

# Home health monitoring during the COVID pandemic: Results from a feasibility study in Alberta primary care

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## Abstract

The expansive geography of Central Alberta presents many barriers to optimal care, including limited resources and access issues. In response to the COVID-19 pandemic, primary care networks (PCNs) within Central Alberta partnered with a technology provider to rapidly implement home health monitoring (HHM) for patients with chronic diseases. In the 37 patients evaluated in phase 1 (90 days), diabetes was most common (73%), followed by hypertension (38%), chronic obstructive pulmonary disease (27%), and heart failure (11%). Overall, patients were comfortable using the HHM technology, and >60% reported improved quality of life after follow-up. Patients also made fewer visits to their family physician/emergency department compared with the pre-enrolment period. In January 2021, the HHM initiative was expanded to a larger patient cohort (phase 2; n = 500). Interim results for 90 patients from eight PCNs up to the end of May 2021 show similar findings to phase 1.

## Introduction

In 2019, the Canadian Medical Association (CMA) published a discussion paper on the challenges of making digital healthcare—and in particular, virtual healthcare—a mainstream activity in Canada. In its concluding statement, the CMA remarked: “At the current rate of progress, it is likely to take decades for Canada to achieve the level of virtual care that is currently being delivered by [the] systems of Kaiser Permanente.”<sup>1</sup> If the need to accelerate virtual care infrastructure in Canada was evident in 2019, it is now—in the wake of a pandemic that has rocked traditional healthcare systems worldwide—absolutely critical.

Access to virtual care is particularly critical for patients living with one or more chronic diseases, such as diabetes, hypertension, and chronic obstructive pulmonary disease (COPD), as it is these patients who have the highest risk of requiring acute care after COVID-19 infection. In the primary care setting, routine care for patients with chronic diseases is provided by family physicians, often supported by primary care networks (PCNs), but virtual healthcare delivery is, to our knowledge, uncommon. Reports of virtual healthcare initiatives in Canada come primarily from secondary care settings (eg, studies in which patients are followed up remotely after acute hospital care).<sup>2–4</sup>

To explore the feasibility of delivering virtual healthcare within the primary care setting, a multiparty collaboration came together to deliver home health monitoring (HHM) to patients with chronic conditions in Alberta’s Central Zone, a largely rural area with a population of over 450 000.<sup>5</sup> The expansive geography of Central Alberta presents many barriers to optimal care, such as limited resources and access issues (distance, cost, weather, and ability to drive). Furthermore, patients in Alberta’s Central Zone have higher rates of most chronic conditions compared with the rest of the province,<sup>6</sup> with 30–40% more emergency department (ED) visits than the average Albertan and higher unplanned hospital readmission rates at both 7 and 30 days after discharge.<sup>7</sup> As

such, this vast geographic area was the ideal setting in which to implement this pilot feasibility study.

## Methods

### Home health monitoring

Home health monitoring is an approach that enables regular monitoring of chronic diseases without the need for patients to visit a clinic in person,<sup>8</sup> thus offering remote healthcare delivery.<sup>9</sup> According to a predetermined schedule, patients enter biometric data relevant to their chronic condition using a technological device, such as a smartphone or tablet, and answer questions about their symptoms. Based on data from these remote monitoring platforms, healthcare providers then receive alerts for results requiring follow-up.<sup>8</sup>

### Partners and collaborators

The participating partners in this collaboration were as follows: PCNs in Central Alberta; Alberta Health Services; the not-for-profit corporation Health Cities; the pharmaceutical company Boehringer Ingelheim; the research and innovation agency Alberta Innovates; the Government of Alberta Ministry of

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Seniors and Housing; and the technology provider TELUS® Health (Figure 1).

**Phase 1 (initial deployment)**

The Central Alberta HHM initiative consists of two phases: (1) initial deployment and (2) scale-up. The objectives of phase 1 were to validate HHM delivery through HHM kits (provided by TELUS® Health) and to investigate the impact of HHM through patient- and provider-reported outcomes.

From June through September 2020, three PCNs within Central Alberta (Drayton Valley, Kalyna Country, and Wolf Creek) recruited patients with one or more of four chronic conditions (COPD, diabetes, heart failure, and hypertension). Each patient had an HHM kit that included a touchscreen tablet, blood pressure monitor, thermometer, weight scale, and pulse oximeter. After 90 days of monitoring, patients were discharged from the program and asked to return their HHM kits.

Primary care network nurses funded through the HHM initiative provided training for each patient in the use of the monitoring equipment and remote monitoring platform. In addition to monitoring their biometrics using the provided equipment, patients used the remote monitoring platform to answer questions about symptoms related to their conditions. The remote monitoring platform identified clinically significant results as either “moderate” or “high” priority. Designated PCN nurses monitored the remote platform and, when necessary, arranged for patients to have a virtual or in-person consultation with their family physician.

Results were generated using data extracted from the HHM platform, in addition to patient-reported outcomes (via the EuroQoL EQ-5D-5L health-related quality of life assessment and a custom patient experience survey) and provider-reported

outcomes to inform the second phase of the program. Within the patient and provider surveys, each evaluation question had several subquestions, with various indicators and data collection methods (further methodological details available [here](#)).

**Phase 2 (scale-up and development)**

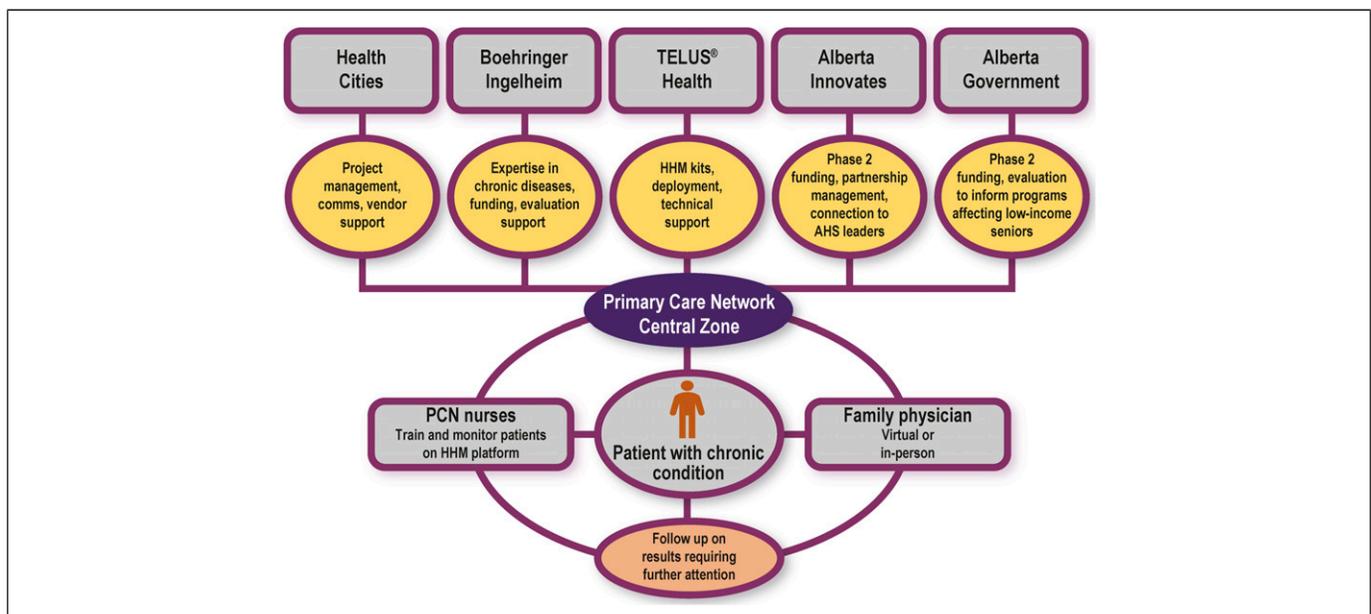
Initiated in January 2021 and ongoing at the time of publication, the second phase involves scaled-up deployment of HHM to 12 PCNs and uses a more robust evaluation approach that will employ iterative evaluation cycles following patient enrolment periods. In total, 500 patients are expected to participate (375 patients enrolled with HHM device kits; 125 patients enrolled through Bring Your Own Device [smartphone or tablet]), each for 90 days through to June 2022. Patients will be monitored by PCN Chronic Disease teams in three enrolment periods over 12-18 months, with 165-170 patients per enrolment “wave.” This larger cohort of patients will enable a more robust analysis of patient experience, health outcomes, cost implications, and any impact on broader health system usage.

Unlike phase 1, phase 2 now incorporates the EQ-5D-5L health-related quality of life tool into the HHM platform itself to support its completion at baseline and after 90 days in a much larger patient cohort, providing a consistent measure of health outcomes and allowing comparison of results against provincial norms.

**Results**

**Phase 1**

Thirty-seven patients were enrolled from all three participating PCNs, with nearly half coming from the Wolf Creek PCN. More



**Figure 1.** Study model and partners. AHS, Alberta Health Services; HHM, home health monitoring; PCN, primary care network.

males (57%) than females (43%) were enrolled, and the average patient age was 64.1 years across all PCNs, with 68% of patients aged 60 years or above. Postal codes were recorded infrequently but indicated that patients from across a broad swathe of Central Alberta were enrolled. Of the four chronic conditions in scope for phase 1, diabetes was most common, with nearly three-quarters of patients presenting with the condition (73%). Hypertension was documented in 38%, COPD in 27%, and heart failure in 11% of patients (Figure 2). Quality of life scores at enrolment were similar to norms for Albertans aged 60 years and over.

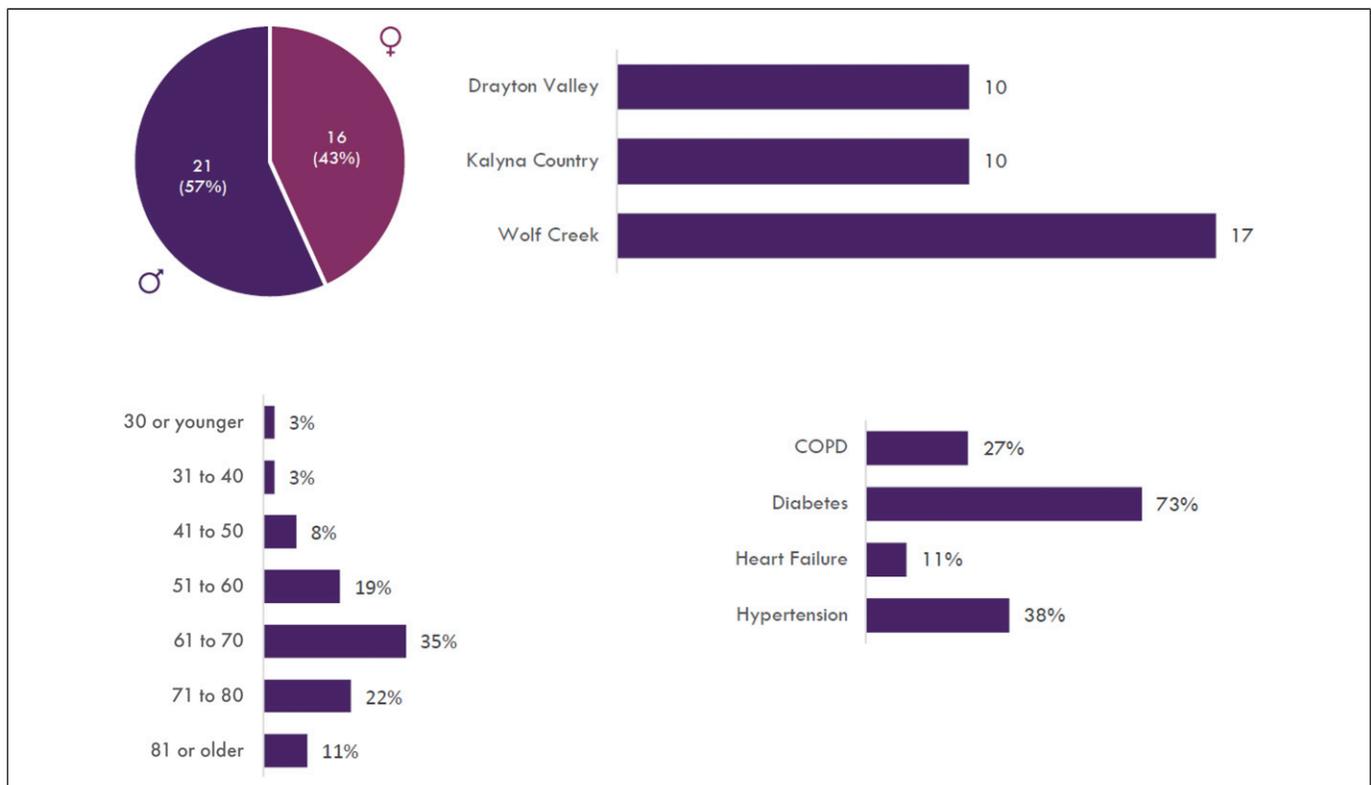
Of the 11 patients who completed the EQ-5D-5L health-related quality of life assessment at baseline and end of their 90-day participation, over 60% maintained or improved their health-related quality of life, defined as a minimally important difference in index scores of  $\geq 0.037$  (Figure 3A). While the number of patients who completed the patient experience survey was relatively small, results were overwhelmingly positive. All 17 reported feeling comfortable with the technology and agreed that their information was private and secure. They also reported feeling safe and well cared for by their monitoring nurse, and all agreed that they would recommend this system to other patients with similar medical conditions (Figure 3B). The evaluation had intended to assess whether there were differences in patient experience across PCNs; however, this comparison was not possible due to one PCN having no patient experience survey responses. With 17 responses received, the patient experience response rate across the other two PCNs was 46%. In terms of

health system usage, patients reported less use of services such as Alberta’s Health Link advice line, EDs, and family physicians. No patients reported being admitted to hospital, and only one reported a visit to an ED (Figure 3C).

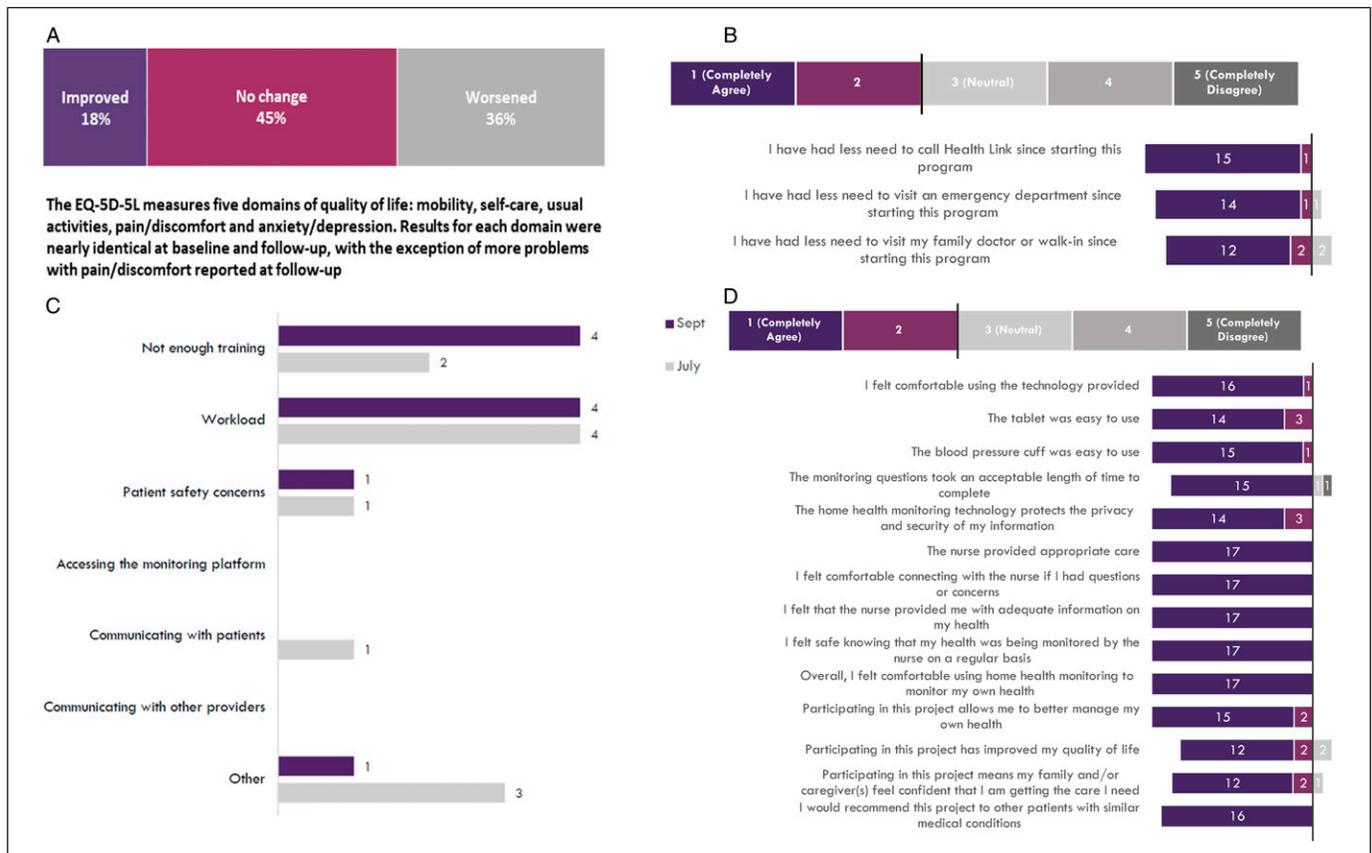
Surveys completed by nurses at two different time points showed that the remote monitoring platform helped them to follow patients’ conditions over time, and improved continuity of care and patient safety. Responses around challenges were consistent: a busy workload and insufficient training were the most common, and some providers reported a lack of clarity on the inclusion/exclusion criteria. Importantly, access to the platform was not reported as a challenge at any point (Figure 3D). With only six providers responding to survey invitations at the beginning, and five at the end of phase 1, these survey results should be interpreted with some caution.

**Phase 2**

Interim results for 90 patients from eight PCNs are available from phase 2 up to the end of May 2021. Demographic data from this group show a slightly higher proportion of females (57%) and a slightly younger population (average age: 61 years) compared with phase 1. The distribution of chronic diseases was similar to phase 1, with diabetes the most common condition (71%), followed by hypertension (40%), COPD (18%), and heart failure (12%). Quality of life scores at enrolment were lower than provincial norms for Albertans aged 60 years and over, with patients reporting lower scores in all five domains.



**Figure 2.** Patient demographics. COPD, chronic obstructive pulmonary disease.



**Figure 3.** Patient and provider experiences. (A) Patient-reported quality of life; (B) patient-reported experiences; (C) patient experience survey; (D) provider challenges encountered while working with the HHM model (September 2020 and July 2021).

Only 33 of the 90 patients completed both baseline and follow-up EQ-5D-5L assessments. Using the minimally important difference of  $\geq 0.037$  in index scores (as per phase 1), 17 patients (52%) reported an improvement in quality of life, 8 patients (24%) maintained their quality of life, and 8 patients (24%) reported a deterioration in quality of life. Although the average EQ-5D-5L index score improved slightly in the overall group, this was neither clinically nor statistically significant. Similar non-significant improvements were found for four of the five individual domains of the EQ-5D-5L index (mobility, self-care, pain and discomfort, anxiety, and depression), with no change reported in the fifth domain (usual activities). For pain and discomfort, anxiety, and depression, follow-up scores were better than the provincial norms. In terms of health system usage, approximately 75% of survey respondents agreed that they had less need to visit an ED or family doctor, or call the Health Link emergency helpline. Overall, most patients (41/44) reported that they were comfortable using the technology, consistent with findings from phase 1.

The majority of nurses (16/18 respondents) reported that they liked delivering care through the HHM model. Across all eight PCNs, an average of 57 minutes per day was spent by nurses on HHM activities. Consistent with the phase 1 interviews, a busy workload (13 responses) and insufficient training (4 responses) were the most common challenges reported by providers.

Health-economic data are not yet available at this stage of the project. Corroboration of health system usage data collected through the patient experience survey with actual service delivery data (held by Alberta Health Services) will be conducted on completion of phase 2.

## Discussion

In this study, Central Alberta's PCNs collaborated with several health system partners from the public and private sectors to deliver HHM for patients with a range of chronic conditions. Data from phase 1 and early data from phase 2 (N = 127 overall) demonstrate the feasibility of delivering HHM within the primary care setting, with patients reporting that they are comfortable with both the technology and the privacy of their data, and that they feel cared for. The lower health service utilization recorded in phase 1 is encouraging, but these results should be interpreted with caution as it is fair to assume that the COVID-19 pandemic may have created a reluctance among patients to attend EDs due to concerns around contracting the virus.

Though limited in number, the provider responses received so far allow for cautious optimism. Respondents acknowledged the utility of the HHM system, reporting that the system allowed them to monitor trends easily, as well as motivating patients to engage with their own care. However, a busy workload was

overwhelmingly reported as the key barrier to successful engagement with the system, with some nurses reporting a need for more ongoing training and support. Overall, these results should be interpreted with caution due to the very small sample size. A fuller assessment of provider experience will be possible at the end of phase 2.

## Strengths of the study

Historically, telehealth models have focused on patients with one chronic condition, assessed in a secondary care/hospital setting.<sup>2,4</sup> Unique to this HHM initiative is its integration within the PCN and its potential to serve the needs of patients with one or more chronic condition(s). Our program allowed the monitoring of patients from their home, educating and empowering them to confidently manage their conditions at an early stage, which has the potential to reduce their long-term impact on the health system.

Another striking feature of the HHM initiative is the speed of implementation of the project despite the COVID-19 pandemic. This was facilitated by the established zonal collaborative structures of the PCNs and dedicated chronic disease management programs. Paying for clinical lead time to support the wrap-around processes for this work was also important.

## Limitations and learnings

Although the patient-reported results from this study are promising, less than half of patients in phase 1 (17/37) and phase 2 (46/90) completed one or more question in the patient experience survey, preventing a fuller assessment of patient experience. Similarly, baseline and follow-up EQ-5D-5L data are available for only one-third of patients in both phase 1 (11/37) and phase 2 (33/90). As such, robust conclusions about whether HHM can improve quality of life will not be possible until completion of phase 2 in June 2022.

Three essential lessons have been learned from our experience so far. The first is that clear guidelines on inclusion/exclusion criteria should be provided to HHM providers to ensure maximum inclusion and reduce the barriers to entry for patients with chronic diseases. Without ensuring equity, the implementation of telemedicine may increase disparities in healthcare access for vulnerable populations with limited digital access or literacy, such as rural residents, racial/ethnic minorities, and older adults.<sup>10</sup>

The second learning was the need for implementation of increased management support for the providers. The nurses' experiences in both phase 1 and phase 2 highlighted the importance of thorough hands-on training for providers and patients. The provider experience is an important consideration in any new healthcare initiative. To be successful, intervention and ongoing support are required to ensure integration of telehealth into existing clinical practice and the development of new procedures and protocols.<sup>11</sup>

The third learning was the need to identify and address potential barriers highlighted in phase 1 that can be circumvented in phase 2. As a result of a low rate of completion of the EQ-5D-5L quality of life assessment in phase 1, phase 2 now includes the EQ-5D-5L

tool within the HHM platform itself to support completion in a much larger patient cohort. Phase 1 results do not include robust analysis of the impacts on the broader health system; however, at the end of phase 2, the impact of HHM on health system utilization will be assessed. Phase 2 will also investigate outcomes for individual conditions, as doing so may enable a stronger analysis of HHM efficacy.

## Conclusion

In this feasibility study of HHM for chronic diseases in the primary care setting, early results show high patient satisfaction in terms of overall ease of use and comfort with the technology, as well as a willingness by providers to work within this innovative model of care. Upon completion, phase 2 results will provide information on how and where to appropriately introduce remote monitoring as a regular component of primary healthcare. Home health monitoring has the potential to alleviate the health-economic burden of chronic disease in Alberta, serving as the national standard for a rapid technological response to a pandemic.

## Supplementary methods

Further methodological details relating to phase 1 are available [here](#).

## Declaration of conflicting interests

Jodi Thesenvitz reports grants from Alberta Innovates and Health Cities during the conduct of the study. Shelby Corley is an employee of Three Hive Consulting, which was contracted by Health Cities and provides evaluation services for an additional HHM project with NorQuest, and a Health Cities project unrelated to HHM. Lana Solberg is an employee of Boehringer Ingelheim. Chris Carvalho reports grants from Boehringer Ingelheim and TELUS during the conduct of the study.

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