Summary

Systematic review of the effects of home telemonitoring in the context of diabetes, pulmonary diseases and cardiovascular diseases

Introduction and context

Home telemonitoring is a telemedicine application in which physiological and biological data are transmitted over a distance for follow-up, interpretation and clinical decision-making purposes. It is a relatively recent and steadily growing intervention modality, not only in many industrialized countries, but also in certain developing countries. It is a means of making health care and services accessible to vulnerable patients where there is a shortage of resources.

Given the rise in chronic diseases, the increase in the aging of the population and the policy emphasizing a shift toward ambulatory care, a large number of chronically ill patients in Québec could benefit from remote home monitoring. The most frequent diseases include diabetes, pulmonary diseases, heart failure and hypertension.

In this context, the issue of the efficacy of such an intervention modality arises. The objective of this systematic review is, therefore, to determine the effects associated with home telemonitoring. These effects will be examined in light of studies that have looked at three main categories of diseases and their associations: diabetes (type 1, type 2 and gestational), pulmonary diseases (asthma and chronic obstructive pulmonary disease) and cardiovascular diseases (heart failure and hypertension). The assessment also explores the conditions for success for this care delivery method.

Method

This systematic review covers the period from January 1966 to December 2007 and concerns the clinical, behavioural (patients taking greater ownership of their health, compliance with treatment and with the telemonitoring program), structural (emergency room visits, hospitalizations, length of stay) and economic effects associated with home telemonitoring, and its main conditions for success (features of the technological devices, the target audience, work organization, etc.). The following databases were consulted: MEDLINE (PubMed interface), the Cochrane Library and the INAHTA database (International Network of Agencies for Health Technology Assessment). In addition, the Copernic and Google search engines were queried for other types of relevant publications that were not available in the above-mentioned databases.

Results

In all, 119 studies on home telemonitoring were identified. More than half of them had been carried out in the United States, about a third in Europe, and slightly more than 10% in Canada. More than three-fourths of the studies identified had been published during the previous six years. It is also noted that 40% of the studies included in our sample were randomized clinical trials. The other types of study designs represented are, in order of importance, cohort studies, nonrandomized trials with a control group, case-control studies, and descriptive studies.

The analysis of the identified studies reveals that the effects of telemonitoring are, in general, highly encouraging, especially at the clinical, behavioural and structural levels. The main conclusions are as follows:

- The studies identified found telemonitoring to be clinically effective in patients with diabetes, hypertension or asthma. This efficacy is more clearly demonstrated in patients whose health at the outset is considered very poor, those who accept their condition, those who wish to play an active role in managing their health,

and those who are motivated to use such technological devices.

- In general, telemonitoring permits a better understanding of the patient's health, better control of the symptoms associated with the disease, greater pharmacologic therapeutic compliance and, as a result, greater patient empowerment.
- Telemonitoring leads to a reduction in the demand for health care, in particular, in patients with heart failure or COPD.
- Fifty percent of the studies showed a significant decrease in service consumption (e.g., emergency room visits, physician office visits, and hospitalizations). The other half permit the conclusion that both modalities (telemonitoring and conventional home follow-up) are equivalent in this regard.
- Lastly, given the paucity of evidence and the ambiguity of the results obtained thus far, no firm conclusions can be drawn regarding the economic viability of home telemonitoring. More thorough and more rigorous economic studies are therefore recommended.

The assessment also identifies various conditions for the successful implementation of this care delivery method. These conditions are divided into three main categories:

Conditions associated with the patient's targeted by home telemonitoring

- Home telemonitoring is not suitable for all chronically ill patients. Those with a moderate or severe cognitive, visual or physical impairment, and those with a shortened life expectancy measured in months rather than years should not be considered, for obvious reasons.
- The effects of home telemonitoring on health are especially beneficial in patients whose health at the outset is considered very poor, those who accept their condition, those who wish to play an active role in managing their health, and lastly, those who are motivated to use such technological devices.

Conditions associated with the technological devices used

- The user-friendliness of the technological devices provided to the patients and the technology's nonintrusiveness in their lives are important acceptance criteria.
- It is advisable for application suppliers to be able to offer patients the technological device that best meets their specific needs, based on their technical skills, work constraints and lifestyle.
- Also, the use of electronic measurement instruments is recommended, since they simplify data capture and transmission and offer greater reliability.
- Lastly, the technological devices provided to the patients should promote access to information in order to help them increase their ability to think and take action regarding their health.

Conditions associated with the organization of a home telemonitoring program

- As for the duration of remote monitoring, it seems desirable to view home telemonitoring as a permanent intervention modality. The shape and frequency that this monitoring assumes should, however, be adjusted according to the changes in each patient's condition.
- When designing and implementing home telemonitoring, it should be borne in mind that it is an intervention modality that supplements primary care. A number of telemonitoring programs that have yielded conclusive clinical results have maintained the telephone follow-ups and home visits, and only their frequency has been adjusted according to the changes in each patient's condition.
- Setting up a home telemonitoring program requires close collaboration between the nurses assigned to telecare and the other professionals, especially physicians. Such collaboration based on relationships of trust between the care providers leads to greater professional autonomy among the nurses.

Conclusion

The highly encouraging results observed at the clinical, behavioural and structural levels, together with the demographic changes, the prevalence of chronic diseases and the anticipated shortage of nurses in Québec, warrant the gradual implementation of home telemonitoring for all the health-care services offered to the chronically ill. However, the success of such projects depends, to a large extent, on a holistic view and proactive management of the various issues and risks involved, for the technological devices provided to the patients cannot, by themselves, guarantee that the desired effects will materialize. The likelihood of observing these positive effects can be significantly increased only by meeting all of the conditions for success listed above. However, it will be necessary to confirm the presumed cost-effectiveness of this care delivery method.