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CADTH Health Technology Review Recommendation

Remote Monitoring Programs for Cardiac Conditions

Appropriate Use Recommendation

CADTH

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

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Summary

CADTH

These recommendations were developed by the CADTH Health Technology Expert Review Panel (HTERP) to address the implementation of remote monitoring or remote management programs for patients with chronic cardiac conditions (i.e., heart failure, atrial fibrillation, or hypertension) or patients participating in cardiac rehabilitation.

The recommendations were developed following HTERP deliberations over multidisciplinary evidence reviewed in a CADTH Health Technology Assessment (HTA) report.[1] The HTA included a realist review conducted to identify key perceived or actual mechanisms of remote monitoring programs, patients' and caregivers' expectations and experiences of engaging with remote monitoring programs, and ethical issues raised by the use of remote monitoring for patients with chronic cardiac conditions. Monitoring conducted via implantable cardiac devices (e.g., implantable cardioverter defibrillators) was outside the scope of this work. Given the existing literature on the diversity of remote monitoring programs and devices as well as the safety and effectiveness of remote monitoring, the HTA did not examine the clinical effectiveness or cost-effectiveness of remote monitoring.

The target populations for these recommendations are people living with chronic cardiac conditions, defined as those patients with chronic heart failure, atrial fibrillation, or hypertension, or people participating in cardiac rehabilitation. The target users of these recommendations are Canadian health care decision-makers, people in provincial and territorial ministries of health, and people involved in the implementation of remote monitoring programs.

HTERP recommends that the design and implementation of remote monitoring programs for patients with chronic cardiac conditions include a broad range of stakeholder voices with considerations across several key domains. In particular, HTERP recommends that:

- remote monitoring programs for chronic cardiac conditions be flexible and adaptable to a diverse range of patient circumstances
- if implemented, remote monitoring should be an integral part of the care pathway for chronic cardiac conditions, with processes and policies to support it
- jurisdictions understand and be transparent about information flow, and keep patient data use and privacy at the forefront of service contract negotiations
- remote monitoring programs for cardiac conditions avoid creating or exacerbating inequities in health care
- remote monitoring programs include an evaluation component to ensure program aims are met.

Technology

Remote monitoring (also known as *remote patient monitoring* or *remote patient management*) is a form of telehealth in which health care is delivered to patients outside traditional settings through the exchange of health data between patients and health care providers using telecommunication technologies (e.g., video conferencing) or stand-alone devices (e.g., portable heart rate monitors).[2,3] The goals of using remote monitoring in clinical practice centre around promoting home-based self-management to improve patient outcomes or reduce health system usage.[4] Self-management strategies typically aim to improve diet and cholesterol levels, exercise levels, knowledge of the patient's health condition, confidence to stay at home, patient satisfaction, and quality of life. These outcomes are, in turn, theorized to lead to improved patient outcomes over time and to enable patients to continue living at home and in the community.[4] The focus of these recommendations is the use of remote monitoring programs for patients with chronic cardiac conditions (i.e., heart failure, atrial fibrillation, or hypertension) or who are participating in cardiac rehabilitation. A remote monitoring program was considered to be a formal, organized offering from a health authority or health care organization that may employ a variety of technologies (e.g., video conferencing, blood pressure monitors, online portals) to collect and transmit patient data. This is in contrast to the one-off use of remote monitoring devices that may be used or prescribed by an individual clinician.

Methods

CADTH conducted an HTA[1] including a realist review to examine the aspects of remote monitoring programs that contribute to patient- and system-level outcomes, a review of patient and caregiver perspectives and experiences, and an ethics analysis related to the use of remote monitoring for people with chronic cardiac conditions or people undergoing cardiac rehabilitation. HTERP developed recommendations on the implementation of remote monitoring programs based on evidence presented in the HTA report. HTERP members reviewed the evidence, discussed all elements of the HTERP deliberative framework,[5] considered stakeholder feedback, and developed recommendations through discussion, deliberation, and consensus. Additional information on the HTERP process can be found on the HTERP page of the CADTH website.

Detailed Recommendation

The CADTH HTA[1] found that patients, providers, and caregivers generally found remote monitoring programs for cardiac conditions easy to use and beneficial to health, although some populations likely to be targeted by these programs, such as Indigenous peoples or people of low socioeconomic status, were not specifically described in the literature analyses. Studies in rural and remote settings, where remote monitoring programs may also be deployed, were lacking. Evidence and programs are heterogenous, but common themes emerged across the analyses that influence uptake and effectiveness of remote monitoring programs, including the need for functional and easy-to-use technologies that fit within a patient's lifestyle, the availability of technical support, and the ability to address the needs

of caregivers, and also the potential to increase clinician workload or create disparities in care.[1] The objective of these recommendations is to provide advice for Canadian health care decision-makers and researchers about the design and implementation of remote monitoring programs for people with chronic cardiac conditions or people participating in cardiac rehabilitation.

- HTERP recommends that the design and implementation of remote monitoring programs for patients with chronic cardiac conditions includes a broad range of stakeholder voices with considerations across several key domains.

Patient and Caregiver Considerations

HTERP recommends that remote monitoring programs for chronic cardiac conditions be flexible and adaptable to a diverse range of patient circumstances:

- Although remote monitoring programs can have positive effects on a patient's life and enable care at home and in the community, these programs can also create barriers to some activities of daily living (e.g., travel). In particular, larger or bulky equipment, such as the type provided in legacy programs, may be intrusive, difficult to place in the home, or otherwise challenging to incorporate into the patient's daily routine. Tailoring remote monitoring equipment and program design (e.g., continuous versus intermittent monitoring) to patient circumstances can reduce these barriers.
- The goals of a remote monitoring program are not always clear. Transparency about the program's aims (e.g., early warning systems versus behaviour modification) is important.
- Although most technical glitches are minor, practical considerations such as battery life and reliable connectivity are important and contribute to the success of a remote monitoring program. The perception of technological literacy requirements (e.g., that remote monitoring requires patients to be technologically savvy) can be a barrier to uptake. Accessible and helpful technical support can mitigate some of these issues.
- Informal caregivers can facilitate the uptake and success of remote monitoring programs. However, remote monitoring programs can increase the burden on informal caregivers to assist with monitoring or help navigate technological issues. Support for caregivers as well as patients is an important consideration.
- There is a lack of data from rural or remote settings, and certain segments of the population, such as Indigenous peoples, are underrepresented in the literature. Given that there are different systems that may more or less adequately serve different populations, it becomes important that there are transparent ways for patients in different target populations to have a voice in the selection and adoption of remote monitoring systems.

Provider Considerations

If remote monitoring is implemented, HTERP recommends that it be an integral part of the care pathway for chronic cardiac conditions, with processes and policies to support it.

- Remote monitoring programs have the potential to increase workloads for clinicians, including increased administrative tasks, increased number of patient contacts, and the need for rapid decision-making and responses to alerts, which can interrupt workflow. This increase in workload is likely to go beyond cardiac specialists and also impact primary care providers, nurses, allied health professionals, and administrative assistants involved in supporting remote monitoring.

- Remote monitoring is an adjunct to in-person care, not a substitute. The technologies used should be integrated into health care processes, including electronic health records to minimize duplicate data entry and to ensure smooth transitions between care providers. Programs should align with available clinical practice guidelines.
- Program costs can extend beyond the costs of the technology. Lack of remuneration for some remote monitoring activities could be a barrier to uptake. Funding of remote monitoring programs, including equipment costs, supports their operation.
- In jurisdictions where individuals access specialist cardiac care outside their province or territory of residence, limits on cross-jurisdictional practice created by professional licensure and credentialing requirements may also create a barrier to accessing remote monitoring.

Data and Privacy

HTERP recommends that jurisdictions understand and be transparent about information flow and keep patient data use and privacy at the forefront of service contract negotiations.

- The use of software and applications is sometimes bound by end-user agreements, and there are concerns that current or future risks around the use of data may not be fully known. Further, patients who do not want their data used in certain ways may find fewer options available. These concerns can be mitigated by negotiation of service contracts between jurisdictions and technology providers, which can place limits on third-party use of data.
- Relatedly, where and how data are transmitted and stored can raise issues related to security and privacy. In particular, transfer of data outside of the jurisdiction may make it subject to different privacy provisions. Contract negotiation can also be used to constrain where data can be stored. Decision-makers considering a specific technology or provider should, if they have access, look to their jurisdiction's privacy office or health law team for additional support.

Digital Equity

HTERP recommends that remote monitoring programs for cardiac conditions avoid creating or exacerbating inequities in health care.

- Access to remote monitoring programs can be limited by access to required infrastructure, such as a reliable and suitable internet connection or sufficient technology (e.g., smartphone or computer).
- Bring-your-own-device (BYOD) models for remote monitoring can be attractive to funders because they can reduce overall costs to the health care system and allow patients to use devices with which they are already familiar. However, caution is warranted because this model can result in differential care for those who can afford more advanced devices, or it can create barriers to access for those who lack their own technology. BYOD programs should be supplemented by non-BYOD models for those who lack access to the internet, a phone, or other modern devices.
- Solutions to overcome specific access issues (e.g., providing a cellular-enabled monitoring device) may not address underlying barriers to health outcomes (i.e., social determinants of health). Some patients may benefit more from in-person services or services that target these underlying barriers.

Evaluation

HTERP recommends that remote monitoring programs include an evaluation component to ensure program aims are met.

- The goals of a remote monitoring program can be multifaceted. Programs may aim to improve morbidity and mortality over what can be achieved through in-person care, improve patient quality of life, improve access to care for those patients for whom in-person care is inaccessible, improve communication between patients and care providers, or enhance patient autonomy. Program outcomes should be monitored to evaluate whether the aims are achieved.
- Clinical practice guidelines and quality indicators for a condition can be used to benchmark care.
- Although remote monitoring programs can increase workload, costs and cost-effectiveness remain unknown. More research is needed in these areas, and the direct impact of these programs should be monitored from a payer and societal perspective.

Evidence

The complete assessments describing the realist review, patient and caregiver perspectives and experiences, and ethical issues used for developing this guidance are available in the CADTH Health Technology Review on remote monitoring programs for chronic cardiac conditions.[1] The majority of the literature focused on remote monitoring for behaviour change and was conducted in urban settings.

Realist Review

A realist review was conducted to identify key perceived or actual mechanisms of remote monitoring programs for adult persons living with, or persons who care for those living with, a chronic cardiac condition or who are participating in cardiac rehabilitation.

The research question addressed was:

1. What aspects of remote monitoring programs for chronic cardiac conditions or post-cardiac events influence patient and system-level outcomes, for whom, in what circumstances, to what extent, and why?

Although the review identified only 1 dedicated realist evaluation, a sizable number of studies were identified that contained data on remote monitoring program mechanisms and/or contexts in studies examining programs for patients with heart failure (n = 64) and for cardiac rehabilitation (n = 23). A small number of studies (n = 4) addressed atrial fibrillation. No studies were identified that focused on hypertension.

The vast majority of sampled patients, caregivers, and health professionals (typically 80% to 90%) consistently found or perceived remote monitoring programs across different cardiac conditions to be easy to use and beneficial to health.

In terms of the key mechanisms, adequate program technology was necessary but insufficient to foster positive outcomes. To ensure program effectiveness, technology had to integrate well with patients' daily life patterns and home life, and promote understanding in

patients not only of their condition but also of their personal health status. The main issues around technology uptake did not relate as much to general fears about the technology but rather frustrations around common but technically straightforward issues, such as unstable connectivity of devices and poor battery life.

For cardiac rehabilitation, programs were seen to focus predominantly on promoting healthy lifestyle behaviours with the capacity of technology to facilitate these outcomes being dependent on the ability to integrate the technology with patients' life patterns. Programs were most effective when motivated patients received highly individualized program content and components, and leveraged existing strengths in relationships between health care providers and patients.

Patient experiences of heart failure were far more ambiguous, and programs were seen to provide vital support for daily ongoing self-care and knowledge. Programs tended to be more complex, but most effective when the technological aspects of the programs were easy to use, were supported adequately, and — crucially — were highly unobtrusive in patients' lives. Similar to cardiac rehabilitation programs, heart failure programs were viewed as adjuncts not replacements for traditional face-to-face health care provision; however, unlike cardiac rehabilitation programs, remote monitoring programs for heart failure provided more useful knowledge to interpret symptoms and guide daily self-care.

Evidence regarding atrial fibrillation programs was scant, but ease of technological use guided patients' uptake of platforms and was seen to complement face-to-face health care.

Perspectives and Experiences

The Perspectives and Experiences review was conducted using a thematic synthesis of primary qualitative research to understand and describe peoples' experiences with and perspectives on remote monitoring programs for chronic cardiac conditions and cardiac rehabilitation. The research questions addressed were:

1. For people living with a chronic cardiac condition or post-cardiac event, what are their expectations of, experiences with, and perspectives on remote monitoring programs?
2. What are their families' and care providers' expectations of, experiences with, and perspectives on remote monitoring programs?
3. How do people living with a chronic cardiac condition or post-cardiac event, their families, and their care providers experience and understand:
    - how to adopt and use remote monitoring technologies?
    - how remote monitoring programs move health care into peoples' places of residence? What is the impact of this shift on the families of people with a chronic cardiac condition or who are post-cardiac event?
    - the changes in roles and responsibilities that can accompany remote monitoring programs? What is the impact of this shift on the families of people with a chronic cardiac condition or who are post-cardiac event?
    - how and when remote monitoring programs are seen as "working" or as "not working"?

A total of 27 studies, reported in 30 publications, met the inclusion criteria and were included in the review of patient and caregiver perspectives and experiences with remote monitoring

for chronic cardiac conditions. CADTH also separately engaged patients and caregivers directly in a Patient Engagement section

Ideas around age and technological literacy were commonly raised by people living with cardiac conditions as a reason for being disinterested or unable to participate in remote monitoring programs. When people encountered technological challenges, they expressed being discouraged from adopting and using remote monitoring. Having informal caregivers, particularly adult children, who could help troubleshoot the technologies helped them overcome these hurdles. Sometimes the challenges were not with the use of the technologies but with the physical installation of the equipment itself, which meant finding the space and having the necessary connections, which was not always easy or possible depending on peoples' housing arrangements.

Many people living with chronic cardiac conditions reported an openness to taking greater responsibility for their own health through self-management. This required people living with cardiac conditions to make connections between their health measurements and their behaviours over time. The self-management of medication required more guidance and support from health care providers for people with chronic cardiac conditions to become confident in changing their dosages or medications. Remote monitoring played a critical role as an external motivator for patient self-management because it required patients to be accountable and provided them with reminders. Once patients discontinued remote monitoring programs, they described struggling with or giving up on monitoring their condition and lifestyle changes.

People with chronic cardiac conditions saw remote monitoring programs as providing a sense of security through being watched, particularly for those with heart failure, and as a way of accessing health care and fostering a closer connection between providers and patients. Both providers and patients appreciated the ways that remote monitoring programs allowed people living with cardiac conditions to be more involved in their care.

Providers' experiences with and expectations of remote monitoring embodied views that remote monitoring can both take time and reduce time. Remote monitoring was seen by providers as increasing the amount of time needed for patient care due to increased numbers and length of consultations. However, providers described remote monitoring programs as saving time because of the ability to identify and address health concerns early. The workload, particularly case load, was raised as a concern by nurses when programs underestimated or did not allow for adequate time for consultations. Remote monitoring programs that were not technically or organizationally integrated into health care delivery also presented challenges to providers.

Ethical Issues

An ethical analysis was conducted building from a literature review of articles with either explicit normative analysis of ethical issues arising in the use of remote monitoring, either generally or for the treatment of the conditions of interest, or empirical research that included ethical issues arising in the use of remote monitoring.

The research questions guiding this inquiry were:

1. What are the ethical issues related to the implementation of remote monitoring programs?

2. How might these issues be addressed in rural, remote, and urban settings?

The goals of remote monitoring programs are not always clear. For a program to be implemented with a good chance of success, decision-makers need to assess what gaps exist in current care and what options exist to meet those needs (technological, human resources, transportation, others). This assessment should include the voices and perspectives of those who will be most impacted by the decision and who will also play a key role in the uptake and success of the program. That should include patients of different socioeconomic backgrounds, races and ethnicities, and genders (especially those who are less likely to be represented at decision tables); their informal caregivers, such as family and spouses who often play central and critical roles; and general practitioners and cardiac teams.

Remote monitoring programs are often framed as a solution to provide care to patients in their own homes or communities, and to increase patient access to high-quality services. Unfortunately, there is limited evidence about the effectiveness of various types of remote monitoring programs in different contexts. These evidence gaps are most notable with people living in rural and/or remote locations, racialized groups and Indigenous people, and people of low socioeconomic status.

Remote monitoring programs are not necessarily a solution to health access challenges. Attention should be paid to what costs are borne by patients or their families in the target population(s) and subgroups. What may be a small expense to some patients and their families may be an impossible barrier to others (e.g., transportation to clinic, internet provider at home).

Programs that include private third-party technology raise concerns about privacy and informed consent. User agreements between patients and a third party may be challenging because the risks to patients and/or their genetic relatives from their health information and other information may not be clear or reasonably known. If such legal agreements are a requirement for patients to receive care, this raises concerns about freedom of choice.

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Appendix 1: Health Technology Expert Review Panel (HTERP)

The Health Technology Expert Review Panel (HTERP) consists of up to 7 core members appointed to serve for all topics under consideration during their term of office, and up to 5 expert members appointed to provide their expertise for a specific topic. For this project, 4 expert members with expertise in cardiac care were appointed. The core members include health care practitioners and other individuals with expertise and experience in evidence-based medicine, critical appraisal, health technology assessment, bioethics, and health economics. One public member is also appointed to the core panel to represent the broad public interest. HTERP is an advisory body to CADTH and is convened to develop guidance or recommendations on non-drug health technologies to inform a range of stakeholders within the Canadian health care system. Further information regarding HTERP is available on the CADTH website.

HTERP Core Members

Dr. Hilary Jaeger (Chair), Dr. Sandor Demeter, Dr. Lawrence Mbuagbaw, Dr. Jeremy Petch, Dr. Lynette Reid, Ms. Tonya Somerton, Dr. Jean-Eric Tarride

Expert Members

Dr. Jason Andrade, Dr. Robert McKelvie, Dr. Roopinder Sandhu, Dr. Neville Suskin

Conflicts of Interest

HTERP core members' declarations are posted on the CADTH website.

Dr. Andrade has received research funding or grants, consulting fees and/or payment for speaking engagements from Medtronic, Baylis Medical, Biosense Webster, Pfizer/Bristol-Meyers Squibb, Servier, and Bayer. Dr. Sandhu has received research funding or grants from Pfizer/Bristol-Meyers Squibb and Servier. Dr. Suskin has received consulting fees from Amgen; research funding or grants from Pfizer, Bayer, Servier, and Amgen; and payment for speaking engagements from Pfizer. Dr. McKelvie declared no conflicts of interest.