 years (range 60–88 years).

CHARACTERISTIC	N (%)
Male sex	12 (55)
Language first spoken: English	20 (91)
Living arrangements	
• Lives alone	7 (32)
• Lives with others (children, spouse, friend, sibling, or parent)	15 (68)
Community services client	2 (9)
Education	
• Public school	2 (9)
• Some high school	7 (32)
• Completed high school	3 (14)
• Community college	3 (14)
• University	6 (27)
• Other	1 (5)
Main activity	
• Working for pay or profit	4 (18)
• Recovering from illness or on disability pension	1 (5)
• Retired	16 (73)
• Other	1 (5)

Table 2. Patients' quality of life and caregiver burden at randomization: Patients' rating of mean number of unhealthy days during past 30 days=9.1.*

A) PERCEIVED HEALTH RATING*	N (%)
Excellent or very good	6 (27)
Good	7 (32)
Fair or poor	9 (41)
B) VARIABLE	SCORES
Mean score on SF-36†	
• Physical component summary	38
• Mental component summary	52
Mean score on Instrumental Activities of Daily Living instrument ¹⁷	11
Mean score for caregiver burden*	14

*Patients' perceived health status as measured by the Health Related Quality of Life scale¹⁵ using a 5-point Likert scale from 0 (poor) to 5 (excellent) and the number of days in the previous 30 that were limited owing to physical or mental health conditions.

†Identifies 8 health domains and constructs physical and mental component summary scores. Scores range from 0 to 100, with higher scores representing better health-related quality of life.¹⁶

*Scored on the Zarit Burden Scale,¹⁸ a 5-point Likert scale that addresses 22 items related to caregiver burden. Scores range from 0 to 88. Higher scores indicate higher burden. Fifteen caregivers were assessed.

Table 3. Prevalence of chronic conditions in study subjects at randomization and in the practice's patient population

CHRONIC CONDITION*	OVERALL PATIENT POPULATION N = 241 N (%)	TELEHOMECARE PATIENTS N = 22 N (%)
Congestive heart failure	15 (6)	5 (23)
Diabetes mellitus	73 (30)	8 (36)
Hypertension	134 (56)	13 (59)
Chronic obstructive pulmonary disease	34 (14)	5 (23)
Chronic anxiety or depression; other mental illnesses	90 (37)	10 (46)
Cancer	32 (13)	4 (18)
Neurologic conditions	78 (32)	10 (46)
Cerebrovascular disease	14 (6)	0 (0)
Ischemic heart disease or atrial fibrillation	29 (12)	5 (23)
Peripheral vascular disease	23 (10)	2 (9)

*Many patients had more than 1 chronic condition.

study. All patients had the blood pressure peripheral installed, 50% had the wired weight scale, 23% had the glucometer, and 23% had the pulse oximeter.

Acceptance

Telehomecare units were in place from 9 days (for a patient after hospital discharge) to 339 days as determined by patients' needs. Three patients asked to have the units removed early. One patient requested removal after 12 days owing to inconvenience (the equipment was thought to be "awkward and a nuisance"). In 2 other cases, units were removed after 216 days because they were not being used (problems using the scale owing to balance issues, and the system not working).

Patients' and caregivers' satisfaction with telehomecare

Patients were overwhelmingly positive toward home health monitoring, and most thought the technology easy to use and useful. All the caregivers found home health monitoring useful, and most found the units easy or very easy to use. Patients and caregivers also felt a sense of security. One patient's spouse said, "Gives me a feeling of security knowing he is being closely monitored." All the caregivers thought that if they needed monitoring themselves, they would want to use the unit. One said, "It's accurate. A good way to keep track of your own health. If you need help, you need help. Living in the country, you need something like this."

Health care providers' satisfaction with telehomecare

Each NP had a patient load of 40, among whom 7 (18%)

had telehomecare units. About 7% of NPs' time was spent on telehealth activities.

The NPs thought the units were useful and might have reduced the need for office visits and home visits. One said, "When I became better at selecting patients for the equipment, the information provided helped to shape medical decisions in a more timely fashion [and] reduced need for patient visits." They found the alerts produced by the unit very helpful for identifying emerging health issues.

Two NPs found the units very useful for monitoring long-term trends. The third NP said: "I'd much rather put in the equipment for short-term only when medications are being switched, monitor pressure for a month and then move it. I would find that more helpful, to have the equipment change rather than keep it in one place."

Physicians satisfaction with telehomecare

Clinical data from the units could be useful during office visits, so communication about the device was essential. Physicians said it was helpful when notes on patients' use of telehomecare units were made in their charts: "If a patient comes in for a diabetic check, it would be handy to have a page of the Care Companion data, the most recent data, pasted in. Because then we can see all the glucoses, their weights."

Physicians found that data from the telehomecare units helped them assess patients' stability:

I guess I had another gentleman who used the Care Companion blood pressure cuff, and with him it sort of highlighted that ... we really weren't achieving good control ... so maybe with him it got him to the point where he was getting his blood pressure checked often enough to realize that we really weren't doing a very good job about it, even though we were throwing all kinds of medications at him.

Physicians also found the Care Companion helped with monitoring patients. One said, "It's quite amazing, with the patients that are diabetics, the software allows them to signal if they're out of range with sugars, blood pressures." Another said, "I had 1 patient who the respirologist said ideally there would be reading of [oxygen saturations] ... so it was quite comforting to know that the CC [Care Companion] would take those readings" [with an alert being sent if the readings were below range]. Another stated: "There was 1 patient too that, where I think I held onto him for a bit longer because I had this extra resource. He had COPD and got pneumonia. With the NP going in, she put in 1 of these Care Companions with O₂Sat, weight, and blood pressure, all of those things were relevant."

Physicians were concerned about the medicolegal liability associated with receiving time-sensitive data (eg, response time to critical values). One said, "It's really a

medical-legal issue on our part. I don't think it's going to happen, but if something did happen, the ultimate responsibility is on us."

Technical issues

During the study, slightly more than a third of patients required technical support. In most cases it was provided over the telephone; few patients required home visits. Troubleshooting was often as simple as unplugging the unit and plugging it back in. No patients needed their units or peripheral equipment changed, and in no case did a malfunction persist for more than 24 hours.

Reliability and calibration of peripheral equipment

The reliability of the peripheral equipment was sometimes a concern for NPs, physicians, and patients. One NP said: "So that brings the whole issue of the Care Companion calibration. I'm just not sure; they [patients] may be doing it [calibrating their scales on their own], but I'm not sure if they have some standard scales that they take out that are very good to calibrate the Care Companion. Or a calibrated glucometer that they check the machine with."

The NPs verified the calibration of patients' home glucometers by testing them against the unit glucometer and made adjustments if the home glucometer was inaccurate: "I had my own tester, and they [patients] wanted to use both to make sure we were within a point or two of each other." Some patients continued using their own glucometers instead and manually entered the numbers into the unit.

DISCUSSION

These preliminary results demonstrate that telehomecare monitoring in a collaborative care community family practice is feasible and well used and might improve access to and quality of care. Both patients and clinicians found the units beneficial for monitoring and improving provision of care. By introducing the technology directly into a primary care setting, health care providers can improve access to care as most telehealth programs currently still function in conjunction with scheduled home visits.³ They do not yet have the capability of quick response to changes in patients' health status.

Unlike our program, most other programs are run by homecare agencies and operate independently or on referral from family physicians or other providers. Our project demonstrated use of telehomecare as an integral part of a primary care practice. Other studies have shown inadequate integration of telehealth services into health care delivery to be a barrier to successful use of telehealth.¹⁹ Access can be improved through use of telehomecare on several levels, including nurses' increased

availability to support larger numbers of patients and improved prevention of chronic problems, such as heart failure, that can lead to fewer hospitalizations and emergency department visits. Bowles and Baugh,²⁰ in a recent review of telehomecare research, suggested that using telehomecare could reduce the number of in-person visits by 45%.

There were some differences of opinion regarding best use of the units (short-term vs long-term monitoring). This issue can be resolved only through further studies that focus particularly on clinical outcomes and economic effects. In an observational trial of patients with diabetes, Chumbler et al²¹ compared weekly intense telehealth intervention with daily less intense monitoring of 297 diabetic veterans. Compared with the weekly monitored group, the daily monitored group had 52% fewer all-cause hospitalizations, 53% fewer diabetes-related hospitalizations, and 8 fewer bed-care days over 12 months.

Introduction of continuous in-home monitoring allows care providers to focus on secondary prevention, which is important with the increased prevalence of chronic disease and interest in chronic care models, such as Wagner's CCM.²² Current health care reforms, including improved reimbursement for providers linked to chronic disease care, collaborative team approaches, and increasing use of clinical information systems in primary care can only enhance future telehomecare initiatives. Although this study could not report on clinical outcomes because of its small sample size and its selection criteria, other studies have demonstrated improved adherence to medication regimens and better general health, reduced rates of repeat hospitalizations, improved user efficacy ratings, and improved overall self management of patients with chronic diseases.²⁰

The high level of acceptance and use by the patients in this study suggests that this technology is suitable for primary care of frail elderly people. This is important in view of the aging of the "baby boomers," as there are concerns in the health care community about whether there will be enough physicians and resources to care for them.⁴ There is a commonly held assumption that older people will be unwilling, or perhaps unable, to use technology such as the telehomecare peripheral medical devices. Our study refutes that belief, and several other recent studies have had results similar to ours in terms of ease of use, acceptance, and patient satisfaction.²³⁻²⁵

Jennett and Andruchuk²⁶ suggest 5 key factors for successful implementation of telehealth: the readiness of patients and providers, a systematic needs analysis, staged implementation, interconnectivity, and program evaluation. The practice in our study was already equipped with an electronic medical record and booking system and was ready for the introduction of more technology. It is possible that the patients were also more accepting because of this. In-depth individualized


needs assessments were carried out for patients, and the telehomecare units were individualized. The evaluation process and the qualitative aspects of the project allowed for continuous consultation and adjustment of plans according to feedback. These elements probably contributed to the success of the telehomecare component of the project.

Future innovative applications could include integration of telehomecare data into electronic medical records, links with other health care providers and systems, and expansion of telehealth applications in primary care to include palliative care, newborn care and support, and general self-management for the practice population. A telehomecare system as part of a community of care could provide links among primary care physicians, hospital physicians, hospitals, homecare agencies, nurses, pharmacists, support staff, informal caregivers, and patients, and facilitate communication across the primary, acute, long-term, and community care sectors.

Limitations

Our results are limited by sampling bias in that our participants were a convenience sample. Also, the study was carried out in a rural community practice where health care providers chose to participate in the study; therefore, these practitioners were highly motivated for success.

Conclusion

Telehomecare monitoring in primary care holds great promise because it is easy to use and can be used for housebound, elderly, frail patients. Other studies have focused on the use of telehealth for acute care conditions,²⁷ for transitions between hospital and home,⁵⁻⁷ and for care provided by community agencies. Our study, which examined the use of telehomecare within a group family practice setting, found good grounds for increased use of this technology in primary care. Consideration of patient and provider readiness, an individualized approach, good technologic support, and effective communication were key elements of implementation. There is now a need to test primary care telehomecare on a larger scale within a sustainable model of care, with particular attention to clinical outcomes and cost effectiveness. 

Contributors

Dr Liddy drafted the manuscript and was involved in the design and analysis of the study. **Ms Dusseault** contributed to the analysis and critically reviewed the manuscript. **Ms Dahrouge** was responsible for data collection, and contributed to writing the manuscript and critically reviewing it. **Dr Hogg, Dr Lemelin, and Ms Humbert** contributed to design of the study and critically reviewing the manuscript.

Competing interests

None declared

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