

A network diagram with nodes and connecting lines, set against a dark blue background. One node in the upper right quadrant is highlighted in pink.

REMOTE PATIENT MONITORING: EVALUATION FINAL REPORT

Centre for Digital Health Evaluation,
Women's College Hospital Institute for
Health System Solutions and Virtual Care

PREPARED FOR: Digital Health Division, Ontario
Ministry of Health

Note: Throughout the report, remote patient monitoring (RPM) will be referred to as remote care management (RCM).

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Acronyms

ACL Anterior cruciate ligament

ALC Alternate level of care

CDHE Centre for Digital Health Evaluation

CHF Congestive heart failure

COPD Chronic obstructive pulmonary disease

CSAT Clinical Sustainability Assessment Tool

ED Emergency department

EMR Electronic medical record

EMS Emergency medical services

GPS Global positioning system

HOOS, JR Hip Disability and Osteoarthritis Outcome Score, Joint Replacement

HSN Health Sciences North/Horizon Santé-Nord

HSP Health service provider

HTN Hypertension

LOS Length of stay

MCID Minimal clinically important difference

MGH Michael Garron Hospital

MOH Ministry of Health

OH Ontario Health

OHT Ontario Health Team

OL Organizational lead

PACU Post-anesthesia care unit

PREMs Patient-reported experience measures

PROMs Patient-reported outcome measures

PT Physical therapy

RCM Remote care management

ROM Range of motion

RHC Riverside Health Care

SDD Same day discharge

SJCCC St. Joseph's Continuing Care Centre

TGHC Toronto Grace Health Centre

THA Total joint arthroplasty (hip)

TKA Total joint arthroplasty (knee)

WOHS William Osler Health System

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Executive Summary

Background

In Ontario, the rapid expansion of virtual care due to the COVID-19 pandemic resulted in drastic reductions of in-person visits, prompting an expansion of remote care management (RCM) into broader areas of disease management. Using remote communication and data collection for chronic and acute conditions, such as surgical transitions, diabetes, and COVID-19, remote monitoring enables timely detection and action at the onset or early deterioration of illness. Evidence demonstrating the benefits and impacts of RCM programs shows widely varying outcomes, likely due to variations in patient selection, clinical models, and implementation strategies, rather than features of the technology. With the rapid implementation of these digital solutions, there has been little time to study current practices, incorporate evidence-based approaches, and evaluate their value for patients and health systems.

Objectives

This project had two evaluation objectives: 1) describe and categorize different RCM projects into distinct RCM typologies, and 2) understand the mechanisms that make remote monitoring programs successful to ensure appropriate and effective models of care are offered to the right patients.

Methods

The evaluation involved 1) literature reviews on RCM programs for chronic diseases, COVID-19, and surgical transitions, 2) the development of an RCM taxonomy to categorize a sub-set of RCM programs implemented in Ontario, 3) case-study of six programs that included interviews with patients, caregivers, and organizational leads (OLs), and focus groups with health service providers (HSPs), and 4) administration of the Clinical Sustainability Assessment Tool (CSAT) survey to assess OLs perceptions of the sustainability of their programs.

Key Findings

- Twelve key characteristics of RCM programs were identified from 87 articles on chronic diseases and COVID-19. These were organized into four domains: technology, touch,

integration, and equity, resulting in 16 possible typologies of RCM programs that are disease agnostic.

- Applying the taxonomy to classify six selected programs in Ontario showed a variety of typologies against the four domains. Based on the taxonomy, three sites were classified as high technology (Health Sciences North, St. Joseph's Continuing Care Centre, and Toronto Grace Health Centre), three sites were high touch (Health Sciences North, Riverside Health Care, and Toronto Grace Health Centre), all sites were highly integrated, and only two of the six sites were considered equity enhancing (St. Joseph's Continuing Care Centre and Toronto Grace Health Centre).
- There is no one standard for designing RCM programs, but rather implementation teams should consider an appropriate mix of technology and touch recognizing the population served, clinical pathway, program maturity, available resources, and potential for sustainability and scale. On the other hand, integration and equity enhancing traits should be inherent baseline features of an optimal RCM program.
- Patients and caregivers valued the feeling of safety and comfort that RCM provided to manage their symptoms. The responsiveness of RCM teams was also appreciated and provided patients and caregivers with reassurance in the event of a clinical escalation.
- Patients, caregivers, and HSPs wanted individualized approaches to care through RCM programs. RCM programs held value for caregivers as a form of support and relief from caregiver burnout.
- By leveraging existing resources, including relevant clinical expertise and community health care services, sites were able to adapt their programs to facilitate referrals and create new response pathways where gaps in health care service coverage were identified.
- Two key elements for high patient satisfaction and efficient workflows were identified: 1) increased automation, and 2) patient-centric care. This was particularly important for enrollment, referral, and discharge processes.
- A streamlined and integrated referral and onboarding process was identified as a rate-limiting step to program spread and scale.
- The ability for RCM programs to adapt and respond to operational and clinical challenges was constrained by unpredictable and short-term funding cycles which impacted program sustainability, potential for growth, and long-term continuity.

Recommendations

To guide future planning and establishment of new RCM programs, as well as identify areas of improvement, sustainment, and expansion of existing programs, the following recommendations are organized by differing priorities and goals for three main groups of stakeholders – the Ministry of Health (MOH), Ontario Health (OH), and RCM implementing sites.

POLICY RECOMMENDATIONS

1. **Coordinate a standardized approach to RCM** providing up-to-date best practices and recommendations to support the implementation of new programs and the sustainment, spread, and scale of existing programs (MOH, OH).
2. **Identify and maintain a shortlist of vendors of record** to assist organizations and health teams with selecting an approved and verified vendor to suit their program needs. Ideally, each vendor should be required to appoint a client success manager to assist sites in utilizing the technology to its full capacity. OH's Verified Solutions List for Virtual Care can be expanded to include RCM solutions (OH).
3. **Investigate funding models that are appropriate for effective implementation and support the long-term sustainment of RCM programs.** A frequently reported challenge among OLs was program planning within short (one-year) funding envelopes. Sustained funding is needed to enable RCM sites to strategically plan for long-term service integration into the existing health system (MOH).
4. **Evaluate outcomes of RCM programs in combination with a standardized tool** (i.e., taxonomy). This can help decision makers compare similar RCM programs, identify programs that offer the most benefit for integrated quality care, and determine areas that may require additional investment (MOH, OH).

PROGRAM DESIGN RECOMMENDATIONS

1. **Support adaptive approaches in the implementation and sustainment of RCM programs.** This will facilitate scale up of existing programs and inform future iterations of RCM programs with respect to discharge planning, continuity of care, and building community collaborations and partnerships (RCM sites).



2. **Adopt a patient-centric and individualized approach that includes customizable RCM features based on patient needs.** Patients and HSPs expressed the desire to have more flexible and personalized care plans. The redesign or addition of certain technological features could improve their experience with RCM (e.g., multimedia elements, video follow-up, plain language instructions, etc.) (RCM sites).
3. **Program length of stay should be modifiable, as many patients with complex health needs require longer-term care** (RCM sites).
4. **Include patients and caregivers in the development of RCM programs through co-design or participatory design methods.** Representation from patient partners enables diverse perspectives and expertise to be represented at the onset of program design and implementation, providing early insight into patients' needs and preferences (RCM sites).

INTEGRATION AND EQUITY RECOMMENDATIONS

1. **Integrate RCM programs with existing services and resources within and across Ontario Health Teams.** HSPs and OLs noted the importance of building partnerships with community organizations to increase referrals and fill RCM service gaps. The full potential of RCM and its sustainability, spread, and scale is enhanced through integrated models (RCM sites, OH).
2. **Embed RCM programs seamlessly into existing workflows to promote staff buy-in and improve staff retention.** Many sites noted that health and human resource insufficiencies limited the ability to onboard and care for patients, and contributed towards burnout due to a significantly increased workload (RCM sites).
3. **Develop a streamlined referral and onboarding process with partners and referral sites** which includes integrating RCM programs with existing technological infrastructure (e.g., electronic medical records). This was identified as a rate limiting step for spread and scale (RCM sites, OH).
4. **Remove barriers and reduce health inequities to improve the accessibility of RCM programs and, more generally, health care services.** To achieve this, strategic allocation of health system investments should be distributed towards the expansion of cellular and internet access, improving digital health literacy, supporting multilingual access, and providing devices for those who do not have one (MOH, OH, RCM sites).

1.0 Background

1.1 Context

In Ontario, the introduction of physical distancing measures due to the COVID-19 pandemic led to a rapid expansion of virtual care. During this time, remote care management (RCM)¹, also known as remote care monitoring, enabled care teams to monitor a patient's clinical conditions outside of typical in-person care settings, and facilitated timely detection and resulting clinical action at the onset or early deterioration of illness. RCM programs have been integrated and expanded into broader areas of disease management through remote communication and data collection for chronic and acute conditions, such as surgical transitions, diabetes, and COVID-19. In a recent national survey of physicians on virtual care, over half of respondents either perceived little benefit or were unsure of the benefits of RCM for their patients (1). Amongst all virtual care modalities, remote monitoring was the least utilized across Canada with the highest use in Ontario at 7% (1). While there are numerous potential benefits to RCM, systematic reviews show widely varying outcomes due to variations in patient selection, clinical models, implementation strategies and features of the technology (2,3). While evidence on RCM is developing, the rapid implementation and adoption of these digital solutions over the last three years has provided little time to study current practices and understand their value for patients and health systems (4).

1.2 Objectives

The purpose of the evaluation was to characterize different models of RCM, identify promising models, and assess the impact of more mature models. While there are many clinical use cases of RCM, this evaluation focused on priorities set by Ontario Health (OH) and the Ontario Ministry of Health (MOH) which included chronic diseases, priority patient populations (geriatrics), surgical transition patients, and COVID-19 patients.

This evaluation was guided by the following objectives:

1. Describe and categorize different RCM projects into distinct RCM typologies.
2. Understand the mechanisms that make RCM programs successful.

¹ Remote care management (RCM) is also referred to as remote patient monitoring, remote care monitoring, home health monitoring, or remote patient management.

The evaluation findings are intended to inform future planning and investments in RCM to ensure appropriate and effective models of care are offered to the right patients. To address the objectives described above, the Centre for Digital Health Evaluation (CDHE) utilized the following data sources:

- Targeted environmental scans
- Six case studies including semi-structured interviews with patients, caregivers, and organizational leads (OLs), and focus groups with health services providers (HSPs)
- Clinical Sustainability Assessment Tool (CSAT) surveys with site OLs
- Site documents and dashboard data



2.0 Overview of RCM Programs

We examined six RCM programs to describe mechanisms of integration and implementation, and approaches to enhance equity and improve health experiences in remote care. A subset of six RCM programs across Ontario were identified and selected for the case study analysis as shown in Figure 1.

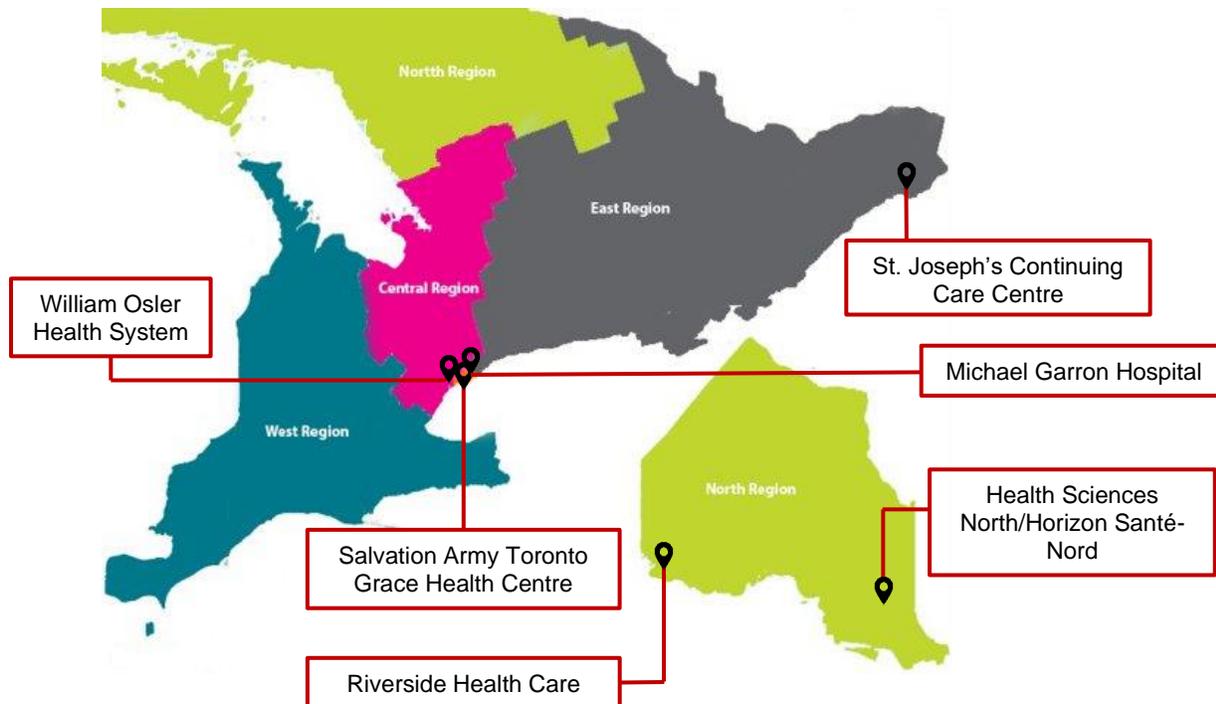


Figure 1. Regional map showing six RCM sites included in the evaluation.

Patient population was the main criteria for site selection based on priorities identified by OH and the MOH. Aside from patient population, we considered several factors to guide site selection including region, size of program, availability of program metrics (based on reporting data on percentage of target patient volumes achieved), and supporting equity (e.g., offering services in French, serving Indigenous populations, etc.). The sites selected for analysis were Health Sciences North/Horizon Santé-Nord (HSN), Michael Garron Hospital (MGH), Riverside Health Care (RHC), St. Joseph's Continuing Care Centre (SJCCC), Salvation Army Toronto Grace Health Centre (TGHC), and William Osler Health System (WOHS). Site enrollment and other programmatic metrics are summarized in Table 1.

Table 1. Site characteristics across the six sites.

	Case Study Sites					
	HSN	MGH	RHC	SJCCC	TGHC	WOHS
Data Collection Timeframe	Jul 2021 – Mar 2022 (9 months)	Apr 2021 – Mar 2022 (12 months)	Dec 2021 – Mar 2022 (4 months)	Apr 2021 – Mar 2022 (12 months)	Apr 2021 – Mar 2022 (12 months)	Oct 2021 – Mar 2022 (6 months)
Patient population	Orthopedic surgery (pre- and post-operative)	COVID-19	Diabetes	Geriatric rehabilitation	Alternate level of care (ALC) ²	Orthopedic surgery (pre- and post-operative)
Patients monitored (total)	697	1047	82	139	954	227
Average length of stay (days)	29	12	74	30	219 ³	30
Escalations per monitored patient (avg.)	0	0.2	0.1	0.1	1.2	0.2
Escalations to the emergency department (total)	5	50	0	8	9	0

² Level of care provided to patients, usually occupying a hospital bed, who do not require the intensity of resources/support provided in that care setting (8).

³ Based on 26 patients during the timeframe of April 2021 to March 2022. Length of stay is variable depending on patient needs and enrollment in the program. As of June 2, 2023, the average length of stay is likely over 12 months.

3.0 RCM Taxonomy

3.1 Rationale and Methods

Despite the recent proliferation of RCM programs in Ontario, there have been no proposed frameworks to evaluate program effectiveness and its impact on health care systems and population health. The range and complexity of RCM programs from technological solutions, clinical workflows, patient populations, medical processes, and staffing resources to disease typologies present significant challenges to fully realize the potential and capacity for RCM programs to enhance patient care and alleviate health care strains. Furthermore, with no standardized evaluative methods, newer RCM programs may continue to be developed without consideration of existing flaws and limitations that could hinder innovation, growth, and optimization of these programs. To better understand how to design, implement, and deliver RCM programs, we developed a taxonomy that provides a systematic way to assess RCM programs irrespective of any disease focus.

Two environmental scans were conducted to inform the taxonomy, based on priorities set by OH and the MOH. The first scan focused on literature that reported on chronic disease RCM programs for hypertension (HTN), diabetes (all types), chronic obstructive disease (COPD), and congestive heart failure (CHF) clinical pathways. The search identified peer-reviewed literature of English-language studies published between 2017 to 2021. Initially the search included studies that reported on RCM programs for COVID-19 but as many studies were conducted during the COVID-19 pandemic, the search yielded a large number of results. A second and separate environmental scan was conducted focusing on RCM programs for COVID-19. Detailed search strategies for both environmental scans are available in Appendix A. The chronic disease and COVID-19 searches resulted in 87 relevant full-text articles. Following the development of the taxonomy, we collected characteristic data from each site that aligned with the taxonomy (e.g., alert protocol, data entry modality, etc.), through a Microsoft Forms survey between February 8 to 13, 2023 (see Appendix B1).

3.2 The RCM Taxonomy

Through an iterative process of pattern recognition, sensemaking, and repeated consultation with a group of clinical advisors with expertise in delivering remote care, 12 commonly reported

characteristics of RCM programs were identified and further categorized into four domains as shown in Table 2. The classification, definition, and scoring of domain characteristics, and a list of commonly occurring integration and equity considerations (characteristics C1 and D2) can be found in Appendix B2 and in the accompanying RCM Taxonomy Excel sheet.

Table 2. Overview of taxonomy domains and characteristics.

Domain	A: Technology	B: Touch	C: Integration	D: Equity/Patient-Centricity
Definition	Refers to the level of automation and technical complexity of the RCM platform.	Refers to the level of monitoring and interaction required between the patient and the RCM team.	Refers to the extent to which the RCM program is linked to (or leverages) existing systems (i.e., interoperability) including services, resources, workflows, and infrastructure.	Refers to the extent to which the RCM program proactively enables inclusion, equitable access, and/or patient-centricity.
Characteristics	A1: Alert protocol	B1: Follow-up communication	C1: Integration considerations	D1: Device ownership
	A2: Data entry modality	B2: Level of monitoring specialization		
	A3: Data access	B3: Availability of RCM team	C2: Device linkages	D2: Equity considerations
	A4: Manual data entry (frequency)	B4: Risk profile		

Domain A (Technology) and **Domain B (Touch)** are considered variable program features with characteristics that exist on a *spectrum* from low to high. The optimal combination of these domains depends on context and program specific factors including program maturity, the population served, clinical pathway, available resources, and plans for sustainability and scale. **Domain C (Integration)** and **Domain D (Equity/Patient-Centricity)** are fixed program features and should be considered inherent aspirations of all RCM programs (i.e., high integration and high equity), existing on a *hierarchy* from low (Type 4) to high (Type 1). Type 2 (high integration, low equity) and Type 3 (low integration, high equity) are equivalent in the hierarchy such that one is not necessarily superior to the other. Application of the taxonomy allows users to categorize RCM programs into 16 distinct typologies as seen in Table 3.

Table 3. RCM taxonomy matrix according to type and group resulting in 16 program typologies.

		GROUP								
		Group A		Group B		Group C		Group D		
		Tech	Touch	Tech	Touch	Tech	Touch	Tech	Touch	
		High	High	Low	High	High	Low	Low	Low	
TYPE	Type 1									
	Integration	Equity								
	High	High	1A	1B	1C	1D				
	Type 2									
	Integration	Equity								
	High	Low	2A	2B	2C	2D				
	Type 3									
	Integration	Equity								
	Low	High	3A	3B	3C	3D				
	Type 4									
	Integration	Equity								
	Low	Low	4A	4B	4C	4D				

The taxonomy enables decision makers to identify which domains a given RCM program may require additional investment. For example, a type 2C program may have sufficient investment integrating their program into existing services, workflows, and electronic medical records (EMRs), but could benefit from additional investment into equity strategies to be classified as a type 1C program. Additionally, the appropriateness of the high technology and low touch nature of the type 2C program can be determined considering the program maturity, the population served, clinical pathway, available resources, and plans for sustainability and scale.

The categories presented in this taxonomy were based on the chronic disease and COVID-19 environmental scans and have not yet been validated. There is an opportunity to adapt the taxonomy and build in additional domains of interest that were not captured in the literature. For example, although we recognized its importance, scalability⁴ was not sufficiently captured in the literature and thus is not included in the current version of the taxonomy. Once there is appropriate data and programmatic expertise, this and other domains can be included.

⁴ Scalability refers to the spread (number of sites) and case load (number of patients served) of the RCM program.

3.3 Typology of OH RCM Programs

The six sites were typified using the taxonomy matrix as shown in Table 4. Information from program site documents (i.e., closeout reports and OH applications) and a Microsoft Forms survey administered to all six site leads was used to determine the most applicable typologies for each site. Survey questions were based on the four domains and domain characteristics (Appendix B2).

Table 4. Six sites typified according to the taxonomy matrix.

		GROUP								
		Group A		Group B		Group C		Group D		
		Tech	Touch	Tech	Touch	Tech	Touch	Tech	Touch	
		High	High	Low	High	High	Low	Low	Low	
TYPE	Type 1		1A TQHC		1B		1C SJCDC		1D	
	Integration	Equity								
	High	High								
	Type 2		2A HSN		2B WOHS		2C		2D MGH RHC (with Vivify)	
	Integration	Equity								
	High	Low								
	Type 3		3A		3B		3C		3D	
	Integration	Equity								
	Low	High								
	Type 4		4A		4B RHC (no vendor) ⁵		4C		4D	
	Integration	Equity								
	Low	Low								

3.3.1 HEALTH SCIENCES NORTH/HORIZON SANTÉ-NORD: ORTHOPEDIC SURGERY

HSN is classified as a **2A RCM program (high technology, high touch, high integration, low equity)**. This program, launched in February 2021, uses the SeamlessMD solution and requires patients to report symptoms daily for orthopedic surgery (pre- and post-operative). HSPs are automatically notified of events requiring escalation and can access patient data through a centralized server. Patients can follow-up with the monitoring team synchronously or

⁵ Two typologies are presented for RHC: one for their RCM program with Vivify prior to December 31, 2022, and one for their current RCM program which operates without a vendor in the absence of a provincial solution.

asynchronously during regular weekday hours. The monitoring team consists of a surgeon, nurse, and administrative staff. Although this program is integrated with existing resources and services, it is not integrated into existing clinical workflows or the EMR. This program is offered in both English and French, culturally adapted, and enables patients to access their own data. Although no physiological device is required to participate in the program, patients must have their own digital device (e.g., phone, tablet, laptop, etc.) to participate. The average post-operative length of stay (LOS) is 30-days.

3.3.2 MICHAEL GARRON HOSPITAL: COVID-19

MGH is classified as a **2D RCM program (low technology, low touch, high integration, low equity)**. Prior to December 31, 2022, the RCM program was delivered through Vivify but has since switched to SeamlessMD. This program monitors daily COVID-19 symptoms and adverse reactions to medication. HSPs are automatically notified of events requiring escalation and can access patient data through a centralized server. For those with low digital literacy, the RCM team calls patients daily for symptoms reporting, requiring HSPs to manually assess whether an escalation is needed based on the clinical presentation. The RCM team consists of nurses and administrative staff who are available during regular weekday and weekend hours. A mobile team consisting of a respirologist, general internal medicine physician, and primary care physician, can be dispatched to respond to patient escalations as needed. Patients can follow-up with the RCM team synchronously or through pre-scheduled appointments and, only under Vivify, could asynchronously communicate with a nurse. The RCM program is integrated with existing resources, services, and clinical workflows; however, it is not integrated with the EMR. Patients can access their own data and patient interviews reported that digital literacy training was provided. The SeamlessMD app also includes educational and informational resources (i.e., descriptions of common COVID-19 symptoms to monitor). Although no physiological device is required to participate in the program, patients must have their own digital device to participate. The average LOS is 7 to 10 days but varies based on the progression of the COVID-19 infection.

3.3.3 RIVERSIDE HEALTH CARE: DIABETES

RHC (with Vivify) is classified as a **2D RCM program (low technology, low touch, high integration, low equity)**. Like MGH (prior to December 31, 2022), this program was delivered through the Vivify solution which provided automatic alerts to the RCM team for events requiring



escalation. This RCM program includes daily medication reminders, access to educational videos, and requires symptoms reporting (daily) and blood sugar measurements (weekly) which must be entered manually. The RCM team is comprised of an RCM lead, a nurse, and a dietician, who are only available during regular weekday hours. The RCM lead is primarily responsible for program planning, patient onboarding, triaging alerts, and for escalating clinical concerns to the nurse and dietician and communicating the course of action back to the patient via asynchronous messaging. The RCM program was and is integrated with regular clinical workflows but not the EMR. This program was delivered in more than one language, enabled patients to access their own data, and digital literacy training was provided. However, patients must have their own physiologic and digital device to participate. The RHC diabetes program has a 12-week LOS except for gestational diabetes patients whose LOS depends on their delivery date.

Currently, in the absence of a provincial RCM solution, this program is operating without a vendor and is classified as a **4B RCM program (low technology, high touch, low integration, low equity)**. RHC intends to operate without a vendor until a new provincial solution is selected. This iteration of the program requires patients to call the monitoring team daily to report symptoms and enables patients to follow-up both synchronously and asynchronously. Patients do not have access to their own data as it is stored and accessed by HSPs in paper charts. Despite the less automated processes, RHC added a clinical specialist to the RCM team. Additionally, this iteration of the program enables patients to report symptoms offline (i.e., calling in to report symptoms outside of regular working hours), but they no longer have access to educational videos, their own data, nor is the program offered in other languages.

3.3.4 ST. JOSEPH'S CONTINUING CARE CENTRE: GERIATRIC REHABILITATION

SJCCC is classified as a **1C RCM program (high technology, low touch, high integration, high equity)**. Prior to December 31, 2022, SJCCC used the Vivify solution but has since switched vendors to Aetonix. HSPs are automatically notified of events requiring escalation and access patient data from a centralized server. Patients are required to report symptoms daily, in addition to other physiologic measurements (e.g., blood pressure, weight, blood glucose levels, etc.), depending on their underlying conditions. The monitoring team consists of social workers and community-based paramedical personnel, and is only available during regular weekday hours. Patients can follow-up with the RCM team synchronously, asynchronously, or during pre-scheduled visits. Although the RCM program has been integrated into existing clinical workflows,



it has not yet been integrated with existing services, resources, or the EMR. This program is offered in both English and French, provides digital literacy training, and provides patients (on loan) with all physiologic and digital devices in a Bluetooth-enabled kit which also includes internet connectivity. The LOS for this program is 30-days.

3.3.5 TORONTO GRACE HEALTH CENTRE: ALTERNATE LEVEL OF CARE AND FALLS PREVENTION

TGHC is classified as a **1A RCM program (high technology, high touch, high integration, high equity)**. Patients are provided with all the necessary devices to participate which includes one or more of the following, supplied by GRTHHealth:

1. A pendant for falls alerts with built-in global positioning system (GPS) tracking and two-way communication functionality.
2. An automated home medication dispensing machine that is refilled by the TGHC pharmacy.
3. Home sensors to detect (lack of) movement.

Alerts are automatically triggered if a medication dose is missed, if the patient travels outside a predefined geographical area, if abnormal activity is detected by home sensors, if the pendant battery is low, and if the pendant button is pushed by the patient in the event of a fall. In the event of an escalation, the RCM team will synchronously follow-up with the patient to resolve the alert through one or more of three mechanisms: i) notifying the caregiver, ii) performing a “wellness check” by the TGHC team, emergency medical services (EMS), or partnering home care agencies, or iii) calling 911. This program does not require any physiologic measurement or symptoms reporting, and patient data can be accessed through a centralized server by the RCM team. The RCM team provides 24/7 monitoring and patients/caregivers can follow-up through asynchronous messaging. Although integrated with existing services, resources, and clinical workflows, the program is not integrated with the EMR. In addition to alert responses, the RCM team can monitor alert trends to identify patients that may benefit from additional support from the TGHC interdisciplinary team which consists of an occupational therapist, a social worker, and a registered practical nurse. Patients can be added to the RCM team’s caseload for 90-days and receive an additional level of care from the interdisciplinary team including other services as needed from home care, primary care, and TGHC specialists.

The RCM program does not require internet connectivity, provides digital literacy training, and enables patients and caregivers to access their own data. The role of the caregiver was

considered in the design of the program, as demonstrated in the escalation pathway which can follow a pre-set hierarchy where multiple caregivers are involved. For example, in the event of an alert, caregiver A is notified first, followed by caregiver B, then the TGHC monitoring team resolves the escalation. This program is not restricted to any geographical area as patients outside the catchment area (e.g., London, Algonquin, Sudbury) are enrolled in the program. The LOS for this program is indefinite.

3.3.6 WILLIAM OSLER HEALTH SYSTEM: ORTHOPEDIC SURGERY

WOHS is classified as a **2B RCM program (low technology, high touch, high integration, low equity)**. This program requires daily symptoms reporting which is then manually reviewed by an HSP to determine whether escalation is needed based on the clinical presentation. Patients can follow-up synchronously during regular weekday hours with the RCM team, which consists of an orthopedic surgeon, an orthopedic nurse practitioner, a bundled care coordinator, and administrative staff. The WOHS program is highly integrated with existing services, resources, clinical workflows, and the EMR. The RCM checklist responses indicate that multiple devices from different vendors are used in the program but have the ability to be seamlessly integrated (i.e., through Bluetooth or Wi-Fi). However, interview responses indicate that the program only uses the SeamlessMD app. Although physiologic devices are not required for this program, patients must have their own digital device to participate. This program has been translated into six additional languages (Punjabi, Urdu, Hindi, Italian, Portuguese, French), is culturally adapted, offers digital literacy training, and provides patients access to their own data. The average post-operative LOS is 30 days.

4.0 In-Depth Case Studies

4.1 Rationale and Methods

4.1.1 SEMI-STRUCTURED INTERVIEWS

To assess user experiences of different RCM models, semi-structured interviews were conducted with patients and caregivers. Interviews investigated satisfaction, perceived value, ease of use, users' onboarding journey, equity considerations, program fit, enablers and barriers to adoption, and technology acceptance. Additionally, interviews with OLs were conducted to explore the program's operational and organizational structure, staff adoption and buy-in, technical RCM features, patient enrollment and uptake strategies, equity considerations, long-term continuity, and systematic integration. For both interviews and focus groups, participants were recruited using a purposive sampling⁶ strategy in which site coordinators selected and recommended participants to the research team who then contacted participants. Recruitment and scheduling were done via email or telephone. Interviews and focus groups were conducted over Microsoft Teams or Zoom, audio-recorded, and transcribed verbatim for analysis. Participant demographic information was collected during interviews.

4.1.2 FOCUS GROUPS

Focus group discussions were conducted with HSPs and Ontario Health Team (OHT) staff who were involved in the delivery and/or implementation of the program. Focus group discussions were conducted to explore site-specific experiences and perceptions on scalability, delivery, long-term continuity, systematic integration, equity considerations, enablers and barriers to adoption and implementation, perceived value, and technology acceptance of the respective RCM programs. Demographic information was not collected during the interview due to privacy concerns and therefore was collected through an electronic survey. Two individuals did not return the demographic survey despite repeated follow-up emails and therefore we only present demographic data for 16 of the 18 focus group participants. Interview and focus group guides can be found in Appendix C.

⁶ Purposive sampling involves selecting units for a sample based on specific characteristics that are relevant to the research, and it falls under the category of non-probability sampling techniques.

4.1.3 CLINICAL SUSTAINABILITY ASSESSMENT TOOL

The CSAT survey was distributed to OLs following semi-structured interviews to obtain their perception about the sustainability of their RCM program. The CSAT survey was adapted and created using Research Electronic Data Capture (REDCap) software (5,6) to facilitate online administration and data collection of responses. The CSAT is a survey that can distinguish sustainability capacity among different types of clinical settings (7). It contains 35 questions across seven domains (Domain 1: Engaged staff and leadership; Domain 2: Engaged stakeholders; Domain 3: Organizational readiness; Domain 4: Workflow integration; Domain 5: Implementation and training; Domain 6: Monitoring and evaluation; and Domain 6: Outcomes and effectiveness). These domains can be scored on a Likert-scale. The CSAT is reported to have excellent usability and reliability (7). See Appendix D for the CSAT survey.

4.2 Study Participant Characteristics

Between August 29, 2022, to February 9, 2023, 27 interviews and six focus groups were conducted. Participants included 16 patients, 2 caregivers, 18 HSPs, and 11 OLs as shown in Table 5. Patients and caregivers were between 30 and 80 years of age (mean age = 63.6, SD = 11.6). Among this group of participants, 22.2% rated their health as excellent or very good, 50.0% rated their health as good, and 22.3% rated their health as fair or poor. Regular access to the internet was reported by 88.9% of participants, and device accessibility by 66.7%. Most participants (66.6%) self-rated their technical skills as advanced or average, while a smaller proportion rated themselves as expert (16.7%) or basic (16.7%).

A majority of the OLs (54.5%) who participated in the evaluation were involved in the implementation and delivery of their RCM program on a full-time basis, with 90.9% implementing/delivering care through the RCM program for more than 11 months. Ten of 11 OLs who participated in key informant interviews completed the CSAT survey. Of the HSPs, 31.2% and 25% reported full-time and part-time involvement, respectively, with the RCM program (i.e., program implementation and/or delivery). A total of 37.5% of HSPs reported casual involvement in the program (i.e., on an as-needed basis). The majority (68.8%) of HSPs have provided RCM care through their respective programs for more than 11 months. A summary of participant demographics is available in Appendix E.

Table 5. Distribution of participants among the case studies across the six sites.

Participant Type	Case Study Sites						Total (N)
	HSN	MGH	RHC	SJCCC	TGHC	WOHS	
Patients/Caregivers (n)	3 / 1	1 / 1	4	4	1	3	18
OLs (n)	1	2	1	2	3	2	11
HSPs/OHT staff (n)	3	2	3	4	3	3	18
Total (N)	8	6	8	10	7	8	47

The following section provides an overview of patient and provider experiences for all six sites.

4.3 Case Studies: Program Perceptions and Experiences

4.3.1 HEALTH SCIENCES NORTH/HORIZON SANTÉ-NORD: ORTHOPEDIC SURGERY

Overall, the patients (n = 3) and caregiver (n = 1) interviewed felt satisfied with the program. Many described it as a comfort and relief to know that someone was monitoring them virtually, which translated to less time spent in the hospital environment and the freedom to recover in the safety and security of their home. One patient compared her experience to a previous surgery without RCM, noting that while she felt overwhelmed by that experience, the HSN RCM program was instrumental in a better surgical recovery experience.

"[The program] was like an angel. It was your ace in the hole. It was like my doctor on speed dial... Comfort, I don't know how else to say it." – Surgery Patient, HSN

"Even up until the night of the surgery there was a little prompt to say, 'OK, get ready for your big day tomorrow', kind of thing. It was good ... And then in the morning too, 'good luck'; then you felt like you had a team behind you." – Surgery Patient, HSN

Patients described the SeamlessMD app as easy to use and low burden (i.e., it did not take long to answer the health surveys). Of benefit was the daily email notification/reminders for completing the health survey, which also directed users straight into the app. Both patients and HSPs valued the information library provided within the app which included pre-operative preparation guidelines, to-do lists, post-operative exercises, and a weekly synopsis of what to expect during recovery. However, the caregiver noted that sometimes the information from the app conflicted with the instructions provided by the nurse. One OL noted that keeping patient education material up to date with the most recent evidence on the app was a challenge and thus led to discrepancies in clinical advice between the nurse versus the app.

Despite the general positive feedback, two patients and the caregiver noted that their experience declined at the point when recovery was going well, and the daily health check questions were no longer relevant to the patient's stage of recovery. For example, following suture removal, a patient continued to receive questions about this. Patients recommended for the daily health survey questions to change, and specifically ask about symptoms that reflected their post-operative recovery stage. From the monitoring side, while the RCM team was actively communicating with patients in the first week of the program, this level of engagement tapered off leaving patients questioning whether they were still being monitored. Therefore, although most patients felt the monitoring team was responsive, knowledgeable, and supportive, patients' enthusiasm for the program declined and survey fatigue set in in the absence of communication from the RCM team. A participant described this as "sending answers into the void" leading them to engage with the app and respond to the daily checks only because they felt obliged to continue participating in the program. One caregiver that engaged with the RCM program until discharge recommended for HSPs to communicate with patients even when no action is required to reassure patients their progress was normal.

"She did say if you post pictures then it, kind of, puts up a red flag because we know that there's something going on and we'll likely get back to you. But when I posted pictures of my incision and the infection still no one got back to me. And they do tell you that this is only monitored by one person. It's a waste of time if nobody's actually monitoring it, then that's just more of our health care dollars that are getting thrown out the window." – Surgery Patient, HSN

HSPs were overwhelmingly impressed with the health information library provided within the SeamlessMD app and felt that it enabled them to deliver patient education while also monitoring the recovery of their patients. Two patients suggested being dissatisfied with the health care system not meeting their needs and described how the RCM program provided the level of care that was missing. HSPs felt that benefits to the program were limited only if the patient felt it was time-consuming or if they forgot to answer the daily health checks. Interviews revealed that staff and physician buy-in and engagement have been an ongoing challenge for implementation of the program as a result of burnout, high staff turnover, lack of time, and inadequate supportive resources.

4.3.2 MICHAEL GARRON HOSPITAL: COVID-19

The patient (n = 1) and caregiver (of an infant patient) (n = 1) interviewed reported the program to be valuable, exceptionally easy to use, and not time-consuming despite completing daily surveys. The primary benefit for both users was the comfort they felt having their concerns addressed promptly, as well as the option to reach out to the nurses with any questions. This was matched by the high level of responsiveness of the RCM team, which added to users' feelings of security.

"I feel like now I'm all by myself and there's no one to look at me and kind of go, 'Oh, you're in trouble'. So, I really appreciated the opportunity to have that phone number if I needed it and I appreciated the fact that I could fill out that form every morning, or every day, and someone would call if they saw an issue that raised some medical concern. I was very happy about the program." – COVID-19 patient, MGH

The patient and caregiver also reported the educational component of the app to be useful for detecting COVID-19 symptoms, and perceived that incorporating visual elements (i.e., images, videos) could be beneficial. In addition, the caregiver and HSPs expressed a desire for a video call function, citing that the ability to recognize irregular breathing in infants to be particularly challenging for caregivers. Adding this function would allow for a quick check-in from an HSP and eliminate the need for infants to be brought into the emergency department (ED) unnecessarily or could facilitate a necessary visit to the ED with an otherwise hesitant caregiver. Another limitation of the program was the lack of adaptability of the survey questions. Although symptoms may have improved over time, the caregiver noted that the questions did not change to reflect these improvements, resulting in unnecessary and intrusive procedures – such as the rectal temperature of an infant to be repeated. In this instance, the caregiver experienced feelings of guilt as the app continued to prompt for the rectal temperature, although they did not feel it was still necessary since their infant's condition had improved.

Following the shift in vendors (from Vivify to SeamlessMD), HSPs described how navigating and utilizing SeamlessMD resulted in a perceived increase in workload (inability to communicate with patients in app which now requires phone calls), a poorer workflow integration (inability to connect to the EMR, having to use two platforms to assess patients, loss of visualization of patient progress), and a more laboured experience connecting with the patients (loss of chat box function).

“We’re seeing a lot of administrative information issues in SeamlessMD [compared to Vivify], so it’s not as good in regard to getting the health history on the patient or a clear snapshot on other issues that may contribute to some of their symptoms or makes their symptoms a bit worse.”
– COVID-19 Health Service Provider, MGH

The program was perceived by the patient, caregiver, and HSPs as a preventative tool to avoid ED visits. It could quickly address concerns that could have otherwise prompted an unnecessary ED visit, whilst avoiding situations where a rapid decline in status is not promptly identified or managed.

“I definitely feel like the program keeps a lot of people out of emerg. We’ve had a lot of feedback from the patients themselves who said, ‘this is so reassuring because I can’t get a hold of my family doctor and I don’t know what I would have done,’ or, ‘I had a lot of anxiety being diagnosed with COVID and it helped to know that somebody was there looking over me every single day or at least monitoring my symptoms and connecting with me when needed’.
So, I do think that it keeps a lot of people out of the health care system unnecessarily and provides that additional support to people who would otherwise not have that.” – COVID-19 Health Service Provider, MGH

The HSPs noted that it was rewarding to be able to receive patient appreciation first-hand through the app. However, they also noted feeling unappreciated once patients began to feel better. HSPs would continue to provide daily check-ins with the patients but found a significant decline in responsiveness from healthier patients near the end of their stay. Due to this lack of response, HSPs noted an artificial increase in LOS due to an inability to discharge patients. This frustrated HSPs as they had to spend time checking in on patients that would repeatedly ignore them, taking time away from other tasks and patients, and adding a feeling of discourtesy.

4.3.3 RIVERSIDE HEALTH CARE: DIABETES

The patients interviewed at RHC (n = 4) were not newly diagnosed with diabetes and thus felt knowledgeable about their condition and had pre-existing strategies for self-management. Although they found the Vivify app easy to use and not time-consuming to integrate into their usual routine, some found the requirement to report symptoms daily as burdensome (too frequent) since their condition was fairly stable and their responses were consistent on a day-to-day basis. There was varied use of the educational videos, some patients found them helpful whereas others thought they were unnecessary given their existing knowledge. Two patients suggested questions related to diabetes prevention (e.g., exercise, diet, etc.) to be incorporated into the daily symptoms

reporting. While all patients we interviewed felt that the RCM program did not significantly change their self-management approaches, they all had positive views of the program and appreciated that there was someone monitoring their symptoms, citing the benefits of an increased sense of security. Patients also valued the responsiveness of the RCM lead when there was an escalation or for general clinical questions. One patient reported that the RCM program was reaffirming and made them feel like they were doing a good job self-managing their diabetes.

“... you get this diagnosis and then they send you home and say ‘well now, take care you old wiener dog’ and then they don’t want to have anything else to do with you. Then you go to a doctor’s appointment three months down the road and tell you, yeah, your numbers are this or that, but there’s been no interaction in between. Then they give you a new drug but then they don’t tell you how to use the new drug and what are the side effects or anything. So you just kind of feel like you’re left to deal with it all by yourself, and it’s a big thing. But with this app, I didn’t feel like I was alone. So I really liked that.” – Diabetes Patient, RHC

Although the interviewed patients felt like they could manage their condition well, the closeout reports described one instance where a patient was not self-managing well and expressed their reluctance to participate as they felt like they were constantly being watched. To foster patient acceptance, the RCM team adopted a personalized approach, temporarily removing questions perceived to be threatening and increased the frequency of educational videos. Constant communication between the patient and RCM team enabled the program to be introduced in a way that was perceived to be less threatening, highlighting the importance of an individualized approach and consideration of patient comfort with technology.

4.3.4 ST. JOSEPH’S CONTINUING CARE CENTRE: GERIATRIC REHABILITATION

The patients (n = 4) interviewed at SJCCC had varied health issues, including diabetes, post-surgery recovery, HTN, and stroke. The patients and HSPs shared their experiences of using the Vivify platform. Patients described the program as easy to use, and that it could be incorporated into their daily life with little impact to their routine (inputting information when taking daily medication) and had a low burden on users. Health check questions on the Vivify app were described as straightforward and quick to answer, with helpful notifications received from the RCM team.

"I was just glad that I had somebody there. I wish that the lady next door would get something like that. Maybe she would be better too... Because people don't know about these programs so we have to know about it because that would be perfect for a lot of people." – Geriatric Rehabilitation Patient, SJCCC

Support was often required for technical set up which could be provided through a program technician. Two users reported receiving help from a family member to install the program. However, all patients described having no issues engaging with the technology once they had the program set up. The perceived value of the program for patients was described in many ways, including making them feeling safe and comfortable knowing that someone was monitoring them remotely.

"It made me more aware of my high blood pressure and sort of what not and what to do. Not get myself in a situation where I get super excited or (in a) fury and try not to get depressed... yeah, that has helped. I definitely learned from the program... I'm feeling OK and OK, now that I've sort of found out what the problem is, I keep in contact with the doctor. I do my blood pressure on a regular basis so that if I do have any problems, I know to go to emerg... It got me through a very hard, difficult time." – Geriatric Rehabilitation Patient, SJCCC

Four HSPs shared their perceptions of the SJCCC RCM program and compared it to having another set of eyes on discharged patients, particularly for those who have limited support networks at home and in the community. The RCM program has found value in partnering with non-clinical partners (i.e., social work, paramedicine) and is seeking to incorporate mental health and wellness expertise. HSPs also acknowledged the role of the RCM program in serving as a hub of information and growing list of community resources allowing them to better connect patients to additional social and health supports in their community, particularly for those patients who are socially isolated and lacking supports.

"I find that those seniors who are vulnerable with, very isolated, very limited family and friends, who don't have someone to maybe even assist with some of their caregiving, it's just nice to have someone, as I mentioned before, kind of oversee that plan of care, to ensure that they're set up and they're getting that follow up." – Geriatric Rehabilitation Health Service Provider, SJCCC

4.3.5 TORONTO GRACE HEALTH CENTRE: ALTERNATE LEVEL OF CARE AND FALLS PREVENTION

Despite multiple varied efforts, we were only able to interview one patient from this site. The respondent had no formal caregiver and is partially deaf, often experiencing sudden falls due to an unbalanced equilibrium. This patient found the program easy to use and described the program as a “godsend”, relieving their default state of panic and fear from experiencing a fall without the RCM program.

“Having this against not having it, I’m not afraid to go out of my apartment now because this goes with to me. Before, when my husband died and I was left alone, I wasn’t going out. I wasn’t seeing anybody or getting any fresh air and that’s not a good thing, that breeds depression. Never mind other problems, at least now I am able to go out and feel safe. If I get into trouble and fall down in the middle of the street, I’m going to get help. It means the difference between life and death.” – Elderly Patient, TGHC

The patient appreciated the responsiveness of the RCM team not only for escalations but also for wellness checks and reminders. HSPs perceived the medication reminders and GPS tracking to be valuable, especially for patients with cognitive impairments. There were a few instances where patients were uncomfortable with the level of monitoring and felt like they were constantly being watched, highlighting the importance of change management for patients and respecting patient preferences when receiving care. The program was perceived by HSPs to prevent caregiver burnout by providing 24/7 monitoring and an added feeling of safety and security, ED visits, acute care admissions, 911 calls, and support early discharge from hospital.

4.3.6 WILLIAM OSLER HEALTH SYSTEM: ORTHOPEDIC SURGERY

In general, the WOHS program was well received by patients (n = 3). Two described the app as being easy to use, the onboarding process as smooth, and the monitoring team as responsive and knowledgeable. One patient described having undergone surgery twice at WOHS, and perceived having received better care while enrolled in the RCM program than they did without the use of the app.

"I truly had no dislikes about it whatsoever. I think that it's excellent. I'm not a believer in staying in the hospital. If you get sick, you go to the hospital. I think the best place to recover is at home and this is the second time that I've recovered at home from major surgery. The first surgery didn't have a program like that, and I really wish they would have. You know what to expect and if you have any concerns you can leave a message for the health team and they will get back to you, which is absolutely awesome." – Surgery Patient, WOHS

Patients felt that the RCM program provided them reassurance and comfort knowing that they were being monitored and not left to deal with their post-operative care alone. One patient described the program as fostering a sense of patient-provider connection despite care being delivered virtually. Additionally, being able to see their progress and having access to the online information library was highly praised as it made patients feel that they were active in their own post-operative recovery.

"In the past I've felt disconnected and not knowing, and this actually brought that connection between me and the health professionals. Whether it was a surgeon, or a nurse, or an outreach person, it doesn't matter, so long as it's somebody. And for me, I thought it greatly improved the whole experience. Without it, I don't think I would have been very happy with the whole thing. I would have just felt disconnected, not knowing what's going on, not understanding my own experience, not being able to get answers to my questions, and you just kind of feel lost, and 'what is happening to me right now? I don't understand what's going on.'" – Surgery Patient, WOHS

However, one patient revealed that there was room for improvement with program execution early in the implementation of the program. In this instance, the patient had undergone hip surgery and received incorrect post-care instructions (incision care and exercises). This led to frustration and eventual abandonment of the program, with the patient relying instead on other means of recovery support (i.e., accessing exercises online). This patient's account of their experience reflects some HSP commentary on some of the growing pains of the program, having undergone design improvements and pathway expansion during the pandemic.

"I do think it's valuable. I think it's been a work in progress. I think there's process improvements to be made and we're kind of just getting our feet landed. And this got launched in the middle of the pandemic too, so we haven't had normalcy for a lot of things. So, I think having the opportunity to receive, to be working with this program and evolving it, and we've expanded it to breast and colorectal and other programs. So, I do think there's benefit to the patients, and to the system, and emerg, by keeping it going." – Surgery Health Service Provider, WOHS

HSPs described seeing great potential with the RCM program. Having strong administrative support was integral to program adaptation and revision, as administrative staff could address escalations triggered by patients that ended up being false alerts. This process has allowed several improvements to be implemented including adding visuals to assist patients in understanding post-operative instructions, as well as adding a free text box to allow patients to input their own concerns relating to daily health check questions.



5.0 Surgical Transitions Environmental Scan

5.1 Methods

A literature search was conducted to examine the clinical impact and outcomes of RCM surgical transitions programs for bariatric, hip, and knee surgeries. These surgical conditions were identified in consultation with OH as the most common surgical pathways with the highest patient enrollment. The search identified peer-reviewed, English-language articles for all surgical transition RCM programs between 2017 and 2021 (see Appendix F1 for detailed search strategy). We included articles with a focus on telerehabilitation programs that encompassed elements of remote monitoring for short-term outcomes after surgical discharge. Programs that focused on long-term prevention and maintenance were therefore excluded. A quintuple aim framework – including patient and provider experiences, equity, population health outcomes, and cost reduction – was used to extract data on overall outcomes. Comparisons between RCM surgical transition programs and standardized care were specified by study design, methods, patient population, program size, and LOS (see Appendix F2, Table F2-1 for descriptive data).

5.2 Results

Data was extracted from 19 studies which included knee arthroscopy (n = 9), hip replacement surgery (n = 8), bariatric surgery (n = 3), anterior cruciate ligament (ACL) surgery (n = 1), and knee replacement surgery (n = 1), across North America, Europe, and China (see Appendix F2, Table F2-2). Most included studies were pilot programs that were conducted with small patient populations (14 to 1434 patients) and a limited number of care personnel (1 to 12 HSPs).

Our analysis found mixed results for the quintuple aim between RCM patients and patients on traditional care pathways. Overall, most studies reported a positive patient experience (n = 10) with RCM and found the technology motivating, engaging, informative, easy to use, and convenient for patient-provider communication. Insights into HSP experiences were limited as only three articles discussed HSP feedback. However, these findings indicated that physicians were satisfied with the in-app asynchronous messaging function for patient-provider communication that RCM programs provided, as it was found to be less time-consuming compared to traditional in-person follow-ups. For example, surgeons who conducted RCM reported that it took them only “five minutes” to respond to a message, as opposed to scheduling

an in-person follow-up. Only three studies reported a decrease in hospital readmission rates among the intervention groups, while the rest did not yield any statistically significant findings regarding readmission rates and overall physiological outcomes.

Only one article assessed the cost-effectiveness of surgical transition RCM programming, reporting that there was a significant reduction in costs for patients that used a monitoring app compared to traditional care pathways. Although most of the studies did not conduct a comprehensive cost-effectiveness analysis to assess the feasibility of implementing surgical transition RCM programs, several papers suggested that these interventions could potentially lead to significant reductions in health care costs due to lower readmission rates and decreased hospital stays (n = 7). However, given the limited evidence in this area, further cost evaluations are necessary to validate the cost-effectiveness of surgical transition RCM programs. For 12 of the studies, patients were provided with the appropriate technology (i.e., physiologic, digital, or both) to participate in RCM programming. The remaining studies either required patients to have their own digital devices (n = 4) or did not report on technological equity considerations (n = 3). Only two studies reported providing digital literacy training to patients. Detailed characteristics and outcomes data are available in Appendix F.

6.0 Discussion

6.1 Key Findings

6.1.1 OPTIMIZING THE PATIENT AND PROVIDER EXPERIENCE

Three sites (HSN, SJCCC, TGHC) are classified as *high technology*⁷ according to the taxonomy as shown in Figure 2. These programs have an automated alert system to notify the RCM team of events requiring escalation and patient data was accessible through a centralized server or dashboard. While HSN and TGHC do not require physiologic measurements to be transmitted, SJCCC automatically transmits physiologic measurements through Bluetooth-enabled devices. HSN and SJCCC patients are also required to complete daily symptoms reporting, contributing to the lower technology score compared to TGHC.

Three sites (MGH, RHC, WOHS) are classified as *low technology* due to the manual processes required to:

- Alert the RCM team of events requiring escalation (WOHS), or not having any alert processes (RHC (no vendor))
- Enter physiologic measurements (MGH, RHC)
- Access patient data through paper charts (RHC (no vendor))

Despite programs requiring daily symptoms reporting (HSN, MGH, RHC, SJCCC, WOHS), in most instances, patients did not describe this process as burdensome. However, some patients (MGH, RHC) found questions too frequent and repetitive, noting that their responses did not change on a daily basis.

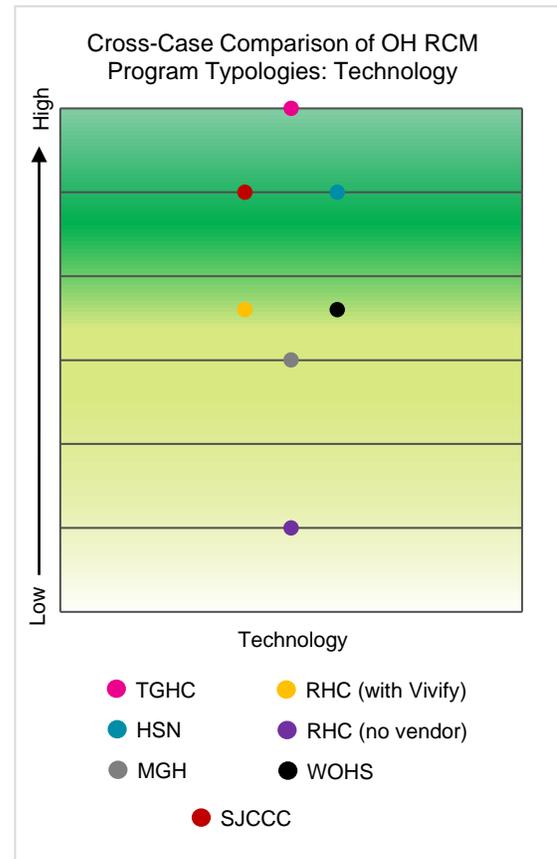


Figure 2. Comparison of RCM sites by technology, according to the taxonomy.

⁷ Technology refers to the level of automation and complexity of the RCM platform.

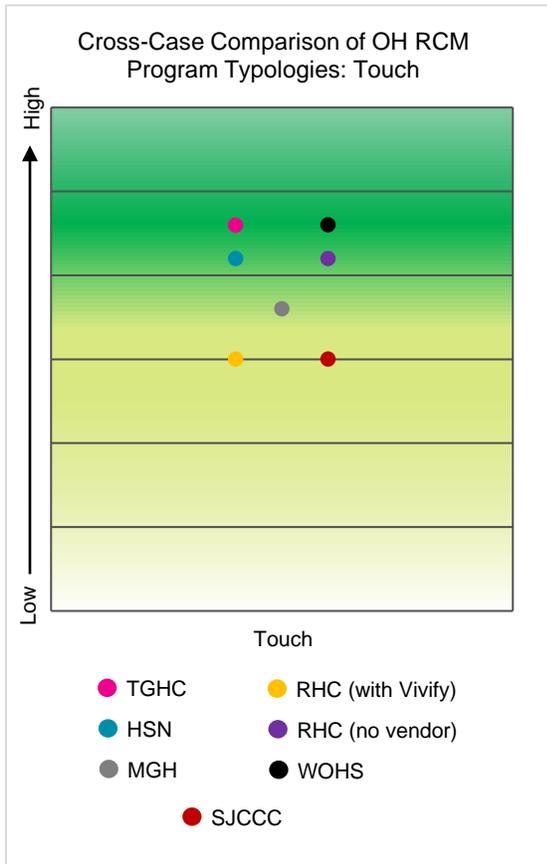


Figure 3. Comparison of RCM sites by touch, according to the taxonomy.

The level of touch⁸ varied by site as demonstrated in Figure 3, with those classified as *high touch* (HSN, RHC (no vendor), TGHC, WOHS) notably having clinical specialists as part of the monitoring team compared to sites classified as *low touch* (MGH, RHC (with Vivify), SJCCC).

The convenience of RCM programs cannot be overstated in supporting adoption. Patients are less likely to continue engaging in the program otherwise, as was reported at RHC. During the design phase, RCM programs should consider the appropriate mix of technology and touch alongside the population served, clinical pathway, program maturity, available resources, and plans for sustainability and scale. For example, patients and caregivers at the two surgical sites (HSN, WOHS), appreciated the high touch nature of the program. This is likely due to both the clinical pathway and population served, as many patients were undergoing surgery for the first time

with no prior experience with pre- and post-operative care procedures. In addition, the ability for synchronous on demand follow-up for patients, and for surgeons to provide clinical expertise to resolve escalations contributed towards patient satisfaction.

Due to the rapid onset of COVID-19 and in the face of clinical uncertainty, it is likely MGH adopted high touch components for their RCM program (i.e., synchronous on demand follow-up, monitoring on weekdays and weekends) despite being classified as low touch. In addition, MGH HSPs reported that incorporating asynchronous messaging as a follow-up modality could reduce their workload by resolving minor clinical escalations and, currently, having phone as the only source of follow-up was burdensome in situations when patients did not answer. TGHC provides 24/7 monitoring services, likely due to their population—primarily older adults, that are prone to falls and require a higher level of monitoring. Despite the variation in touch across sites, patients

⁸ Touch refers to the level of monitoring and interaction required between the patient and the RCM team.

and caregivers from all sites reported that the RCM programs were responsive, contributing to feelings of safety, security, and comfort.

6.1.2 EQUITY AND ENHANCING PATIENT-CENTRED CARE

Patient-centred care should be the focus of any health care program. To achieve this, RCM programs should prioritize reducing barriers to care for all served. Health inequities can result in unmet needs and poor access to services, due to social determinants of health including language, socioeconomic status, race and ethnicity, gender, level of educational attainment, geographic and physical environments, and digital health literacy. As seen in Figure 4, the RCM programs that demonstrate *high equity* are TGHC and SJCCC. In comparison, the remaining sites are situated on the lower end of equity with MGH classified as the least equity enhancing according to the taxonomy.

High equity in the context of the taxonomy refers to the ability of the RCM program to proactively enable inclusion, equitable access, and enhance patient-centred care. In the case of digital access, both TGHC and SJCCC provide devices for their patients,

unlike other programs where patients need to provide their own devices (digital or physiological) to participate in the program. While most programs require internet for the technology and program to work, TGHC is the only program where internet is not a requirement. The system-provided kit at SJCCC also provides internet connectivity for free for those who do not have access. However, it does require a cellular signal which is not always available for those living in rural or remote areas. MGH offered an RCM pathway with offline functionality (i.e., phone-based model for manual monitoring) for patients who do not have internet access, but participation with the technology (app) does require internet for the COVID-19 program.

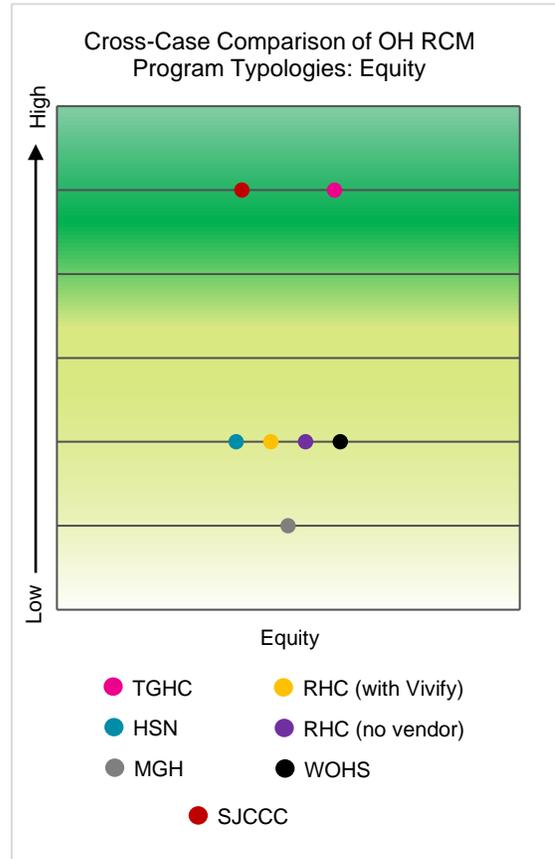


Figure 4. Comparison of RCM sites by equity considerations, according to the taxonomy.

As patients may be overwhelmed by their diagnosis and require continuous support to help manage their condition effectively, RCM can allow for continuity of care. To eliminate potential access barriers, all programs should ensure that measures are in place to advance health equity. Across all sites, education and assurance were critical for all patients, especially those who are newly diagnosed (RHC: diabetes), unfamiliar with new illness (MGH: COVID-19) or procedures (HSN and WOHS: hip and knee replacement surgery). While vendors usually include patient information resources on their platforms, RCM programs should also adapt education and instructions to be delivered in multiple languages (HSN, RHC (with Vivify), SJCCC, WOHS). Information should be in plain language, and culturally adapted to meet the informational needs of the patients (HSN, RHC (no vendor), WOHS). It was noted that reminders and closer monitoring can be beneficial for some patients who are newly diagnosed, forgetful, or non-compliant. To support adoption of the program, most sites (MGH, RHC, SJCCC, TGHC, WOHS) also reported being able to provide ongoing and as needed digital literacy support for patients. Two sites (SJCCC, TGHC) established working groups with representation from patient and community partners, enabling diverse perspectives and expertise to be represented during the implementation process.

Another finding that emerged was RCM programs were also considered valuable to caregivers. Patient adoption and engagement in RCM is particularly reliant on caregivers when patients are not familiar with the technology/content or speak a language in which the program is not delivered, as mentioned by HSPs at SJCCC, TGHC, and WOHS. One lesson identified by OLs (SJCCC, TGHC) was that caregivers and family members can benefit from RCM as a form of support and relief. Only one program (TGHC) included features specific to caregivers, enabling them to access patients' health data and be notified of alerts and escalations. Among the caregivers that were interviewed (HSN, MGH) they noted that information specific to caregivers would be beneficial to help them better support patients.

Despite the abovementioned strategies employed to provide equitable access and quality care to patients, further health system investments, including funds to expand cellular and internet access, improve digital health literacy, support program language translation, and provide devices for those who do not have one, is needed to improve the accessibility of RCM programs and, more generally, health care services.

6.1.3 EXPERIENCES OF INTEGRATION AND IMPLEMENTATION: PROGRAM SUSTAINMENT AND EXPANSION

Understanding the implementation process and experiences of the six sites can help guide future planning and establishment of new RCM programs as well as identify areas of improvement, sustainment, and expansion. Summarized below are key considerations for the sustainability, spread, and scale of RCM programs as perceived by OLs and HSPs.

Engaging Staff and Leadership for Continuous Quality Improvement

Engaged staff and leadership (CSAT Domain 1⁹) is crucial for the successful adoption and sustainability of RCM programs and was generally ranked high across all sites but one (TGHC). Despite this low score, the TGHC OLs and HSPs reported high staff buy-in and engagement, largely due to an overwhelming amount of positive feedback from patients. One OL was of the view that positive patient feedback improved staff retention. Regular and consistent communication with staff and leadership is necessary to promote HSP buy-in and support continuous quality improvements for program delivery including how to communicate with and onboard patients and adapt clinical or discharge processes. Three sites employed this strategy by engaging HSPs in the co-design of their RCM programs and pathway (HSN, TGHC, WOHS). Four sites (HSN, RHC, SJCCC, TGHC) employed an adaptive implementation approach which enabled sites to adapt to their site's specific contexts and to gain some understanding about which patients the RCM program worked best for and why, where improvements could be made to meet the changing needs of patients, caregivers, and HSPs, respond to operational and clinical challenges, and operate in the unpredictable state of available funding (one-year funding envelopes). For example, through an adaptive implementation approach at RHC, the RCM team was able to realize which patients the RCM program was best suited for, specifically: 1) newly diagnosed patients, including gestational diabetics, that require education and assurance, and 2) patients with uncontrolled diabetes that could benefit from reminders and closer monitoring. These perceptions informed the targeted onboarding approach taken by RCM team – specifically tailored to patients in these two groups. In addition, the ability to adapt was especially important within the MGH program which served COVID-19 patients and experienced fluctuating patient volumes and rapidly changing clinical practice guidelines.

⁹ Domain 1 asks respondents about program engagement with staff, leadership, clinical champions, multi-professional partnerships, and team-based collaboration.

Engaging Community Partners

High system integration and partnerships are foundational to success and achieving further growth and impact for RCM programs. To scale programs, OLs reiterated the importance of referrals from other hospitals, primary care, home care, and other community/OHT partners. Three sites (MGH, SJCCC, TGHC) spoke to the importance of staying top-of-mind for partners to ensure they received referrals citing that so many programs existed, their program could go unnoticed.

Building on pre-existing networks and partnerships during the implementation phase was a valuable strategy for engaging with and establishing trust with community partners and referral sources (MGH, RHC, TGHC). This helped to leverage existing resources, expertise, guide decision making, and facilitate referrals and response pathways where gaps in services were identified. Another strategy used to engage both internal and external stakeholders was to hold regularly scheduled meetings (MGH, SJCCC, TGHC) to foster engagement, program buy-in, and adoption, at both the organizational and community level.

Engaging stakeholders and leveraging existing community resources (e.g., home care, community care, primary care, EMS, etc.) is of particular importance for RCM programs that support aging-in-place, like SJCCC and TGHC. With an increasing aging population, longer waitlists for long-term care services, and overall health care shortages, RCM programs that support aging-in-place can serve as health system lifelines.

Optimizing the Referral and Onboarding Process

All sites recognized the importance of a streamlined referral and onboarding process and identified it as a rate limiting step for program adoption and scale. At TGHC, hospital discharge planners were approached to promote program buy-in and enabled external partners to understand the value of the RCM program. Having a dedicated staff member to facilitate onboarding and take on the administrative work was recommended at three sites (HSN, MGH, RHC). Patients across all sites described the onboarding process as easy and straightforward. At three sites particularly (MGH, RHC, WOHS), patients appreciated that onboarding included a phone call and contributed towards the simplicity of the process. This strategy can be particularly beneficial to onboard patients with low digital literacy.

Increased Workload with Limited Resources

One significant challenge is the increased workload that comes with the increasing the number of RCM pathways and growing patient volumes, without an equivalent increase in staff, often leading to HSP burnout. Many sites (HSN, MGH, RHC, SJCCC, WOHS) noted health and human resource insufficiencies due to the COVID-19 pandemic and cited the need to hire more staff. These insufficiencies not only impacted the delivery of the RCM programs but also limited the ability of partnering organizations to refer and enroll patients. This was observed at both surgical sites (HSN, WOHS) which rely on individual surgeon offices for patient consent and initial enrollment onto the SeamlessMD app. These sites reported that although staff see value with their programs, they may not have the time to refer and enroll them into the RCM programs due to health and human resource insufficiencies. This was also reflected in the lower-than-average engaged stakeholder score at WOHS (CSAT Domain 2¹⁰).

To mitigate these risks, some RCM sites maintained low patient volumes and aim to implement patient to HSP ratios which vary by site and program. At TGHC, the RCM program developed an indicator to overcome this challenge such that if 5% of calls were being missed, this indicated that additional staff should be hired. Scaling RCM programs on a provincial level will require more funding and reallocation of resources, which may be challenging given the already limited funding for such programs.

Integration with the Health Care System

OLs and HSPs spoke to the importance of streamlining resources and integrating their RCM programs with existing services and resources within OHTs, workflows, and technical infrastructure to ensure program sustainability and scalability. As demonstrated in Figure 5, all RCM programs, except for RHC (no vendor), were classified as *high integration* according to the taxonomy. However, one commonly reported challenge at four sites (HSN, MGH, SJCCC, TGHC) was the integration of the RCM programs with existing EMRs which was consistent with the CSAT survey responses (Domain 4, Q4¹¹). This lack of integration often translated to time-consuming, manual work. At TGHC, one OL perceived that integrating a referral pathway into partner EMRs could streamline the referral process and increase the number of referrals. SJCCC has already

¹⁰ Domain 2 asks respondents about program engagement with diverse stakeholders including patients, caregivers, and other health care teams, and the ability of the program to respond to stakeholder feedback.

¹¹ Domain 4 question 4 asks respondents to rate how well the program aligns well with other clinical systems (i.e., EMRs).

implemented this process at their main referring hospitals with plans to replicate and scale this practice to other acute care partners. In the absence of a vendor, RHC has switched to documenting patient data in paper charts, indicating a low uptake of EMRs. Workflow integration (CSAT Domain 4¹²) was frequently one of the lower scored domains. OL interviews (MGH, RHC, WOHS) revealed that administrative support was a crucial component to support workflow integration.

Despite the classification of *high integration* in the taxonomy, all sites expressed the need to continue building relationships with community and OHT partners to increase specialization of their RCM programs and better integrate their services into the larger health care system. The SJCCC closeout report mentioned the importance of integrating with the OHT governance structure to increase referral sources and creating a shared responsibility for the RCM program to service the whole OHT.

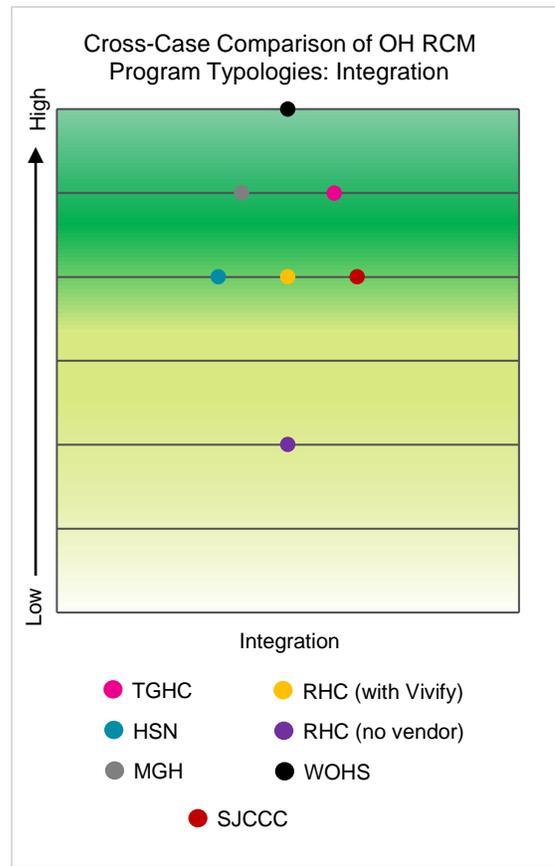


Figure 5. Comparison of RCM sites by level of integration, according to the taxonomy.

Funding and Sustainment

A prominent challenge experienced by all RCM programs was the uncertainty of funding which was a critical factor for continued sustainment. The limited availability of funding created a risk for sites to reallocate internal resources to support RCM activities, potentially leading to gaps in other areas such as in-patient care. The perception that sites had insufficient resources to achieve program goals was further evidenced by the lower-than-average score in the CSAT survey responses (CSAT Domain 3, Question 3¹³).

¹² Domain 4 asks respondents about clinical workflow integration including the alignment with clinical systems and programs, ease of use, and the design of the program.

¹³ Domain 3 question 3 asks respondents to rate whether the program has feasible and sufficient resources (e.g., time, space, funding) to achieve its goals.

Evaluating Program Outcomes and Effectiveness

Another barrier that RCM programs may face is related to monitoring and evaluation needs (CSAT Domain 6¹⁴). Collection of data for monitoring and evaluation is essential to guide improvements and sustainment of the program. However, collecting outcomes data or other measures of effectiveness (CSAT Domain 7¹⁵) may be a persistent challenge. One site (SJCCC) noted that one metric they are often asked to report on are rates of ED readmission, however not having an ED on site or the ability to link patient data to ED measures made it difficult to demonstrate impact. To overcome this challenge, some sites have attempted to collect this information through patient satisfaction surveys but exploring the use of other outcomes data to measure impact can be beneficial. Assessing outcomes and effectiveness of an RCM program is important not only to assess for sustainability and potential to scale, but also in identifying patient needs or gaps in service.

6.2 Limitations

There are a few limitations to note in this evaluation relating to project timeline, available data sources, development of a novel taxonomy, and challenges with site and study participant recruitment.

- Due to significant delays at the Institute for Clinical Evaluative Sciences, a non-profit organization that conducts health services and population health outcomes research using administration data, we were unable to conduct data linking of RCM patients and health services with outcomes data to evaluate the effectiveness of the RCM programs. Originally, we had planned to conduct this analysis among surgical transition patients at HSN and WOHS. The results herein make use of qualitative data collection methods (interviews, focus groups), descriptive data (CSAT survey, demographics), and environmental scans (chronic diseases, COVID-19, and surgical transitions). These served the purpose of eliciting in-depth views on the experiences and lessons learned from the different programs and assessing their potential for sustainability using standardized methods.

¹⁴ Domain 6 asks respondents about evaluating program metrics (process and outcome), consistent program evaluation, and outcomes reporting.

¹⁵ Domain 7 asks respondents about program outcomes including evidence of cost-effectiveness, improved clinical outcomes, and patient reported outcome measures (PROMs).

- HSPs and OLs may have responded favourably to obtain continued funding of their respective RCM program which may have introduced social desirability bias in collected data (interviews, focus groups, CSAT survey). Additionally, selection bias may have occurred whereby the site coordinators selected patients and caregivers with favourable views of the RCM program for interviews.
- The RCM taxonomy as a tool to classify RCM programs is primarily based on evidence from an environmental scan of international programs. The characteristics of programs and domains prioritized were influenced by limited information often provided by authors. Furthermore, the current taxonomy has not yet been validated and the scoring system used assumes equal weighting for all characteristics. Although we attempted to mitigate this limitation by consulting with a clinical expert panel before finalizing the output, future work is needed to validate the taxonomy in a fulsome way. This may involve consensus methods such as the Delphi method to inform construct validity and internal consistency of the tool.
- The RCM checklist survey was distributed to the six sites to collect program information related to the taxonomy characteristics. During data triangulation, insights from interviews and focus groups emerged that conflicted with survey responses. This discordance is likely due to the different timepoints at which the data was collected and may reflect adaptive and changing RCM programs.
- Two out of the six sites selected for the study analysis experienced significant patient recruitment challenges due to the nature of the patient populations being recruited (for example, frail elderly or challenges conducting interviews in a virtual setting). As such, we were unable to meet our target (three to five participants per site) at MGH and TGHC. While it would have been preferred to capture more patient data for these sites, we were able to bridge some of the gaps by collecting site documents and relying on triangulation from HSP focus groups and OL interviews.
- Due to ongoing staff shortages in health care widely across the province, identifying participating sites who had both the capacity and willingness to participate in the evaluation was challenging. While our goal was to have sites from each of the five health regions, we were unable to recruit an RCM site from the West region.

6.3 Recommendations and Next Steps

Based on the evaluation findings, recommendations are provided to 1) improve the implementation and sustainment of RCM programs, 2) improve the design of RCM programs, and 3) better integrate RCM programs with the health system and address existing health inequities. The below recommendations are organized by differing priorities and goals for three main groups of stakeholders— the MOH, OH, and RCM implementing sites.

6.3.1 POLICY RECOMMENDATIONS

1. **Coordinate a standardized approach to RCM providing up-to-date best practices and recommendations to support the implementation of new programs and the sustainment, spread, and scale of existing programs.** Successfully implemented programs can serve as a resource or "model" for newer programs or pathways. This will also allow for knowledge sharing across different sites and pathways to assist in spread and scale (MOH, OH).
2. **Identify and maintain a shortlist of vendors of record** to assist organizations and health teams with selecting an approved and verified vendor to suit their program needs. Ideally, each vendor should be required to appoint a client success manager to assist sites in utilizing the technology to its full capacity. OH's Verified Solutions List for Virtual Care can be expanded to include RCM solutions (OH).
3. **Investigate funding models that are appropriate for effective implementation and support the long-term sustainment of RCM programs.** A frequently reported challenge among OLs was program planning within short (one-year) funding envelopes. Sustained funding is needed to enable RCM sites strategically plan for long-term service integration into the existing health system (MOH).
4. **Evaluate outcomes data of RCM programs in combination with a standardized tool** (i.e., taxonomy). This can help decision makers compare similar RCM programs, identify programs that offer the most benefit for integrated quality care, and determine areas that may require additional investment (MOH, OH).

6.3.2 PROGRAM DESIGN RECOMMENDATIONS

1. **Support adaptive approaches in the implementation and sustainment of RCM programs.** This will facilitate scale up of existing programs and inform future iterations of RCM programs with respect to discharge planning, continuity of care, and building community and OHT partnerships (RCM sites).
2. **Adopt a patient-centric and individualized approach that includes customizable RCM features based on patient needs.** Patients, caregivers, and HSPs expressed the desire for more flexible and personalized care plans. For instance, some patients found some symptom questions irrelevant to their care and the daily symptoms reporting too frequent. This was noted in RCM programs for diabetes management, particularly amongst those with more controlled diabetes. Surgical transition patients also noted that the frequency of reporting and relevance to their care could be adjusted over the course of their enrollment. According to interviews at MGH, integrating multimedia elements, such as images or videos, can help visualize symptoms to those unfamiliar with medical terminology (e.g., video demonstrating symptoms and breathing complications for COVID-19 patients). Additionally, having a video call option can further improve the program by providing real-time assistance to patients requiring immediate care or advice. This could also aid HSPs in prompting non-compliant patients, improving engagement levels, and resolving any misunderstandings. The use of push notifications to not only provide reminders for completing health checks but to also communicate daily tasks (e.g., blood pressure measures) in plain language and in a concise manner is critical to ensuring patient compliance. While we were only able to recruit two caregivers for interviews, one recommendation that came forth was adding information and instructions for caregivers who are active in a patient's care. This was also reflected by HSPs who often relied on caregivers and/or family members to provide ad hoc translation in the case of language barriers, as well as for geriatric and elderly populations (RCM sites).
3. **Program LOS should be modifiable, as many patients with complex health needs require longer-term care.** HSPs at SJCCC described care for patients as “peeling back the onion” whereby the short LOS only permits the care team to address surface layer issues (RCM sites).
4. **Include patients and caregivers in the development of RCM programs through co-design or participatory design methods.** Representation from patient partners enables diverse perspectives and expertise to be reflected at the onset of program design and

implementation, and can provide early insight into patients' needs and preferences (RCM sites).

6.3.3 INTEGRATION AND EQUITY RECOMMENDATIONS

1. **Integrate RCM programs with existing services and resources within and across OHTs.** HSPs and OLs noted the importance of building partnerships with community organizations to increase referrals and fill RCM service gaps. The full potential of RCM and its sustainability, spread, and scale is enhanced through integrated models. For example, TGHC partners with home care agencies that can be dispatched to patients that may require additional home support (RCM sites, OH).
2. **Embed RCM programs seamlessly into existing workflows to promote staff buy-in and improve staff retention.** Many sites noted that health and human resource insufficiencies limited the ability to onboard and care for patients, and contributed towards burnout due to a significantly increased workload (RCM sites).
3. **Develop a streamlined referral and onboarding process with partners and referral sites** which includes integrating RCM programs with existing technological infrastructure (e.g., EMRs). This was identified as a rate limiting step for spread and scale (RCM sites, OH).
4. **Remove barriers and reduce health inequities to improve the accessibility of RCM programs and, more generally, health care services.** To achieve this, strategic allocation of health system investments should be distributed towards the expansion of cellular and internet access, improving digital health literacy, supporting multilingual access, and providing devices for those who do not have one (MOH, OH, RCM sites).

7.0 Conclusion

RCM programs have the potential to improve health outcomes and show promise in enhancing patient-centred care. Our evaluation findings suggest that RCM programs need to strike a balance between the level of technology and touch while considering the patient population and clinical pathway within each organizational context.

Addressing existing health inequities emerged as an important design and implementation consideration for RCM programs. Further investment is needed to promote RCM program accessibility including providing access to devices for patients who may not have them, ensuring that education and instructions are tailored to the patient population and are accessible to patients with low digital health literacy, and offering RCM programs in multiple languages. The integration of RCM programs into existing health system services, resources, workflows, and infrastructure can support their sustainability, spread, and scale. Current health and human resource insufficiencies and limited long-term funding opportunities pose a challenge to RCM program integration within OHTs and the larger health care system.

With the appropriate funds and resources, RCM technologies can fill existing health system gaps in continuity of care. Further research on the cost-effectiveness of RCM programs and their impact on health outcomes is needed to definitively establish their value and to inform future policy and practice decisions.

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Appendices

Appendix A: Environmental Scans for Chronic Diseases and COVID-

19

A1. SEARCH STRATEGY FOR CHRONIC DISEASE RCM PROGRAMS

Table A1-1. Parameters of the chronic disease search criteria.

Intervention	Remote monitoring, including related and overlapping terms like telemonitoring, telemedicine, mHealth, apps, eHealth, virtual care
Populations	COPD, CHF, Diabetes (type 1 and 2, gestational diabetes), HTN
Study Type	Peer-reviewed publications on local, national, and international projects that focus on questions related to technology-enabled RCM programs
Timeframe	Published between 2017-2021
Language	English only
Databases	Embase and Ovid Medline

Table A1-2. Parameters of the chronic disease search syntax for Embase.

#	Searches	Results	Type
1	teleconsultation/ or electronic consultation/ or telemedicine/ or telecardiology/ or teleconsultation/ or telediagnosis/ or telemonitoring/ or telepathology/ or telepharmacy/ or video consultation/ or remote sensing/	63816	Advanced
2	((computer or distance or internet or phone or online or remote or tele* or video or virtual or web) adj2 (administ* or advice or assess* or care or chat* or confer* or consult* or counsel* or deliver* or health* or interv* or manag* or medic* or monitor or nurs* or pharm* or therap* or visit*)).ti,ab,kf.	138572	Advanced
3	(remot* adj4 monitor*).tw,kf.	9088	Advanced
4	(teleadminist* or teleassess* or telecare or telechat* or teleconf* or teleconsult* or teledeliv* or telehealth* or teleinterv* or telemanag* or telemedic* or telemonit* or telenurs* or telepharm* or televisit* or teletherap* or videochat* or videotelephon* or videophone* or wireless tech* or telecardiology or telehypertension or telepathology or smart device or smart phone).tw,kf.	47476	Advanced
5	(eConsult* or e-consult* or eHealth* or e-Health* or einterv* or e-interv* or etherap* or e-therap* or mHealth* or m-Health* or mobile health* or Mobile application*).tw,kf.	27079	Advanced
6	Telemed*.jw.	7281	Advanced
7	mobile application/ or mobile health application/	19257	Advanced
8	(App or apps or facetime* or skype* or zoom or webbased tool or web-based tool* or voice-over or voiceover or VoIP).tw,kf.	58617	Advanced
9	or/1-8 [remote monitoring]	272295	Advanced
10	obstructive lung disease/ or chronic obstructive lung disease/	155689	Advanced
11	(aecb or chronic airflow disease* or chronic airflow disorder* or chronic airflow limitation* or chronic airway disease* or chronic airway disorder* or chronic airway limitation* or chronic obstructive airflow disease* or chronic obstructive airway disease* or chronic obstructive airway disorder* or coad or cobd or copd or emphysema*).tw,kf.	142143	Advanced
12	((chronic* or persistent) adj3 bronchiti*).tw,kf.	18655	Advanced
13	(obstruct* adj3 (pulmonary or lung* or airway* or airflow* or bronch* or respirat*)).tw,kf.	148721	Advanced

14	or/10-13 [COPD]	278454	Advanced
15	diabetes mellitus/ or exp diabetic complication/ or impaired glucose tolerance/ or insulin dependent diabetes mellitus/ or lipoatrophic diabetes mellitus/ or non insulin dependent diabetes mellitus/	1092809	Advanced
16	diabetic ketoacidosis/	15767	Advanced
17	(diabet* or NIDDM or IDDM or prediabet* or MODY or T1DM or T2DM or T1D or T2D or non insulin* depend* or noninsulin* depend* or noninsulindepend* or non insulin?depend*).tw,kf.	1120429	Advanced
18	or/15-17 [diabetes]	1340028	Advanced
19	exp heart failure/	602725	Advanced
20	(decompensation cordis or myocardial decompensation or chronic heart failure or chronic cardiac failure).tw,kf.	31133	Advanced
21	((Heart or cardiac or myocardial) adj2 (failure or chronic or decompensation or congestive)).tw,kf.	368855	Advanced
22	((left ventricular or left ventricle) adj2 (failure or insufficien* or dysfunction*)).tw,kf.	38521	Advanced
23	((dilated or congestive) adj2 cardiomyopath*).tw,kf.	31958	Advanced
24	((ventricular or ventricle*) adj2 (failure or insufficien* or dysfunction*)).tw,kf.	57105	Advanced
25	lvsd.tw,kf.	1452	Advanced
26	or/19-25 [heart failure]	702166	Advanced
27	hypertension/ or elevated blood pressure/ or borderline hypertension/ or essential hypertension/ or hereditary hypertension/ or hypertensive crisis/ or malignant hypertension/ or masked hypertension/ or orthostatic hypertension/ or prehypertension/ or renovascular hypertension/ or resistant hypertension/ or systolic hypertension/	756479	Advanced
28	exp blood pressure/	691810	Advanced
29	(hypertens* or prehypertens*).tw,kf.	779522	Advanced
30	((blood or arterial or diastolic or systolic) adj3 pressure).tw,kf.	600352	Advanced
31	((elevat* or increas* or lower or high or rais* or rising) adj2 (bp or dbp or hbp or sbp)).tw,kf.	26253	Advanced
32	or/27-31 [hypertension]	1581351	Advanced
42	14 or 18 or 26 or 32	3500422	Advanced
43	9 and 42	47477	Advanced
44	limit 43 to (English and last 5 years)	33192	Advanced

Table A1-3. Parameters of the chronic disease search syntax for Medline.

#	Searches	Results	Type
1	Remote Consultation/ or exp Telemedicine/ or Remote Sensing Technology/	42883	Advanced
2	((computer or distance or internet or phone or online or remote or tele* or video or virtual or web) adj2 (administ* or advice or assess* or care or chat* or confer* or consult* or counsel* or deliver* or health* or interv* or manag* or medic* or monitor or nurs* or pharm* or therap* or visit*)).ti,ab,kf.	99800	Advanced
3	(remot* adj4 monitor*).tw,kf.	5864	Advanced
4	(teleadminist* or teleassess* or telecare or telechat* or teleconf* or teleconsult* or teledeliv* or telehealth* or teleinterv* or telemanag* or telemedic* or telemonit* or telenurs* or telepharm* or televisit* or teletherap* or videochat* or videotelephon* or videoconsultation or videophone* or wireless tech* or telecardiology or telehypertension or smart device or smart phone or electronic consultation or telediagnosis or telepathology).ti,ab,kf.	34882	Advanced

5	(eConsult* or e-consult* or eHealth* or e-Health* or einterv* or e-interv* or etherap* or e-therap* or mHealth* or m-Health* or mobile health* or Mobile application*).ti,ab,kf.	24301	Advanced
6	Telemed*.jw.	6562	Advanced
7	exp Mobile Applications/	9689	Advanced
8	(App or apps or facetime* or skype* or zoom or webbased tool or web-based tool* or voice-over or voiceover or VoIP).ti,ab,kf.	42275	Advanced
9	or/1-8 [Remote monitoring]	194481	Advanced
10	exp lung diseases, obstructive/	226599	Advanced
11	(aecb or chronic airflow disease* or chronic airflow disorder* or chronic airflow limitation* or chronic airway disease* or chronic airway disorder* or chronic airway limitation* or chronic obstructive airflow disease* or chronic obstructive airway disease* or chronic obstructive airway disorder* or coad or cobd or copd or emphysema*).tw,kf.	80946	Advanced
12	((chronic* or persistent) adj3 bronchiti*).tw,kf.	11587	Advanced
13	(obstruct* adj3 (pulmonary or lung* or airway* or airflow* or bronch* or respirat*).tw,kf.	97872	Advanced
14	or/10-13 [COPD]	294419	Advanced
15	exp Diabetes Mellitus, Type 2/ or Diabetes, Gestational/ or exp Diabetes Complications/ or Diabetes Mellitus/ or Diabetes Insipidus/ or Diabetes Mellitus, Type 1/	442769	Advanced
16	Diabetic Ketoacidosis/	7056	Advanced
17	(diabet* or NIDDM or IDDM or prediabet* or MODY or T1DM or T2DM or T1D or T2D or non insulin* depend* or noninsulin* depend* or noninsulindepend* or non insulin?depend*).tw,kf.	718962	Advanced
18	or/15-17 [diabetes]	775233	Advanced
19	exp Heart Failure/	136166	Advanced
20	(decompensation cordis or myocardial decompensation or chronic heart failure or chronic cardiac failure).tw,kf.	18001	Advanced
21	((Heart or cardiac or myocardial) adj2 (failure or chronic or decompensation or congestive)).tw,kf.	218071	Advanced
22	((left ventricular or left ventricle) adj2 (failure or insufficien* or dysfunction)).tw,kf.	23536	Advanced
23	((dilated or congestive) adj2 cardiomyopath*).tw,kf.	20122	Advanced
24	((ventricular or ventricle*) adj2 (failure or insufficien* or dysfunction)).tw,kf.	33857	Advanced
25	lvsd.tw,kf.	611	Advanced
26	or/19-25 [heart failure]	281251	Advanced
27	exp Hypertension/ or Blood Pressure/ elevated blood pressure/	509349	Advanced
28	(hypertens* or prehypertens*).tw,kf.	480942	Advanced
29	((blood or arterial or diastolic or systolic) adj3 pressure).tw,kf.	401371	Advanced
30	((elevat\$ or increas\$ or lower or high or rais\$ or rising) adj2 (bp or dbp or hbp or sbp)).tw,kf.	15907	Advanced
31	or/27-30 [hyper tension]	878249	Advanced

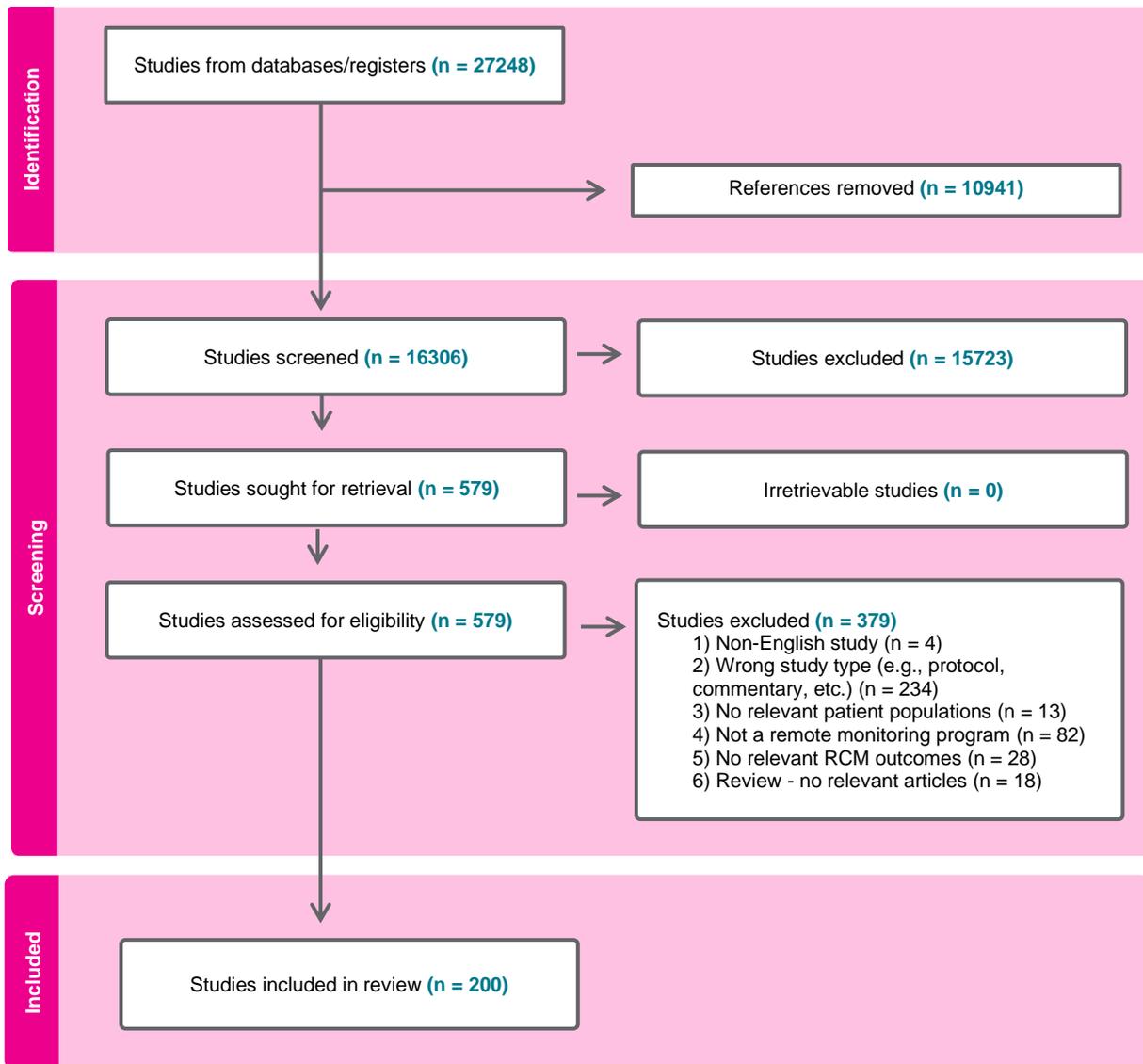


Figure A1-1. PRISMA flow diagram for the chronic diseases environmental scan.

A2. SEARCH STRATEGY FOR COVID-19 RCM PROGRAMS

Table A2-1. Parameters of the COVID-19 search criteria.

Intervention	Remote monitoring, including related and overlapping terms like telemonitoring, telemedicine, mHealth, apps, eHealth, virtual care
Populations	COVID-19
Study Type	Peer-reviewed publications on local, national, and international projects that focus on questions related to technology-enabled RCM programs
Timeframe	Published between 2018-2022
Language	English only
Databases	Google Scholar and PubMed
Search Terms	"Remote patient monitoring" AND "COVID-19", "Telemonitoring" AND "COVID-19" and "Telemedicine" AND "Remote" AND "COVID-19"

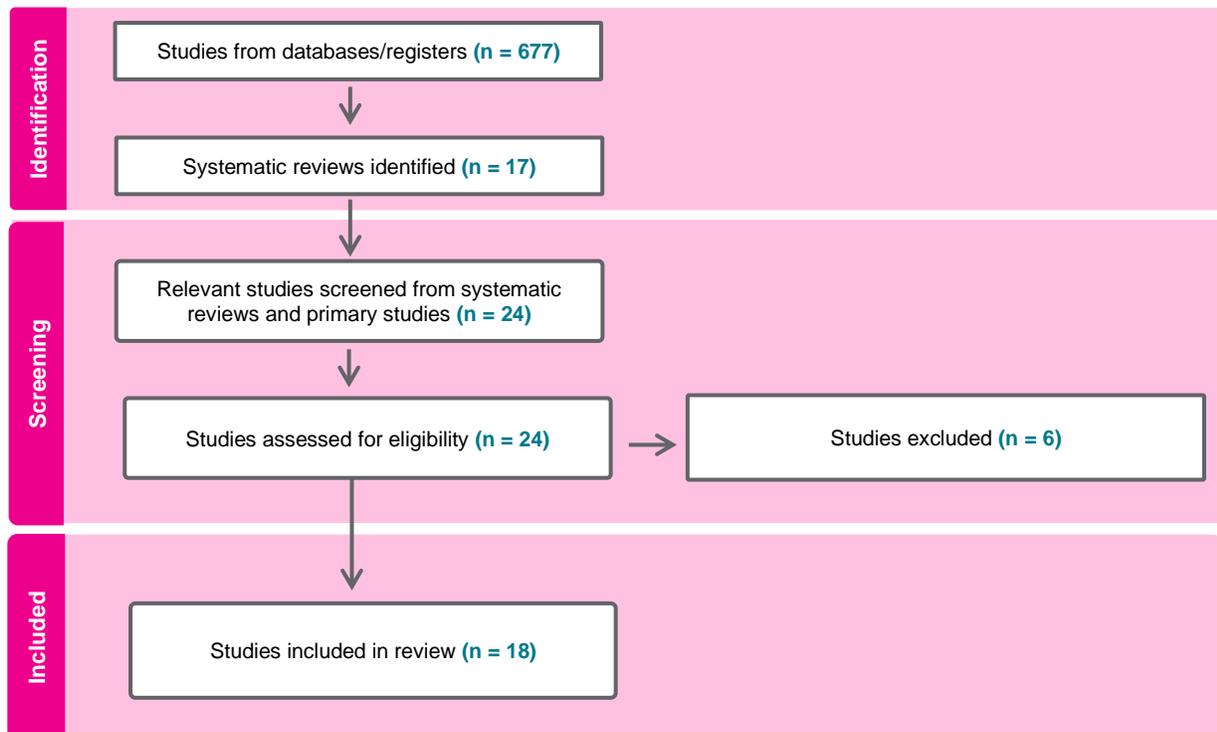


Figure A2-1. PRISMA flow diagram for the COVID-19 scoping review.

Appendix B: Taxonomy

B1. REMOTE CARE MANAGEMENT CHECKLIST

This form will help Ontario Health better understand the characteristics of remote care management (RCM) programs delivered across Ontario. This survey consists of four parts and will take approximately 5 to 10 minutes to complete.

Part A: Technology (questions related to the level of automation and complexity of the program)

Part B: Touch (questions related to the level of monitoring and interaction between the patient and RCM team)

Part C: Integration (questions related to linkages to existing resources, services, and workflows)

Part D: Equity and Patient-Centricity (questions related to program inclusivity, access, and patient-centricity)

General Program Information

Name of RCM program: [Click or tap here to enter text.](#)

Name of RCM site(s): [Click or tap here to enter text.](#)

Clinical Pathway(s) (e.g., diabetes, surgery, ALC, etc. list all that apply): [Click or tap here to enter text.](#)

Part A: Technology

1. How is the RCM team notified of an abnormal physiologic measurement, concerning condition of the patient, or that an escalation is required? (*multi-select*)
 - Automatically- an automatic (pre-set) alert notifies the RCM team/patient/caregiver of an incident requiring an escalation
 - Manually- an RCM team member must manually review patient data
 - Manually- the patient must notify the RCM team
 - None- program does not include parameters for alerts and escalation
 - Unknown
 - Other: [Click or tap here to enter text.](#)
2. How do patients report physiologic measurements (e.g., blood pressure, weight, etc.) or other important assessments (e.g., a fall has occurred for a falls prevention program)? (*multi-select*)

This does not include symptoms, patient-reported experience measures (PREMs)/PROMs, or patient experience surveys.

 - Fully-automatic- devices automatically measure and transmit measurements or assessments (i.e., through Bluetooth or WiFi)
 - Semi-automatic- some measurements or assessments must be entered manually whereas others are automatically transmitted
 - Manual- patients must enter data manually
 - None- program does not require measurements or assessments to be reported
 - Unknown
 - Other: [Click or tap here to enter text.](#)

3. How does the monitoring team access patient data collected through the RCM program (e.g., physiologic measurements, symptoms reporting, etc.)?
 - Through a centralized server or dashboard
 - Through multiple separate platforms
 - The monitoring team does not have access to data collected through the RCM program
 - Unknown
 - Other: [Click or tap here to enter text.](#)

4. How often are patients required to manually enter information on measurements that are not automatically captured including symptoms, PROMs/PREMs, patient experience surveys? *(multi-select)*
 - Daily
 - Weekly
 - Bi-weekly (every two weeks)
 - Monthly
 - None
 - Unknown
 - Other: [Click or tap here to enter text.](#)

Part B: Touch

1. How does the monitoring team stay connected to patients? *(multi-select)*
This excludes enrolment, onboarding, and alerts/escalations. This may include patients asking questions or the monitoring team following-up with patients if they become disengaged from the program.
 - Pre-scheduled visits (in-person, phone, video, text, etc.) at regularly scheduled appointments while the patient is still enrolled in the RCM program
 - Asynchronous communication (e.g., email, requests through patient portal, text messaging, etc.) initiated at any time but does not require an immediate interaction/response
 - On-demand communication by phone, video, or chat bot that generates an immediate response and can be initiated at any time
 - None- no communication occurs outside of enrolment, onboarding, and alerts/escalation.
 - Unknown
 - Other: [Click or tap here to enter text.](#)

2. Are any clinical specialists part of the monitoring team?
The monitoring team refers to individuals who regularly monitor patient data, communicate with patients, and/or are available to respond to clinical escalations. Specialists include both physician and nursing specialists. This does not include primary care physicians, registered nurses, nurse practitioners, pharmacists, social workers, physiotherapists, or other types of allied health professionals.
 - Yes
 - No
 - Not applicable- there is no monitoring team, this is a self-monitoring program

Unknown

3. When is the monitoring team available to review or respond to any patient needs? (*multi-select*)

24/7

Regular workdays and weekends

Regular workdays only (for example, Monday to Friday from 9am-5pm)

Ad-hoc

None- the monitoring team is not available to respond to the patient

Not applicable- there is no monitoring team, this is a self-monitoring program

Unknown

Other: [Click or tap here to enter text.](#)

4. Does your RCM program tailor enrolment based on the level of severity of the health condition that the clinical pathway is designed for? (*multi-select*)

No- any patient with the specified condition is eligible to enroll

Yes- only patients with LOW severity of the specified condition are eligible to enroll

Yes- only patients with MODERATE severity of the specified condition are eligible to enroll

Yes- only patients with a HIGH severity of the specified condition are eligible to enroll

Unknown

Other: [Click or tap here to enter text.](#)

Part C: Integration

1. Is your program integrated with existing services and resources (e.g., shared full-time equivalent (FTE) with existing services or programs)? Yes No Unknown

2. Is your program integrated with existing clinical workflows (e.g., embedded into usual clinical visits and procedures such as intake process)? Yes No Unknown

3. Is your program integrated with existing technical infrastructure (e.g., patient records, EMRs, etc.)? Yes No Unknown

4. How many vendors are involved in the RCM setup (incl. hardware devices and software)?

None

Single- one company provides all hardware and software

Multiple- more than one company provides hardware and software

If multiple, are the hardware devices or software already linked such that data can be synced seamlessly across them (for example, through Bluetooth or WiFi)? Yes No

Unknown

Other: [Click or tap here to enter text.](#)

Part D: Equity and Patient-Centricity



1. Are patients **required** to have their own measurement or assessment device(s) and digital device(s) (phone, table, laptop) before they can participate fully in the program? (*multi-select*)
 - Yes
 - No- our program does not require a physiologic or assessment device, but patients must have their own phone/tablet/computer
 - No- patients are provided with physiologic devices but must have their own phone/tablet
 - No- patients are provided with **ALL** digital and physiologic devices needed for the program
 - No- patients do not require any device to participate in the program
 - Unknown
 - Other: Click or tap here to enter text.
2. Is your program offered in more than one language? Yes No Unknown
3. Does your program provide support to patients that require digital literacy education or training? Yes No Unknown
4. Does your program have offline functionalities (i.e., data can be collected offline and synced later)? Yes No Unknown
5. Is your program culturally adapted (i.e., cultural considerations in the design of the platform or program)? Yes No Unknown
6. Does your program provide all devices to patients (including physiologic or assessment devices and phones, tablets, laptops, etc.)? Yes No Unknown
7. Does your program enable patients to access their own data (i.e., through a patient dashboard)? Yes No Unknown

Additional Notes and Comments

Click or tap here to enter text.

[End]

B2. TAXONOMY GLOSSARY AND CHARACTERISTICS

Table B2-1. Glossary of taxonomy characteristics.

Term	Operational Definition
Taxonomy	Description and categorization of different remote care management programs into distinct models.
Technology (Domain A)	Refers to the level of automation and technical complexity of the RCM platform.
Touch (Domain B)	Refers to the level of monitoring and interaction required between the patient and the RCM team.



Integration (Domain C)	Refers to the extent to which the RCM program is linked to (or leverages) existing systems (i.e., interoperability) including services, resources, workflows, and infrastructure.
Equity/Patient-Centricity (Domain D)	Refers to the extent to which the RCM program proactively enables inclusion, equitable access, and/or patient-centricity.
Alert protocol	Refers to how a decision is made to conclude that escalation is needed. Escalation can mean that the RCM/clinical team contacts the patient, or the patient calls 911 or reaches out to other supportive services.
Data entry modality	Describes how patient physiologic measurements or other assessments are collated and/or reported. This excludes symptoms, PREMs/PROMs, and patient experience surveys which are always entered manually.
Data access	Describes how measurements/collected data from the RCM program is streamlined or managed from the point of entry, where it is reviewed, or decisions are made.
Manual data entry (frequency)	Refers to the frequency for which a patient is required to manually enter data (i.e., measurements that are not automatically captured, symptoms, PROMs/PREMs, experience surveys). This excludes measurements that are automatically captured.
Follow-up communication	Describes how the RCM team stays connected or follows-up with the user. Refers to general two-way communication between the clinical team and the patient. This excludes communication regarding onboarding, enrolment, and alerts/escalations.
Level of monitoring specialization	Describes the level of clinical specializations of the RCM monitoring team. The RCM monitoring team refers to individuals who regularly monitor patient data, communicate with patients, and/or are available to respond to clinical escalations.
Availability of team	Describes the availability of the RCM monitoring team to respond to patient inquiries, alerts, and clinical escalations.
Risk profile	Refers to the severity of disease status for people enrolled into the RCM program.
Integration considerations	Considers whether the RCM program is integrated with the following: 1) existing services and resources (i.e., shared full-time equivalent with existing services and programs), 2) existing workflows (e.g., embedded into usual clinical visits and procedures such as intake processes), and 3) existing systems and infrastructure (e.g., patient records, EMRs, etc.)
Device linkages	Considers the linkages between individual hardware and software devices used in the RCM program (e.g., platform vendors, cloud services, digital applications, etc.) irrespective of device manufacturer or vendor. For example, a multiple integrated program will have >1 device serviced by >1 manufacturer/vendor but still be designed to function as a single unit.
Device ownership	Refers to the extent or burden on the patient with respect to device ownership. This includes any device required to participate in the program such as physiologic devices, non-physiologic devices for alerts/escalations, a phone, tablet, laptop, etc.

Equity considerations	<p>Considers whether the RCM program promotes equity by:</p> <ol style="list-style-type: none"> 1) promoting language inclusivity (provides program in >1 language), 2) promoting digital literacy (provides regular support to users with little education or digital literacy), 3) enabling offline functionality (does not require users to have constant internet access and/or allows data to be collected offline and synced at a later time), 4) adapting the program culturally (reports any considerations in making the RCM platform/program responsive to culture), 5) providing patients digital access (provides all devices to the user and/or does not make the user possess a specific device or access to the internet as a pre-enrolment requirement), and 6) enabling patients access to their own personal health information (interface allows patients to see their own data).
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Table B2-2. Taxonomy characteristics classified by score.

	High (3)	Moderate (2)	Low (0-1)
Domain A: Technology			
A1. Alert protocol	[Automatic]	N/A	[Manual] or [None] or [Unknown]
A2. Data entry modality	[Fully-automated] or [None]	[Semi-automated]	[Manual] or [Unknown]
A3. Data Access	[Centralized]	N/A	[Fragmented] or [None] or [Unknown]
A4. Manual data entry (frequency)	[Monthly] or [None]	[Weekly] or [Bi-weekly]	[Daily] or [Unknown]
Domain B: Touch			
B1. Follow-up communication	[Synchronous on demand]	[Asynchronous on demand]	[Pre-scheduled] or [None] or [Unknown]
B2. Level of monitoring specialization	[Moderately specialized]	N/A	[No specialization] or [None] or [Not applicable]
B3. Availability of team	[24/7] or [Regular + weekends]	[Regular workdays]	[Irregular] or [None] or [Not applicable] or [Unknown]
B4. Risk profile	[High]	[Moderate]	[Low] or [Non-specific] or [Unknown]
Domain C: Integration			
C1. Integration considerations	[3]	[2]	[1] or [None] or [Unknown]
C2. Device linkages	[Multiple linked] or [Single]	N/A	[Multiple separate] or [None] or [Unknown]
Domain D: Equity/Patient-Centricity			
D1. Device ownership	[System provided]	[Mixed ownership]	[BYOD] or [None] or [Unknown]
D2. Equity considerations	[5] or [6]	[3] or [4]	[1] or [2] or [None] or [Unknown]



Appendix C: Interview and Focus Group Guides

C1. PATIENT/CAREGIVER INTERVIEW GUIDE

Thank you for taking the time to speak with me. My name is [interviewer name] and this is [note-taker's name], who will be taking notes during our conversation. Today I'm interested in learning about your thoughts and experiences with the Remote Care Management program at [RCM site name]. You were invited to participate because you were a patient who was or is currently enrolled in that program. Do you recall being enrolled in the RCM program at [site]? [Provide additional information about the program. i.e., you were part of the COVID-19 RCM program at Michael Garron where you were asked to send updates daily through your smart phone to the monitoring team.] [If YES, continue]

There are 3 parts to our discussion. First, I will go over a verbal consent checking to see if you have any questions or concerns about the evaluation. Second, I will ask personal information questions as we want to make sure we have a representative sample of participants. After we will have our discussion.

1. Are you comfortable with our conversation be audio-recorded? We want to make sure that we capture all the information you share with us.

Yes No [If yes, begin recording]

2. Re-confirm that they completed and submitted the *Informed Consent form*. And follow-up with *Verbal Consent Checklist*.

Yes No

Table C1. Patient/caregiver verbal consent checklist.

Interview ID: Name of Interview Participant:		Clear		Re- Explained
<i>I will read out the following information (also available on the project information letter), please let me know if anything is unclear and I will re-explain.</i>		Yes	No	Yes
Voluntary				
1.	You are not required to take part in this evaluation project.			
2.	Declining to participate will not affect your health care and your health care team will not see any of this information.			
About the Project				
3.	This interview is being done to learn more about your experiences with the Remote Care Management program.			
4.	You can choose not to answer question(s) which may cause you discomfort, and you may choose to stop the interview at any time for any reason without telling me why.			
Risk and Benefits				
5.	Results from this evaluation will help us understand what works well and what could be improved about Remote Care Management programs.			
6.	There are minimal risks associated with participation. You can choose to not answer questions that make you feel uncomfortable, and we can stop at any time.			
Confidentiality				
7.	Your opinions and responses will remain confidential, and you will			

	only be identified by an interview ID.			
8.	Only members of the project team will have access to interview data.			
Time Required				
9.	Interview: Participation involves one interview, lasting 45 to 60 minutes.			
Reimbursement				
10.	You will be provided with a \$25 gift card for your participation (Amazon, Shoppers Drug Mart, or Indigo).			
Questions				
11.	If you have questions about this evaluation, you can contact the Principal Investigator, Dr. Ibukun Abejirinde at ibukun.abejirinde@wchospital.ca .			
12.	If you have questions about being involved in a program evaluation in general, you may contact the Assessment Process for Quality Improvement Projects lead (APQIP) at Women's College Hospital at apqip@wchospital.ca .			

[Confirm their consent to continue recording during the demographic survey.]

Patient Information Questionnaire

The purpose of these questions is to better understand considerations for equity as it concerns the remote patient monitoring program you have been enrolled in. We will also use this information to know whether we are including a diverse participant population. The questions are voluntary, and you can choose 'prefer not to answer' or skip any or all the questions. Only people working on this research study will be able to see this information. If used in the research, your information will be combined with information from the other participants in this study so that your information cannot be linked to you.

1. **What year were you born?**
 - Year: _____
 - Prefer not to answer

2. **Overall, how would you describe your level of comfort with using computers or technology?**
 - None
 - Basic (e.g., I can log into email, requiring some assistance)
 - Average (e.g., I can answer emails and browse the internet, requiring little to no assistance)
 - Advanced (e.g., I can independently solve a problem by navigating some webpages and applications)
 - Expert (e.g., I can independently solve a problem with multiple steps across webpages and applications)

3. **What is your gender identity?**
 - Woman
 - Man
 - Trans woman
 - Trans man
 - Two-Spirit
 - Gender nonconforming/Genderqueer
 - Gender fluid
 - Gender neutral



- Androgynous
- Non-binary
- Do not know
- Prefer to self-describe: _____
- Prefer not to answer

4. **What language(s) would you feel most comfortable communicating in with your health care provider?** (Choose all that apply)

- Amharic
- Arabic
- ASL
- Bengali
- Cantonese
- Cree
- Czech
- English
- French
- Greek
- Gujarati
- Hindi
- Hungarian
- Inuktitut
- Italian
- Karen
- Korean
- Mandarin
- Nepali
- Ojibwe
- Oji-Cree
- Persian (Farsi, Dari, Tajik)
- Polish
- Portuguese
- Punjabi
- Russian
- Serbian
- Slovak
- Somali
- Spanish
- Tagalog
- Tamil
- Tigrinya
- Turkish
- Twi
- Ukrainian
- Urdu
- Vietnamese
- Prefer to self-describe: _____



Prefer not to answer

5. **Which of the following best describes your racial or ethnic background?**

- Black (African, Afro-Caribbean, African Canadian descent)
- East Asian (Chinese, Korean, Japanese, Taiwanese descent)
- Southeast Asian (Filipino, Vietnamese, Cambodian, Thai, Indonesian, other Southeast Asian descent)
- Indigenous (First Nations, Métis, Inuit descent)
- Latino (Latin American, Hispanic descent)
- Middle Eastern (Arab, Persian, e.g., Afghan, Iranian, Lebanese, Turkish, Kurdish, etc.)
- South Asian (South Asian descent, e.g., East Indian, Pakistani, Bangladeshi, Sri Lankan, Indo-Caribbean, etc.)
- White (European descent)
- Prefer to self-describe: _____
- Prefer not to answer

6. **What is the highest level of education you have completed?**

- Primary or middle school
- High school
- Trade or vocational diploma/certificate
- College degree/diploma/certificate
- Undergraduate degree
- Master's degree
- Professional degree (e.g., PhD, MD, JD, DDS, etc.)
- None of the above
- Other, please specify: _____
- Prefer not to answer

7. **Which best describes your employment situation?**

- Full Time (30+ hours per week)
- Part Time (less than 30 hours per week)
- Casual, on-call or short-term contract
- Seasonal
- Working for others
- Self-employed
- Other (please specify): _____
- Not currently working in the labour force (includes Retired)
- Prefer not to answer

If “Not currently working in the labour force” or “retired”, proceed to Question 11.

8. **Since when have you not been working in the labour force?**

- Before March 14, 2020 (before COVID-19 pandemic)
- After March 14, 2020 (due to COVID-19 pandemic)
- After March 14, 2020 (**NOT** due to COVID-19 pandemic)
- Prefer not to answer

9. **Are you seeking employment?**



- Yes
- No
- Prefer not to answer

10. **Do you identify with any of the following groups?** (Choose all that apply)

- Homemaker
- Caregiver
- Student
- Retired
- On disability support
- Prefer not to answer

11. **What type of housing do you live in?**

- Apartment/House (Homeowner)
- Apartment/House (Tenant)
- Boarding home
- Correctional facility
- Group home (retirement centre)
- Homeless/street-based
- Shelter/hostel
- Supportive housing
- Transitional housing
- Long term care home/assisted living facility
- Do not know
- Other, please specify: _____
- Prefer not to answer

12. **How would you describe where you live?**

- Rural (less 1,000 people)
- Small population centres (1,000 to 29,999 people)
- Medium population centres (30,000 to 99,999 people)
- Large population centres (100,000 to 999,999 people)
- Urban centres (1 million people and over)
- Do not know
- Prefer not to answer

13. **In the last 7 days, how would you rate your overall health?**

- Poor
- Fair
- Good
- Very good
- Excellent
- Do not know
- Prefer not to answer

14. **For which of the following conditions are/where you enrolled in the Remote Care Management program?**

- Diabetes



- Surgery
- Congestive heart failure
- Chronic obstructive pulmonary disease
- Hypertension
- COVID-19 infection
- Other
- Prefer not to answer

15. **Do you need a caregiver (a family member helping with your care or a paid caregiver such as a nurse or a personal support worker)?**

- Yes, please specify: _____
- No
- Other (please specify): _____
- Prefer not to answer

16. **What is your annual household income (before taxes)?**

- \$0 - \$29,999
- \$30,000 - \$59,999
- \$60,000 - \$89,999
- \$90,000 - \$119,999
- \$120,000 - \$149,999
- \$150,000 +
- Prefer not to Answer
- Do not know

17. **How many people live with you, including yourself? _____ person(s)**

- Prefer not to answer

18. **How many people does this income support, including yourself? _____ person(s)**

- Prefer not to answer
- Do not know

19. **Do you face occasional challenges in meeting financial needs at the end of the month?**

- Yes
- No
- Do not know
- Other (please specify): _____
- Prefer not to answer

20. **On average, do you have reliable access to internet to engage in the Remote Care Management program?**

- Yes
- No
- Sometimes
- Do not know
- Prefer not to answer

21. **How long have you been enrolled in the Remote Care Management program?**

- Less than a month



- 1-3 months
- 4-6 months
- 7-11 months
- 12+ months
- Prefer not to answer

23. **How were you referred to the Remote Care Management program?**

- Self-referral (i.e., I went on the internet and completed the intake assessment)
- Referral from a care provider (e.g., family doctor, therapist, counsellor, etc.)
- Other (please specify): _____
- Prefer not to answer

24. **Who recommended the Remote Care Management program to you?**

- Nobody
- Health care provider
- Family member
- Friend
- Colleague/Co-worker
- Employer
- Other (please specify): _____
- Referral from a care provider (e.g., family doctor, therapist, counsellor, etc.)
- Prefer not to answer

Patient/Caregiver Interview Questions

Do you have any questions before we begin?

1. Tell me about your experience with the Remote Care Management program.

Probes:

- a. How do you feel about the program?
- b. Describe how your medical condition was being managed with the program.
- c. Tell me about your satisfaction with the program.
- d. What aspects or features of the program contribute/do not contribute to your satisfaction?
Tell me more about ...
- e. What do you like/dislike about the program?

2. What are the benefits and/or drawbacks of being in this program?

- a. What was most useful or valuable about the program?
- b. What aspects of the program were not useful?

3. How easy is the program to take part in?

Probes:

- a. Tell me about your experience accessing and learning the medical equipment/the tablet/the mobile application?
- b. What makes or does not make the program easy to learn, easy to engage in, and accessible?
- c. How do you feel about the amount of work required of you to engage in the program?

4. In what ways is the program helpful and/or not helpful in supporting you in managing your condition from home?

Probes:

- a. Did you feel your (remote) care team was responsive whenever you had questions or



- there was a need for clinical action? Why/Why not?
- b. In what ways could the program be improved to better support you in managing your condition from home?
 - c. How confident do you feel about engaging in the program on your own (e.g., using the equipment, recording your vitals, etc.)?
 - d. How do you feel about your ability to continue self-managing your condition at home after being discharged from the program?
5. What are your opinions about the program in terms of it being a good fit for you and your health and self-management needs?
- Probes:**
- a. How well does the program align with the way *you* want to receive care?
 - b. How well or not well does the program fit into your everyday life?
 - c. How could the program be improved to better fit into your lifestyle?
6. What supported you in continuing to stay with the program?
- Probes:**
- a. Did anyone influence or support you in continuing to engage with the program? (If yes) how did they influence/support you in continuing to engage with the program?
 - b. Going forward would you prefer to continue using RPM/SM for managing your condition? Why/Why not?
7. If you could change *anything* about the program, what would you change?

Those are all the specific questions that I had today. Was there anything else that you would like to share with me that perhaps I didn't ask?

Thank you once again for your time and willingness to share with me your thoughts and experience today. If there is anything else that you think that you feel we should know please feel free to email us.

C2. ORGANIZATIONAL LEADER INTERVIEW GUIDE

Thank you for taking the time to speak with me. My name is [insert interviewer name] and this is [note-taker's name], who will be taking notes during our conversation. Today I'm interested in learning about your different experiences with and perspectives of the Remote Care Management program as a member of the senior/leadership team involved in the implementation of [insert name of RCM program].

1. Are you comfortable with our conversation be audio-recorded? We want to make sure that we capture all the information you share with us.

Yes No [If yes, begin recording]

2. Re-confirm that they completed and submitted the *Informed Consent form*. And follow-up with *Verbal Consent Checklist*.

Yes No

Table C2. Organizational leader verbal consent checklist.

Interview ID: Name of Interview Participant:		Clear		Re-Explained
I will read out the following information (also available on the project information letter), please let me know if anything is unclear and I will re-explain.		Yes	No	Yes
Voluntary				
1.	You are not required to take part in this evaluation project.			



2.	Declining to participate will not affect your employment or relationship with Women's College Hospital or other organizations.			
About the Project				
3.	This interview is being conducted to learn more about your experiences implementing the Remote Care Management program at your site.			
4.	You can choose not to answer question(s) which may cause you discomfort, and you may choose to stop the interview at any time for any reason without telling me why.			
Risk and Benefits				
5.	Results from this evaluation will help us understand what works well and what could be improved about Remote Care Management programs.			
6.	There are minimal risks associated with participation. However, you may be uncomfortable with answering some questions, you can choose to not answer any questions that make you feel uncomfortable, and we can stop at any time.			
Confidentiality				
7.	Your opinions and responses will remain confidential and evaluation files will be identified by an interview ID only.			
8.	Only members of the team will have access to interview data.			
Time Required				
9.	Interview: Participation involves participating in one interview, lasting 45 to 60 minutes. A follow-up survey (Clinical Sustainability Assessment Tool) will be distributed at a later date and should not take longer than 15 minutes.			
Reimbursement				
10.	You will be provided with a \$25 gift card for your participation (Amazon, Shoppers Drug Mart, or Indigo).			
Questions				
11.	If you have questions about this evaluation, you can contact the Principal Investigator, Dr. Ibukun Abejirinde at lbukun.abejirinde@wchospital.ca .			
12.	If you have questions about being involved in a program evaluation in general, you may contact the Assessment Process for Quality Improvement Projects lead (APQIP) at Women's College Hospital at apgip@wchospital.ca .			

[Confirm their consent to continue recording during the demographic survey.]

Patient Information Questionnaire

The purpose of the demographic questions is to understand who is implementing the Remote Care Management program. We will also use this information to know whether we are capturing a representative and diverse participant population. The questions are voluntary, and you can choose 'prefer not to answer' or skip any or all of the questions. This information will be visible only to study personnel. If used in research, this information will be combined with data from all other participants and your information will not be identifiable.

1. **What is your professional designation?** (Choose all that apply)

- General practitioner
- Family physician
- Registered Nurse
- Registered Practical Nurse
- Nurse Practitioner
- Social Worker
- Pharmacist
- Administrative Manager



- Other, please specify: _____
- Prefer not to answer

2. **How many years have you been working in your current profession?**

(Round up the number of years you worked e.g., If you worked 5.5 years, round to 6 years).

- 1 year or less
- 2-5 years
- 6-10 years
- 11-15 years
- 16 years
- Prefer not to answer

3. **Please specify the condition(s) that your Remote Care Management program serves**

(Choose all that apply)

- Diabetes
- Surgery
- Congestive heart failure
- Chronic obstructive pulmonary disease
- Hypertension
- COVID-19 infection
- Other
- Prefer not to answer

4. **How long have you been delivering care through/implementing the Remote Care Management program?**

(Round up the number of months you have delivered care through/implemented the RPM program e.g., If you delivered care through/implemented the RPM program for 6.5 months, round to 7 months)

- Less than a month
- 1-3 months
- 4-6 months
- 7-11 months
- 12+ months
- Prefer not to answer

5. **Overall, how would you describe your level of comfort with using technology?**

- None
- Basic (e.g., I can log into email, requiring some assistance)
- Average (e.g., I can answer emails and browse the internet, requiring little to no assistance)
- Advanced (e.g., I can independently solve a problem by navigating some webpages and applications)
- Expert (e.g., I can independently solve a problem with multiple steps across webpages and applications)
- Prefer not to answer

6. **What year were you born?**

- Year: _____
- Prefer not to answer



7. **What is your gender identity?**

- Woman
- Man
- Trans woman
- Trans man
- Two-Spirit
- Gender nonconforming/Genderqueer
- Gender fluid
- Gender neutral
- Androgynous
- Non-binary
- Do not know
- Prefer not to answer
- Prefer to self-describe: _____

8. **What best describes the community size where you primarily provide care/implement the remote patient monitoring program? (Choose all that apply)**

- Rural (less 1,000 people)
- Small population centres (1,000 to 29,999 people)
- Medium population centres (30,000 to 99,999 people)
- Large population centres (100,000 to 999,999 people)
- Urban centres (1 million people and over)
- Do not know
- Prefer not to answer

9. **What languages do you feel most comfortable communicating in with patients? (Choose all that apply)**

- Amharic
- Arabic
- ASL
- Bengali
- Cantonese
- Cree
- Czech
- English
- French
- Greek
- Gujarati
- Hindi
- Hungarian
- Inuktitut
- Italian
- Karen
- Korean
- Mandarin
- Nepali
- Ojibwe
- Oji-Cree



- Persian (Farsi, Dari, Tajik)
- Polish
- Portuguese
- Punjabi
- Russian
- Serbian
- Slovak
- Somali
- Spanish
- Tagalog
- Tamil
- Tigrinya
- Turkish
- Twi
- Ukrainian
- Urdu
- Vietnamese
- Other, please specify: _____
- Prefer not to answer

10. **Which of the following best describes your racial or ethnic background?**

- Black (African, Afro-Caribbean, African Canadian descent)
- East Asian (Chinese, Korean, Japanese, Taiwanese descent)
- Southeast Asian (Filipino, Vietnamese, Cambodian, Thai, Indonesian, other Southeast Asian descent)
- Indigenous (First Nations, Métis, Inuit descent)
- Latino (Latin American, Hispanic descent)
- Middle Eastern (Arab, Persian, e.g., Afghan, Iranian, Lebanese, Turkish, Kurdish, etc.)
- South Asian (South Asian descent, e.g., East Indian, Pakistani, Bangladeshi, Sri Lankan, Indo-Caribbean, etc.)
- White (European descent)
- Prefer to self-describe: _____
- Prefer not to answer

11. **What describes the basis at which you are providing care through/implementing the Remote Care Management program?**

- Full-time
- Part-time
- Other, please specify: _____
- Prefer not to answer

12. **If you are part-time, please specify the number of hours a week you are providing care through/implementing the Remote Care Management program:**

Free text box: _____

Organizational Leader Interview Questions

Before we start with the interview, do you have any questions?

1. Please describe the Remote Care Management program at [*name of site*].



Tell me about the program's operational and organizational structure.

Probes:

- a. What are the key features/processes? (e.g., workflow, clinical process, logistics, escalation protocols, coordination protocols, staffing variation)
 - b. Who are the key members of the team implementing the Remote Care Management program?
 - c. What did implementation rollout look like? (I.e., the initial state of implementation)
 - d. How long has the program been implemented for?
 - e. What operates well? Describe the current uptake/usability of the program.
 - f. What are the pain points that you think need to be addressed?
1. How do you assess, and support fit between the Remote Care Management program and the organization/team in which it is embedded?
- Probes:**
- a. What kinds of considerations do you make to support fit (e.g., the organization's culture, team structure, resource allocation, strategies, pre-existing technology infrastructure, processes, impact on workflows and end-users' experiences (helping staff adapt), etc.)?
 - b. What kinds of audit or feedback processes are in place to evaluate fit? (e.g., quality improvement, experience surveys, what performance measures are collected and prioritized).
2. How did you support adoption and buy-in among staff in the Remote Care Management program?
- Probes:**
- a. Who was engaged? (What type of staff e.g., MDs, RNs, admin, trainees were engaged)
 - b. What worked well? (e.g., what supported adoption/buy-in?)
 - c. What did not work?
 - d. What key lessons did you learn in the implementation process?
3. How did you promote the RPM for patients and support their enrollment and uptake? What types of patients are being managed under the program?
- Probes:**
- a. What worked well (e.g., what supported adoption/buy-in?)
 - b. What did not work?
 - c. What kinds of steps have been taken to address potential barriers to patients engaging in the program?
 - i. How is the equipment provided to patients (e.g., loaner tablets, downloadable apps)?
 - ii. What kinds of supports are in place to help patients learn and use the technology and medical equipment, for example?
 - iii. How is the program designed to meet different accessibility needs (e.g., patients with a physical or cognitive disability, digital literacy).
 - iv. What alternative options (if any) are available and offered to patients for whom the standard equipment/technology might not be well-suited (e.g., patients who experience challenges with vision or reading/writing)?
 - v. How is the program designed to reach those who are experiencing access issues with the health system?
 - d. How could the program be improved to better meet the unique needs of patients?
 - e. How do you maintain continued patient engagement throughout the program?
4. What have you done to ensure the long-term continuity and systematic integration of the program?
- Probes:**
- a. What strategies on the back end are implemented to encourage sustained use (e.g., push

- notifications, text message reminders)?
 - b. How much effort has been committed to ensure enough resources are available to provide (1) training for staff and patients, (2) technical support, and (3) frequent monitoring to ensure the program remains up to date?
 - c. What aspects of the program require immediate revision?
 - d. What are the long-term goals?
 - e. How do you measure the program's success?
5. Those are all the specific questions that I had today. Was there anything else that you would like to share with me that perhaps I didn't ask?

Lastly, could provide us with any documentation that was created to help with the implementation of the program. This can include things like a flow diagram for the patient pathways, meeting minutes (if they're not private) or internal reports or surveys to understand uptake numbers for patients. Thank you once again for your time and willingness to share with me your thoughts and experience today. If there is anything else that you think that you feel we should know please feel free to email us.

C3. HEALTH SERVICE PROVIDER/ONTARIO HEALTH TEAM STAFF FOCUS GROUP GUIDE

Thank you for taking the time to speak with me. My name is [insert interviewer name] and today I'm interested in learning about your different experiences with and perspectives of the Remote Care Management program as a health care provider or administrative staff member involved in the delivery of care. There are no right or wrong answers, just differing viewpoints. I'm interested in both negative and positive feedback as both will be helpful in informing our Remote Care Management evaluation.

1. Are you comfortable with our conversation be audio-recorded? We want to make sure that we capture all the information you share with us.

Yes No [If yes, begin recording]

2. Re-confirm that they completed and submitted the *Informed Consent form*. And follow-up with *Verbal Consent Checklist*.

Yes No

Table C3. HSP verbal consent checklist.

Interview ID: Name of Interview Participant:		Clear		Re-Explained
<i>I will read out the following information (also available on the project information letter), please let me know if anything is unclear and I will re-explain.</i>		Yes	No	Yes
Voluntary				
1.	You are not required to take part in this evaluation project.			
2.	Declining to participate will not affect employment, your relationship with Women's College Hospital or other organizations.			
About the Project				
3.	This interview is being conducted to learn more about your experiences implementing the Remote Care Management program at your site.			
4.	You can choose not to answer question(s) which may cause you discomfort, and you may choose to stop the interview at any time for any reason without telling me why.			
Risk and Benefits				

5.	Results from this evaluation will help us understand what works well and what could be improved about Remote Care Management programs.			
6.	There are minimal risks associated with participation. However, you may be uncomfortable with answering some questions, you can choose to not answer any questions that make you feel uncomfortable, and we can stop at any time.			
Confidentiality				
7.	Your opinions and responses will remain confidential and evaluation files will be identified by an interview ID only.			
8.	Only members of the team will have access to interview data.			
Time Required				
9.	Interview: Participation involves participating in one interview, lasting 45 to 60 minutes. A follow-up survey (Clinical Sustainability Assessment Tool) will be distributed at a later date and should not take longer than 15 minutes.			
Reimbursement				
10.	You will be provided with a \$25 gift card for your participation (Amazon, Shoppers Drug Mart, or Indigo).			
Questions				
11.	If you have questions about this evaluation, you can contact the Principal Investigator, Dr. Ibukun Abejirinde at lbukun.abejirinde@wchospital.ca .			
12.	If you have questions about being involved in a program evaluation in general, you may contact the Assessment Process for Quality Improvement Projects lead (APQIP) at Women's College Hospital at apqip@wchospital.ca .			

[If they haven't yet filled out the online demographic survey, remind them to do so.]

Health Service Provider Interview Questions

Do you have any questions before we begin?

1. Tell me about the program's delivery of care for the Remote Care Management program of [specialty area, e.g., diabetes, COPD].

Probes:

- a. What have been your experience using the RCM technologies at {site name}?
- b. Can you describe how the RCM program was set up and expected to function? Probe cues: staffing, responsibilities of care team/patient, escalation and resolution protocols
- c. What are the key features of the technology?

2. How easy has the program been to deliver?

Probes:

- a. What makes the program easy/not easy to deliver?
- b. Is the program easy to learn and accessible?
Probe cues: delivery, and administrative processes
- c. How do you feel about the amount of work that is involved in delivering the program?

3. Do you feel that the program is a good fit for you and your organization? Why or why not?

Probes:

- a. Do you think the RCM program is an appropriate or suitable program for people with {say relevant patient pathway – Diabetes, Covid-19, Geriatric rehab, Surgical transitions? (Why/Why not?)

4. Do you think there are certain patients that will benefit more from this RCM program than others? If yes, what patient characteristics reflect who is likely to benefit most from the program? Why?

Probes:

- a. How well does the program align with the way *you* want to deliver care/implement care



- programs?
- b. How well or not well does the program fit into your daily workflow and the organization's structure and processes?
 - c. How well does the program improve efficiency of health care delivery and your work productivity?
 - d. Were there any organisational incentives to support uptake and coordination of the program among the care team? If yes, what incentives?
5. What do you like and dislike about the program?
- Probes:**
- a. Do you think the program has been beneficial to patients? Please elaborate
 - b. What do you value about the program?
 - c. What operates well?
 - d. What made the program successful/unsuccessful?
 - e. What are the challenges of the program that you think need to be addressed?
6. What steps have you or your organization taken to address potential barriers that patients may experience when engaging in the program?
- Probes:**
- a. What kinds of supports are in place to help patients learn and use the technology and medical equipment, for example?
 - b. How is the program designed to meet different accessibility needs (e.g., patients with a physical or cognitive disability).
 - c. What alternative options (if any) are available and offered to patients for whom the standard equipment/technology might not be well-suited (e.g., patients who experience challenges with vision or reading/writing)?
 - d. How could the program be improved to better meet the unique needs of patients?
7. What structures, resources, or processes are needed to ensure long term continuity and integration of the program into routine care?
- Probes:**
- a. What strategies on the back end of the technology are implemented to encourage sustained use (e.g., push notifications, text message reminders)?
 - b. How much effort has been committed to ensure enough resources are available to provide (1) training for staff and patients, (2) technical support, and (3) frequent monitoring to ensure the program remains up to date?
8. If you could change *anything* about the RCM program, what changes would you make?
9. How could the program be improved to better fit into your workflow and the organization's structure and processes?
10. Is there anything else you feel is important to tell us about your experience with the Remote Care Management program?

Appendix D: Clinical Sustainability Assessment Tool Survey

D1. CSAT SURVEY

Title: Remote Patient Monitoring Evaluation

Purpose: The purpose of this survey is to gather perceptions on the sustainability of remote patient monitoring programs within clinical settings. Remote patient monitoring is a type of technology that gathers patient generated health information and sends it to a health care site (e.g., hospital or doctor's office). From there, a health care provider can view and monitor the information to determine a patient's health status. This evaluation is supported by the Ministry of Health of Ontario and Ontario Health and will help them to learn who benefits from remote patient monitoring technologies and how this technology can be used to improve efficiency and better health outcomes.

What your Participation Entails: There are 2 sections in this survey which will take approximately 10 minutes to complete. The survey is anonymous, and participants will not be asked to provide any identifying information. Only complete surveys will be eligible for the draw. You will be redirected to another webpage at the end of the survey. If you would like to participate in the draw, you could win 1 of 4, \$50 electronic gift cards to Shoppers Drug Mart, Indigo, OR Amazon Canada.

Who to Contact: Should you have any questions about the survey, please contact:

Dr. Ibukun Abejirinde, Principal Investigator, Women's College Hospital, Institute for Health System Solutions and Virtual Care, Toronto, Ontario, Email: ibukun.abejirinde@wchospital.ca, Tel: 416-323-6400 Ext. 7516

Dr. Janette Brual, Project Lead, Women's College Hospital, Institute for Health System Solutions and Virtual Care, Toronto, Ontario, Email: janette.brual@wchospital.ca

Women's College Ethics Board Contact: Women's College Hospital Research Ethics Board (REB) has reviewed this study. If you have any questions regarding your rights as a participant, please contact the Women's College Hospital Research Ethics Board Coordinator, Ms. Marie Steele, by email: ethics@wchospital.ca or by phone (416) 351-3732 ext. 2723.

Do you consent to participate? Your consent to participate in the survey is demonstrated by your voluntary completion and submission of this survey.

By submitting this survey, you are:

- Acknowledging you have read this information and agree to participate in this study
- Are agreeing to use of your anonymous survey responses for quality improvement purposes and for potential scientific publications;

<< **Yes, I agree and consent to participate**>> **TO BEGIN THE SURVEY**

<< **No, I do not agree and do not consent to participating**>>

Thank you for taking the time to consider participation!

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Section 1: Demographics

The purpose of the demographic questions is to understand who is implementing the remote patient monitoring program. We will also use this information to know whether we are capturing a representative and diverse participant population. The questions are voluntary, and you can choose 'prefer not to answer' or skip any or all of the questions. This information will be visible only to study personnel. If used in research, this information will be combined with data from all other participants and your information will not be identifiable. In this survey there are 12 questions that ask about your demographics or personal information, like age, gender, ethnicity, education, employment situation, etc.

1. What is your professional designation? (Choose all that apply)

- General Practitioner
- Family physician
- Registered Nurse
- Registered Practical Nurse
- Nurse Practitioner
- Social Worker
- Pharmacist
- Administrative Manager
- Other, please specify: _____
- Prefer not to answer

2. How many years have you been working in your current profession? (Please round up the number of years you worked e.g., if you worked 5.5 years, please round to 6 years).

- 1 year or less
- 2-5 years
- 6-10 years
- 11-15 years
- 16+ years
- Prefer not to answer

3. Please provide the name of the institution through which you are implementing remote patient monitoring.

- Toronto Grace Health Centre
- Health Sciences North
- St. Joseph's Continuing Care
- Michael Garron
- William Osler Health Sciences
- Riverside Health Care

4. Please specify the condition(s) that your remote patient monitoring program serves. (Choose all that apply)

- Diabetes
- Surgery
- Congestive heart failure
- Chronic obstructive pulmonary disease
- Hypertension
- COVID-19 infection
- Other



Prefer not to answer

5. **How long have you been delivering care through/implementing the remote patient monitoring program?**

(Please round up the number of months you have delivered care through/implemented the remote patient monitoring program e.g., If you delivered care through/implemented the remote patient monitoring program for 6.5 months, please round to 7 months)

- Less than a month
- 1-3 months
- 4-6 months
- 7-11 months
- 12+ months
- Prefer not to answer

6. **Overall, how would you describe your level of comfort with using technology?**

- None
- Basic (e.g., I can log into email, require some assistance to)
- Average (e.g., I can answer emails and browse the internet, require little to no assistance)
- Advanced (e.g., I can independently solve a problem by navigating some webpages and applications)
- Expert (e.g., I can independently solve a problem with multiple steps across webpages and applications)
- Prefer not to answer

7. **What year were you born?**

<drop down list>

- 1920 – 1929
- 1930 – 1939
- 1940 – 1949
- 1950 – 1959
- 1960 – 1969
- 1970 – 1979
- 1980 – 1989
- 1990 – 1999
- 2000 – 2009
- Prefer not to answer

8. **What is your gender identity?**

Gender refers to the socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people. (Source: CIHR, 2020)

- Woman
- Man
- Trans woman
- Trans man
- Two-Spirit
- Gender nonconforming/Genderqueer
- Gender fluid



- Gender neutral
- Androgynous
- Non-binary
- Do not know
- Prefer not to answer
- Prefer to self-describe: _____

9. **What best describes the community size where you primarily provide care/implement the remote patient monitoring program? (Choose all that apply)**

- Rural (less 1,000 people)
- Small population centres (1,000 to 29,999 people)
- Medium population centres (30,000 to 99,999 people)
- Large population centres (100,000 to 999,999 people)
- Urban centres (1 million people and over)
- Do not know
- Prefer not to answer

10. **What languages do you feel most comfortable communicating in with patients? (Choose all that apply)**

- English
- French
- Mandarin
- Cantonese
- Punjabi (Panjabi)
- Spanish
- Arabic
- Urdu
- Tamil
- Persian (Farsi)
- Tagalog (Pilipino; Filipino)
- Italian
- Portuguese
- Russian
- Polish
- Korean
- Vietnamese
- Gujarati
- German
- Bengali
- Prefer to self-describe: _____
- Prefer not to answer

11. **Which of the following best describes your racial or ethnic background?**

Race is a social construct. This means that society forms ideas of race based on geographic, historical, political, economic, social and cultural factors, as well as physical traits, even though none of these can legitimately be used to classify groups of people. (Source: CIHR, 2019)



Ethnicity denotes groups that share a common identity-based ancestry, language, or culture. It is often based on religion, beliefs, and customs as well as memories of migration or colonization. (Source: Cornell & Hartmann, 2007)

- Black (African, Afro-Caribbean, African-Canadian descent)
- East Asian (Chinese, Korean, Japanese, Taiwanese descent)
- Southeast Asian (Filipino, Vietnamese, Cambodian, Thai, Indonesian, other Southeast Asian descent)
- Indigenous (First Nations, Métis, Inuit descent)
- Latino (Latin American, Hispanic descent)
- Middle Eastern (Arab, Persian, e.g., Afghan, Iranian, Lebanese, Turkish, Kurdish, etc.)
- South Asian (South Asian descent, e.g., East Indian, Pakistani, Bangladeshi, Sri Lankan, Indo-Caribbean, etc.)
- White (European descent)
- Prefer to self-describe: _____
- Prefer not to answer

12. What describes the basis at which you are providing care through/implementing the remote patient monitoring program?

- Full-time
- Part-time
- Other, please specify: _____
- Prefer not to answer

Section 2: Clinical Sustainability Survey (Washington University’s Clinical Sustainability Assessment Tool)

The Clinical Sustainability Assessment Tool (CSAT) will be used to assess providers' perceptions of how sustainable the RPM programs are. The survey contains 35 questions that will take approximately 10 mins. It covers the following concepts: Engaged Staff & Leadership, Engaged Stakeholders, Organizational Readiness, Workflow Integration, Implementation & Training, Monitoring & Evaluation, Outcomes & Effectiveness. Only complete surveys will be eligible for the draw. You will be redirected to another webpage at the end of the survey if you would like to participate in the draw to win 1 of 4, \$50 electronic gift cards to Shoppers Drug Mart, Indigo, OR Amazon Canada. In the following questions, you will rate your remote patient monitoring program across a range of specific factors that affect sustainability.

Please respond to as many items as possible. If you truly feel you are not able to answer an item, you may select “NA.” **For each statement, select the number that best indicates the extent to which your program has or does the following things.**

Table D1-1. Engaged staff and leadership: having supportive frontline staff and management within the organization.

	To little or no extent						To a very great extent	Unable to answer
	1	2	3	4	5	6		
1. The program engages leadership and staff throughout the process.							NA	
2. Clinical champions of the program are recognized and respected.							NA	



3. The program has engaged, ongoing champions.	1	2	3	4	5	6	NA
4. The program has a leadership team made of multi-professional partnerships.	1	2	3	4	5	6	NA
5. The program has team-based collaboration and infrastructure.	1	2	3	4	5	6	NA

Table D1-2. Engaged stakeholders: having external support and engagement for the program.

	To little or no extent			To a very great extent			Unable to answer
1. The program engages the patient and family members as stakeholders.	1	2	3	4	5	6	NA
2. There is respect for all stakeholders involved in the program.	1	2	3	4	5	6	NA
3. The program is valued by a diverse set of stakeholders.	1	2	3	4	5	6	NA
4. The program engages other health care teams.	1	2	3	4	5	6	NA
5. The program team has the ability to respond to stakeholder feedback about the program.	1	2	3	4	5	6	NA

Table D1-3. Organizational readiness: having the internal support and resources needed to effectively manage the program.

	To little or no extent			To a very great extent			Unable to answer
1. Organizational systems are in place to support the various program needs.	1	2	3	4	5	6	NA
2. The program fits in well with the culture of the team.	1	2	3	4	5	6	NA
3. The program has feasible and sufficient resources (e.g., time, space, funding) to achieve its goals.	1	2	3	4	5	6	NA
4. The program has adequate staff to achieve its goals.	1	2	3	4	5	6	NA
5. The program is well integrated into the operations of the organization	1	2	3	4	5	6	NA

Table D1-4. Workflow integration: designing the program to fit into existing programs and technologies.

	To little or no extent		To a very great extent				Unable to answer
1. The program is built into the clinical workflow.	1	2	3	4	5	6	NA
2. The program is easy for clinicians to use.	1	2	3	4	5	6	NA
3. The program integrates well with established clinical programs.	1	2	3	4	5	6	NA
4. The program aligns well with other clinical systems (e.g., EMR).	1	2	3	4	5	6	NA
5. The program is designed to be used consistently.	1	2	3	4	5	6	NA

Table D1-5. Implementation and training: using processes that guide the direction, goals and strategies of the program.

	To little or no extent		To a very great extent				Unable to answer
1. The program clearly outlines roles and responsibilities for all staff.	1	2	3	4	5	6	NA
2. The reason for the program is clearly communicated to and understood by all staff.	1	2	3	4	5	6	NA
3. Staff receive ongoing coaching, feedback, and training.	1	2	3	4	5	6	NA
4. Program implementation is guided by feedback from stakeholders.	1	2	3	4	5	6	NA
5. The program has ongoing education across professions.	1	2	3	4	5	6	NA

Table D1-6. Monitoring and evaluation: assessing the program to inform planning and document results.

	To little or no extent		To a very great extent				Unable to answer
1. The program has measurable process components, outcomes, and metrics.	1	2	3	4	5	6	NA
2. Evaluation and monitoring of the program are reviewed on a consistent basis.	1	2	3	4	5	6	NA
3. The program has clear documentation to guide process and outcome evaluation.	1	2	3	4	5	6	NA

4. Program monitoring, evaluation, and outcomes data are routinely reported to the clinical care team.	1	2	3	4	5	6	NA
5. The program process components, outcomes, and metrics are easily assessed and audited.	1	2	3	4	5	6	NA

Table D1-7. Outcomes and effectiveness: understanding and measuring program outcomes and impact.

	To little or no extent		To a very great extent				Unable to answer
	1	2	3	4	5	6	
1. The program has evidence of beneficial outcomes.	1	2	3	4	5	6	NA
2. The program is associated with improvement in patient outcomes that are clinically meaningful.	1	2	3	4	5	6	NA
3. The program is clearly linked to positive health or clinical outcomes.	1	2	3	4	5	6	NA
4. The program is cost-effective.	1	2	3	4	5	6	NA
5. The program has clear advantages over alternatives.	1	2	3	4	5	6	NA

Is there anything else you feel is important to share with us regarding sustainability and your remote patient monitoring program? Please use the text box below:

[End of survey questions.]

Only complete surveys will be eligible for the draw. You will be redirected to another webpage at the end of the survey if you would like to participate in the draw to win 1 of 4, \$50 electronic gift cards to Shoppers Drug Mart, Indigo, OR Amazon Canada.

<<SUBMIT>>

[Next Page]

Thank you for completing the survey!

If you are interested in entering the draw to win 1 of 4, \$50 electronic gift cards to your choice of Shoppers Drug Mart, Indigo, OR Amazon Canada, please agree to leave your contact information. You will be redirected to another webpage if you would like to participate in this draw, otherwise, you may close the survey window to not participate in the draw. The draw will occur in late 2022 and winners will be contacted by email.

<< Yes, I agree to participate in the draw.>> CONTINUE TO NEXT PAGE

OR



<< No, I do not want to participate in the draw.>> Thank you for taking the time to participate in our survey!

[Next Page]

To enter in the draw, please leave your name and email address. You will be notified by email if you win. By entering your name and email address for the draw, you confirm that you will only submit ONE survey and will not submit more than ONE entry to this survey.

Name: _____

Email Address: _____

Thank you for taking the time to participate in our survey!

[End]



D2. CSAT SCORES OF THE SIX RCM SITES

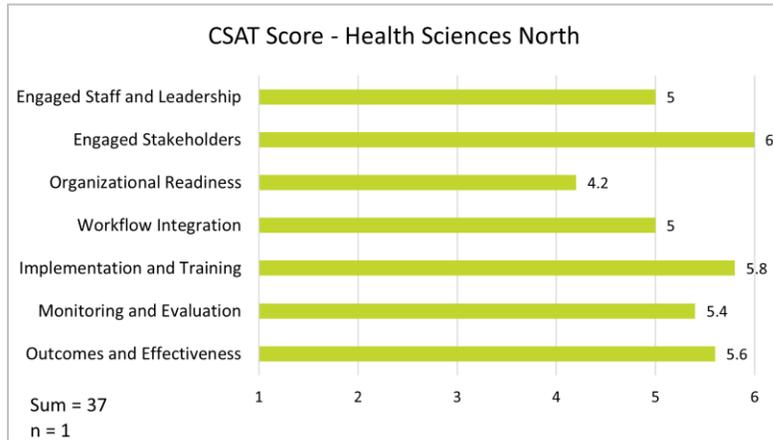


Figure D2-1. CSAT scores for each domain at HSN.



Figure D2-2. CSAT scores for each domain at MGH.

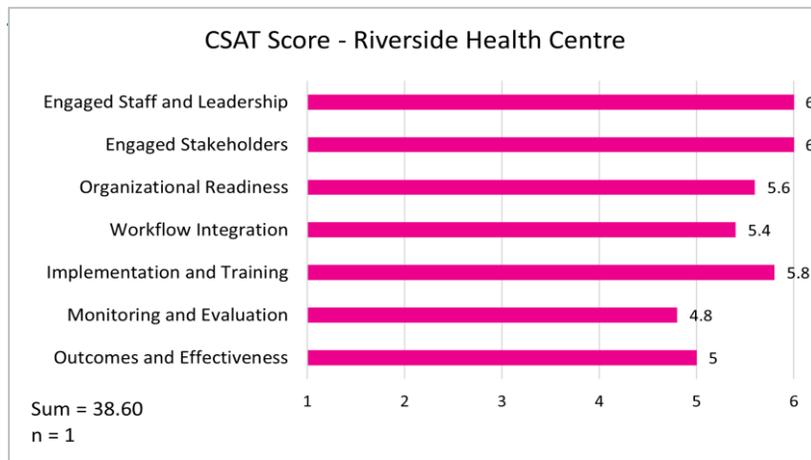


Figure D2-3. CSAT scores for each domain at RHC.

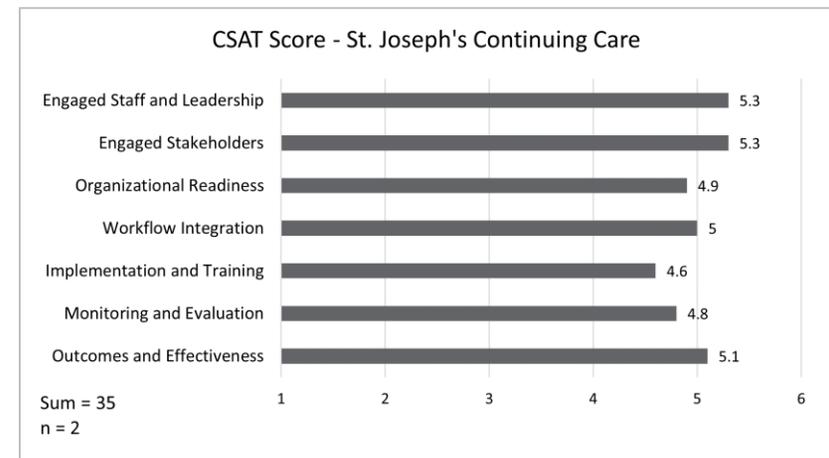
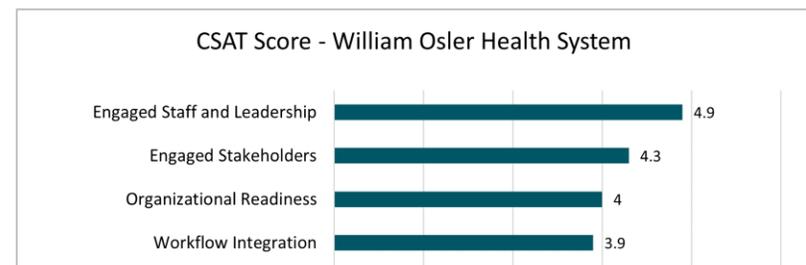


Figure D2-4. CSAT scores for each domain at SJCCC.





Appendix E: Key Informant Demographics

E1. PATIENT/CAREGIVER PARTICIPANTS

Table E1. Patient/caregiver participant characteristics.

Demographic Categories	n (%)
Birth Year	
1940 – 1949	3 (16.7%)
1950 – 1959	10 (55.6%)
1960 – 1969	2 (11.1%)
1970 – 1979	2 (11.1%)
1980 – 1989	0 (0%)
1990 – 1999	1 (5.6%)
Self-Identified Gender	
Man	3 (16.7%)
Woman	15 (83.3%)
Spoken Language	
English	18 (100%)
Racial Group (Multi-Select)	
White (European descent)	14 (77.8%)
Prefer to self-describe: Canadian	1 (5.6%)
Indigenous (First Nations, Métis, Inuit descent)	1 (5.6%)
Indigenous (First Nations, Métis, Inuit descent) and White (European descent)	1 (5.6%)
South Asian (e.g., East Indian, Pakistani, Bangladeshi, etc.)	1 (5.6%)
Highest Education	
College degree/diploma/certificate	5 (27.8%)
High school	6 (33.3%)
Professional degree (e.g., PhD, MD, JD, DDS, etc.)	3 (16.7%)
Undergraduate degree	2 (11.1%)
Trade or vocational diploma/certificate	1 (5.6%)
Primary or middle school	1 (5.6%)
Employment Situation (Multi-Select)	
Not currently working in labour force and retired	11 (61.1%)
Not currently working in labour force and other: on disability support	1 (5.6%)
Full time (30+ hours/week)	4 (22.2%)
Retired	1 (5.6%)
Self-employed and retired	1 (5.6%)
Housing Situation	
Apartment/house (Homeowner)	13 (72.2%)
Apartment/house (Tenant)	3 (16.7%)
Long term care home/assisted living facility	1 (5.6%)

Other	1 (5.6%)
Annual Household Income (Canadian Dollars)	
\$150,000+	4 (22.2%)
\$120,000 - \$149,999	2 (11.1%)
\$90,000 - \$119,999	2 (11.1%)
\$60,000 - \$89,999	2 (11.1%)
\$30,000 - \$59,999	2 (11.1%)
\$0 - \$29,999	2 (11.1%)
Do not know	3 (16.7%)
Prefer not to answer	1 (5.6%)
Community Size	
Urban centres (1 million people and over)	4 (22.2%)
Large population centres (100,000 to 999,999 people)	2 (11.1%)
Medium population centres (30,000 to 99,999 people)	1 (5.6%)
Small population centres (1,000 to 29,999 people)	6 (33.3%)
Rural (less 1,000 people)	1 (5.6%)
Prefer not to answer	2 (11.1%)
Do not know	1 (5.6%)
Missing	1 (5.6%)
Health Status	
Excellent	2 (11.1%)
Very good	2 (11.1%)
Good	9 (50%)
Fair	3 (16.7%)
Poor	1 (5.6%)
Prefer not to answer	1 (5.6%)
Experience with technology	
Expert	3 (16.7%)
Advanced	6 (33.3%)
Average	6 (33.3%)
Basic	3 (16.7%)
Internet Accessibility	
Yes	16 (88.9%)
Sometimes	2 (11.1%)
Device Accessibility	
Yes	12 (66.7%)
Missing	6 (33.3%)
Length of RCM Enrollment	
Less than a month	4 (22.2%)
1-3 months	11 (61.1%)
4-6 months	2 (11.1%)
Unknown (was put in program pre-op and post-op)	1 (5.6%)
Total Number of Respondents	N = 18

E2. ORGANIZATIONAL LEADER PARTICIPANTS

Table E2. Organizational leader participant characteristics.

Demographic Categories	n (%)
Birth Year	
1950 – 1959	1 (9.1%)
1960 – 1969	2 (18.2%)
1970 – 1979	4 (36.4%)
1980 – 1989	1 (9.1%)
1990 – 1999	2 (18.2%)
Prefer not to answer	1 (9.1%)
Self-Identified Gender	
Man	4 (36.4%)
Woman	7 (63.6%)
Spoken Language (Multi-select)	
English	7 (63.6%)
English and French	3 (27.3%)
English, French, Cantonese, and Mandarin	1 (9.1%)
Racial Group	
White (European descent)	8 (72.7%)
East Asian (Chinese, Korean, Japanese, Taiwanese descent)	1 (9.1%)
South Asian (e.g., East Indian, Pakistani, Bangladeshi, etc.)	1 (9.1%)
Prefer to self-describe	1 (9.1%)
Professional Designation	
Administrative Manager	5 (45.4%)
Registered Practical Nurse	2 (18.2%)
Registered Nurse	2 (18.2%)
Social Worker	1 (9.1%)
Other	1 (9.1%)
Years Working	
1 year or less	1 (9.1%)
2-5 years	4 (36.4%)
11-15 years	2 (18.2%)
16+ years	4 (36.4%)
RCM Site	
TGH	3 (27.3%)
HSN	1 (9.1%)
MGH	2 (18.2%)
WOHS	2 (18.2%)
SJCCC	2 (18.2%)

RHC	1 (9.1%)
RCM Condition Treated (Multi-select)	
Surgery	2 (18.2%)
COVID-19 infection	1 (9.1%)
Diabetes	1 (9.1%)
Other – older population living with frailty	2 (18.2%)
Multiple diseases treated (i.e., 3 – 5 conditions)	5 (45.4%)
Community Size	
Urban centres (1 million people and over)	6 (54.5%)
Large population centres (100,000 to 999,999 people)	2 (18.2%)
Medium population centres (30,000 to 99,999 people)	2 (18.2%)
Small population centres (1,000 to 29,999 people)	1 (9.1%)
RCM Involvement	
Full-time	6 (54.5%)
Part-time	4 (36.4%)
Other	1 (9.1%)
Duration of Care Delivery	
12+ months	10 (90.9%)
7-11 months	1 (9.1%)
Experience with Technology	
Expert	4 (36.4%)
Advanced	6 (54.5%)
Average	1 (9.1%)
Total Number of Respondents	N = 11

E3. HEALTH SERVICE PROVIDER/ONTARIO HEALTH TEAM PARTICIPANTS

Table E3. HSP/OHT participant characteristics.

Demographic Categories	n (%)
Age	
1960 – 1969	2 (12.5%)
1970 – 1979	3 (18.8%)
1980 – 1989	5 (31.2%)
1990 – 2000	4 (25.0%)
Prefer not to answer	2 (12.5%)
Self-Identified Gender	
Man	1 (6.2%)
Woman	15 (93.8%)
Spoken Language (Multi-select)	
English	12 (75%)
English and French	3 (18.8%)

English and Punjabi	1 (6.2%)
Racial Group (Multi-select)	
White (European descent)	11 (68.8%)
Indigenous (First Nations, Métis, Inuit descent)	1 (6.2%)
South Asian (e.g., East Indian, Pakistani, Bangladeshi, etc.)	1 (6.2%)
Black (African, Afro-Caribbean, African-Canadian descent)	1 (6.2%)
White (European descent) and Black (African, Afro-Caribbean, African-Canadian descent)	1 (6.2%)
White (European descent) and Indigenous (First Nations, Métis, Inuit descent)	1 (6.2%)
Professional Designation	
Administrative Manager	1 (6.2%)
Registered Practical Nurse	2 (12.5%)
Registered Nurse	6 (37.5%)
Social Worker	3 (18.8%)
Nurse Practitioner	1 (6.2%)
Other	3 (18.8%)
Years Working	
1 year or less	1 (6.2%)
2-5 years	3 (18.8%)
6-10 years	2 (12.5%)
11-15 years	3 (18.8%)
16+ years	7 (43.7%)
RCM Site	
TGHC	1 (6.2%)
HSN	3 (18.8%)
MGH	2 (12.5%)
WOHS	3 (18.8%)
SJCCC	4 (25.0%)
RHC	3 (18.8%)
RCM Condition Treated (Multi-select)	
Surgery	5 (31.2%)
Diabetes	3 (18.8%)
Other – older population living with frailty	2 (12.5%)
Multiple diseases treated (i.e., 2 – 6 conditions)	6 (37.5%)
Community Size (Multi-select)	
Urban centre (1 million people and over)	2 (12.5%)
Large population centre (100,000 to 999,999 people)	3 (18.8%)
Medium population centre (30,000 to 99,999 people)	6 (37.5%)
Small population centre (1,000 to 29,999 people)	3 (18.8%)
Do not know	2 (12.5%)

RCM Involvement	
Full-time	5 (31.2%)
Part-time	4 (25.0%)
Other	6 (37.5%)
Prefer not to answer	1 (6.2%)
Duration of Care Delivery	
12+ months	11 (68.8%)
7-11 months	5 (31.2%)
Experience with Technology	
Expert	1 (6.2%)
Advanced	12 (75.0%)
Average	3 (18.8%)
Total Number of Respondents	N = 16

Appendix F: Environmental Scan for Surgical Transitions

F1. SEARCH STRATEGY FOR SURGICAL TRANSITIONS RCM PROGRAMS

Table F1-1. Parameters of the surgical transitions search criteria.

Intervention	Remote monitoring, including related and overlapping terms like telemonitoring, telemedicine, mHealth, apps, eHealth, virtual care
Populations	Surgical transitions
Study Type	Peer-reviewed publications on local, national, and international projects that focus on questions related to technology-enabled RCM programs
Timeframe	Published between 2017-2022
Language	English only
Databases	Embase and Ovid Medline

Table F1-2. Parameters of the surgical transitions search syntax for Embase.

#	Searches	Results
1	teleconsultation/ or telemedicine/ or electronic consultation/	52453
2	remote sensing/	13273
3	((computer or distance or internet or phone or online or remote or tele* or video or virtual or web) adj2 (assess* or manag* or monitor*)).tw,kf.	44391
4	(remot* adj3 (monitor* or consult*)).tw,kf.	11450
5	(teleassess* or teleconsult* or telemonit* or wireless tech*).tw,kf.	6803
6	((eConsult* or e-consult* or eHealth* or e-Health* or einterv* or e-interv* or etherap* or e-therap* or mHealth* or m-Health* or mobile health* or Mobile application* or smart device or smart phone or smartphone) and (monitor* or assess*)).tw,kf.	23603
7	(mobile application/ or mobile health application/) and (monitor* or assess*).tw,kf.	10069
8	physiologic monitoring/	6748
9	or/1-8 [remote monitoring]	133911
10	self care/ or self medication/ or self-testing/	83797
11	(self report* or patient reported).tw,kf.	338534
12	(Self adj3 (care or administer* or exam* or medicat* or monitor* or inject* or test* or adjust* or evaluat* or measur* or manag* or report*)).tw,kf.	450627
13	(home adj3 (care or medicat* or monitor* or test* or adjust* or manag* or recovery)).tw,kf.	68727
14	(patient adj3 (adjust* or measur* or manag* or control* or participation* or reported)).tw,kf.	301114
15	or/10-14 [self monitoring]	817216
16	9 or 15 [SM RM]	930710
17	postoperative complication/	415816
18	perioperative period/ or enhanced recovery after surgery/	63833
19	peroperative care/	14600
20	postoperative care/	110769
21	preoperative exercise/	843
22	(post operati* or postoperati* or preoperati* or pre operati* or post surg* or postsurg* or pre surg* or presurg* or post transplant* or pre transplant* or perioperative*).tw,kf.	1498924
23	((after or before or prior or following) adj3 (operati* or surg* or transplant*)).tw,kf.	1049922

24	or/17-23 [pre/post surgery/operative]	2315442
25	bariatric surgery/ or biliopancreatic bypass/ or gastric banding/ or sleeve gastrectomy/ or laparoscopic sleeve gastrectomy/	53866
26	(Sleeve Gastrectomy or Roux-en-Y Gastric Bypass or Gastric Bypass or Laparoscopic Roux-Y gastric bypass or LRYGB or Adjustable Gastric Band* or Biliopancreatic Diversion with Duodenal Switch or biliopancreatic bypass or Single Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy or Laparoscopic sleeve gastrectomy or LGS or Bariatric Surgical Procedure* or Metabolic Surger* or Stomach Stapling).tw,kf.	42098
27	(bariatric surger* or gastric bypass or gastroplasty or jejunoileal bypass or lipectomy or Roux-en-Y).tw,kf.	62773
28	or/25-27 [bariatric]	80760
29	24 and 28 [Bariatric and post/pre operative]	47448
30	anterior cruciate ligament reconstruction/	14384
31	knee replacement/ or knee arthroplasty/ or total knee arthroplasty/	38688
32	hip replacement/ or hip arthroplasty/ or hip hemiarthroplasty/ or total hip replacement/	33882
33	((ACL or anterior cruciate ligament) adj4 (reconstruction* or repair* or graft or surger* or operation*)).tw,kf.	18823
34	(THA or TKA).tw,kf.	32618
35	(knee adj4 (replacement or reconstruction* or repair* or graft or arthroplasty)).tw,kf.	52645
36	((knee replacement or knee arthroplasty) adj4 (surger* or operation*)).tw,kf.	4223
37	(hip adj4 (replacement or reconstruction* or repair* or graft or arthroplasty)).tw,kf.	55772
38	((hip replacement or hip arthroplasty or THA) adj4 (surger* or operation*)).tw,kf.	4284
39	or/30-38 [Top Ortho Surg]	135432
40	24 and 39 [post/pre Ortho surg]	66339
41	16 and 29	1946
42	16 and 40	6552
43	41 or 42	8481
44	limit 43 to (english and last 5 years)	4878

Table F1-3. Parameters of the surgical transitions search syntax for Medline.

#	Searches	Results
1	Remote Consultation/ or Telemedicine/ or Remote Sensing Technology/	43524
2	((computer or distance or internet or phone or online or remote or tele* or video or virtual or web) adj2 (assess* or manag* or monitor*)).tw,kf.	29988
3	(remot* adj3 (monitor* or consult*)).tw,kf.	7517
4	(teleassess* or teleconsult* or telemonit* or wireless tech*).tw,kf.	5005
5	((eConsult* or e-consult* or eHealth* or e-Health* or einterv* or e-interv* or etherap* or e-therap* or mHealth* or m-Health* or mobile health* or Mobile application* or smart device or smart phone or smartphone) and (monitor* or assess*)).tw,kf.	19145
6	Mobile Applications/ and (monitor* or assess*).tw,kf.	4931
7	Monitoring, Physiologic/	58389
8	or/1-7 [remote monitoring]	143378
9	self care/	35677
10	Self-Management/ or self-testing/	5286

11	(self report* or patient reported).tw,kf.	242470
12	(Self adj3 (care or administer* or exam* or medicat* or monitor* or inject* or test* or adjust* or evaluat* or measur* or manag* or report*)).tw,kf.	340930
13	(home adj3 (care or medicat* or monitor* or test* or adjust* or manag* or recovery)).tw,kf.	49588
14	(patient adj3 (adjust* or measur* or manag* or control* or participation* or reported)).tw,kf.	183034
15	or/9-14 [self monitoring]	571006
16	8 or 15 [RM or SM]	697607
17	Postoperative Complications/	395695
18	perioperative care/ or intraoperative care/ or postoperative care/ or preoperative exercise/ or enhanced recovery after surgery/	93164
19	(post operati* or postoperati* or preoperati* or pre operati* or post surg* or postsurg* or pre surg* or presurg* or post transplant* or pre transplant* or perioperative*).tw,kf.	1019361
20	((after or before or prior or following) adj3 (operati* or surg* or transplant*)).tw,kf.	694020
21	Surgical Procedures, Operative/	56788
22	or/17-21 [pre/post surgery/operative]	1675009
23	bariatric surgery/ or gastric bypass/ or gastroplasty/ or jejunioleal bypass/ or lipectomy/	32147
24	(Sleeve Gastrectomy or Roux-en-Y Gastric Bypass or Gastric Bypass or Laparoscopic Roux-Y gastric bypass or LRYGB or Adjustable Gastric Band* or Biliopancreatic Diversion with Duodenal Switch or biliopancreatic bypass or Single Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy or Laparoscopic sleeve gastrectomy or LGS or Bariatric Surgical Procedure* or Metabolic Surger* or Stomach Stapling).tw,kf.	22649
25	(bariatric surger* or gastric bypass or gastroplasty or jejunioleal bypass or lipectomy or Roux-en-Y).tw,kf.	36291
26	or/23-25 [bariatric]	49449
27	22 and 26 [Bariatric and post/pre operative]	27676
28	anterior cruciate ligament reconstruction/ or Arthroplasty, Replacement, Knee/ or Arthroplasty, Replacement, Hip/	63386
29	Knee Joint/ and Arthroscopy/	4899
30	((ACL or anterior cruciate ligament) adj4 (reconstruction* or repair* or graft or surger* or operation*)).tw,kf.	15300
31	(THA or TKA).tw,kf.	27445
32	(knee adj4 (replacement or reconstruction* or repair* or graft or arthroplasty)).tw,kf.	42202
33	((knee replacement or knee arthroplasty) adj4 (surger* or operation*)).tw,kf.	2872
34	(hip adj4 (replacement or reconstruction* or repair* or graft or arthroplasty)).tw,kf.	44699
35	((hip replacement or hip arthroplasty or THA) adj4 (surger* or operation*)).tw,kf.	3053
36	or/28-35 [Top Ortho Surg]	110037
37	22 and 36 [post/pre Ortho surg]	56140
38	16 and 27	1102
39	16 and 37	5200
40	38 or 39	6293
41	limit 40 to (english and last 5 years)	3725

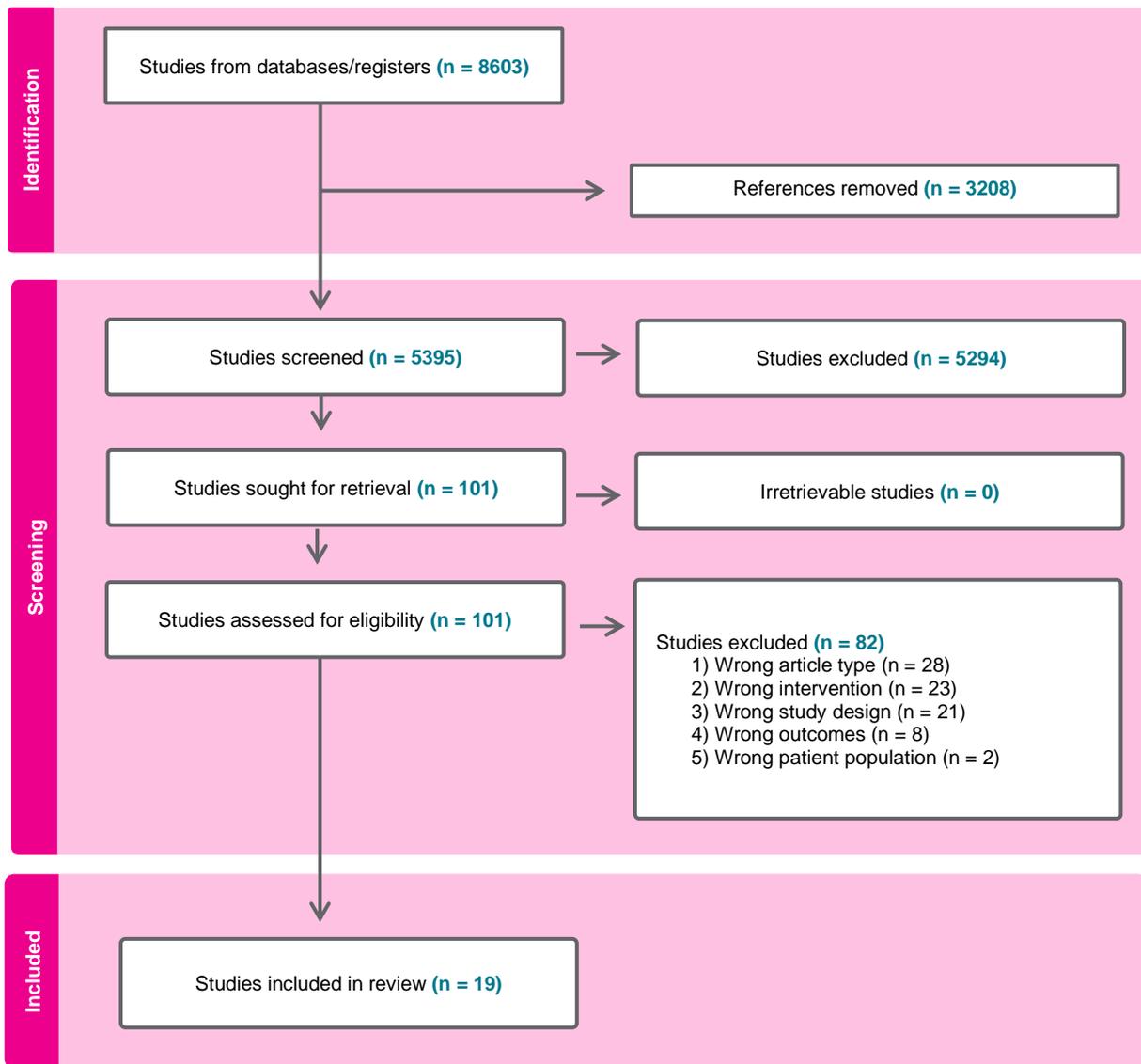


Figure F1. PRISMA flow diagram for the surgical transitions environmental scan.

F2. ENVIRONMENTAL SCAN RESULTS FOR SURGICAL TRANSITIONS RCM PROGRAMS

Table F2-1. Descriptive data of the surgical transition articles.

Study Description							
	Author (Year)	Country	Study Design/ Method	Program Description	Patient Population	Program Size (Number of Patients)	LOS
1	Higgins (2020)	Canada	Single-centre, open, controlled, two-arm parallel group randomized controlled clinical trial.	Compared mobile app versus conventional follow-up care in the first six weeks after ACL reconstruction. Only post-operative intervention. The QoC Health Mobile App was developed by QoC Health (Toronto). The app was used by patients to respond to questions regarding function, complete visual analog score for pain, and Quality of Recovery surveys.	ACL	72	6 weeks
2	Lyman (2020)	Canada	Pre- and post-operative daily steps were recorded in prospectively enrolled patients via an app, which uses the phone's accelerometer.	Investigates the feasibility of using mobile technology to collect daily step data and biweekly PROMs to track recovery after total joint arthroplasty.	Joint arthroplasty – total joint arthroplasty (hip) (THA) and total joint arthroplasty (hip) (TKA)	128 THA, 139 TKA	2 weeks (pre-operative) and at least 6 months (post-operative)
3	Arnaert (2022)	Canada	Qualitative description design: Semi-structured interviews thematically analyzed using the standards of reporting qualitative research checklist.	Post-surgical management, monitoring, support, and aftercare using a telemonitoring platform. Platform is a cloud-based app with secure high-quality videoconferencing and remote physiological monitoring capabilities.	Bariatric surgery	22 patients interviewed	6 weeks
4	Carandina (2019)	France	Prospective pilot study.	Post-operative monitoring via connected devices. Vital signs such as blood	Bariatric surgery	100	15 days

				pressure, heart rate, peripheral capillary oxygen saturation, and temperature were monitored via connected devices with data sent to an internet platform to make them immediately viewable by the surgeon.			
5	Cooper (2022)	United Kingdom	Prospective, observational single-arm feasibility study.	Remote monitoring for pre- and post-operative physical therapy (PT) for knee arthroplasties.	Knee replacement surgery	21	9 weeks
6	Crawford (2021)	USA	Multi-centre prospective randomized controlled trial comparing standard of care rehabilitation to smartphone-based care.	Pre-operative educational content and instructions, along with post-operative educational material and an at-home app-based therapy programme. The app provided patients reminders to complete their educational and exercise modules. The exercise modules consisted of six to eight exercises, performed three times per day.	TKA and partial knee arthroplasty	208	6 weeks
7	Crawford (2021)	USA	Multi-centre prospective randomized controlled trial comparing standard of care to smartphone-based care. Evaluate the early outcomes with the use of a smartphone-based exercise and educational care management system after primary THA compared with a standard of care control group (n = 198). The current study was phase II of a three-phase clinical trial. Phase I involved the pilot and time cohort, while phase III began the non-randomized correlative cohort.	Smartphone-based exercise and educational care management system. Mymobility system provided patients with pre-operative educational and exercise content along with post-operative educational material and an at-home app-based therapy programme. The app provided patients with reminders to complete their educational and exercise modules. Exercise modules consisted of six to eight exercises, performed three times per day, six days per week for six weeks post-operatively.	THA	167	6 weeks
8	Scheper (2019)	Netherlands	Prospective cohort study for 30 post-operative days.	Investigates the ease of use and perceived usefulness of using a	Joint arthroplasty	69	30 days

				wound care app. Patients scored their surgical wound for 20 days post-operative by daily answering questions in app. Built-in algorithm advised patients to contact their physician if needed.			
9	Wang (2018)	China	Experimental design to evaluate the effect of an Internet-based orthopaedic care platform on patients' function joint recovery, quality of life and activities of daily living after hip replacement.	Intervention on patients was performed via internet-based orthopaedic care platform post-operative.	Hip replacement	389	6 months
10	Yang (2018)	Canada	Prospective observational study of patients undergoing elective primary hip or knee replacements.	To demonstrate the feasibility of wireless home monitoring after elective primary hip or knee replacements with a primary feasibility target of >90% successful transmission of blood pressure levels, heart rate, and oxygen saturation levels and to collect until post-operative day four. Secondary outcomes include patient satisfaction.	Hip or knee replacements	54	4 days
11	Mouli (2021)	United States	Single-institution, single-arm experimental pilot study.	To utilize digital monitoring to evaluate the usability and satisfaction of a wireless blood pressure and heart rate monitor and to determine whether the data can enable safe mobilization at home same day discharge (SDD) joint replacements.	Knee arthroplasty, TKA or THA	23	1 day (morning after SDD)
12	Grubbs (2022)	United States	Retrospective observational study	Pre-operative - pulse oximeter, education and when to call; post-operative - six hours in post-anaesthesia care unit (PACU), vitals. At home - pulse oximeter every 2 hours, medical doctor call. Next day - vitals, lab, 2 litres of fluid.	Bariatric surgery	89	Average - 0.48 days
13	Mehta (2020)	United States	Randomized clinical trial 242 patients were analyzed (124 usual care, 118 interventions 81.4% in	Activity monitoring and bi-directional text messaging.	Hip and knee arthroplasty	96	Baseline - 2 weeks

			the intervention arm agreed to receive monitoring).	Remote monitoring was offered before surgery, began at hospital discharge, and continued for 45 days post discharge. Patients assigned to receive monitoring were further randomized evenly to remote monitoring alone or remote monitoring with gamification and social support.			End of study - 6 weeks
14	Nijland (2021)	Netherlands	Single-centre prospective feasibility study.	Remotely monitored after surgery for 48 hours.	Laparoscopic Roux-en-Y Gastric Bypass	50	48 hours
15	Zhang (2019)	United States	Retrospective review of 1434 hip and knee arthroplasty patients who registered for an online platform in the perioperative period.	To evaluate the use of an online image messaging platform for remote monitoring of surgical incision sites. Both pre- and post-operatively.	Hip and knee arthroplasty	1434	Up to 90 days post-operative (no specific timeline indicated for study)
16	Tripuraneni (2021)	United States	Prospective, randomized, multicentre, clinical controlled trial.	Post-operative self-directed rehabilitation program. 3 groups were examined: (1) control group - formal PT (n = 184), (2) high exercise compliance group (n = 90), (3) low exercise compliance group (n = 63). Mymobility platform = patient-physician web-based interface that reports various data points and provides a messaging option. Patients download Mymobility and received daily reminders on their smartwatch, Apple Watch, for completion of PROMs and PT routines.	TKA	153	8 weeks

				Two-week pre-operative exercise regimen followed by a six-week post-operative exercise regimen, whereby the physician is able to choose between two intensity options of the exercise program.			
17	Summers (2022)	United States	<p>Retrospective review - included the six months before and six months after the transition of the new home-based, clinician-controlled therapy system (HCTS) post-operative protocol.</p> <p>Standard therapy protocol ((STP), 'control group', n = 135) & HCTS group ('treatment group', n = 135).</p> <p>Pre-operatively, all patients were provided with the same info brochure with the following pre-rehabilitation exercises to be performed at home (unsupervised).</p> <p>Post-operative in-hospital therapy protocols were the same for both groups.</p> <p>STP group: Four weeks in-person, outpatient therapy sessions two to three times per week, taking place within the surgeon's own therapy centre adjacent to his clinic and staffed by three certified physical therapists as well as four therapy assistants.</p> <p>Clinically relevant improvements above the minimal clinically important difference (MCID) in pain and patient-reported</p>	<p>Supervised (clinician-controlled), in-home rehabilitation protocol using a novel, multi-modal, evaluation and PT device with variable arc adjustment and remote intervention capability.</p> <p>HCTS group: in-home, electro-mechanical therapy device utilized as an interactive touchscreen which prompted each patient to participate in multiple PT sessions per day.</p>	TKA	135	3 to 6 weeks

			functional scores were seen at all time points.				
18	Pronk (2020)	Netherlands	Unblinded, randomized, controlled, single-centre trial.	Investigate the effects of the Pain Coach app on pain control and opiate use in patients who underwent total knee replacement during the first two weeks at home after surgery.	TKA	97	2 weeks (pre-operative) and 1 month (post-operative)
19	Zhang (2022)	China	Randomized controlled trial was used to select elderly patients with osteoporotic hip fractures, including femoral neck fractures and ischiofemoral space, who were hospitalized in the Department of Hip Trauma.	Investigate the effects of home-based telerehabilitation based on the internet-based rehabilitation management system on hip function, activities of daily living, and somatic integrative ability of elderly post-operative hip fracture patients.	Hip replacement	58	5 months

Table F2-2. Outcome data of the surgical transition articles.

Outcomes (Quintuple Aim)						
	Author (Year)	Clinical Impact	Cost-effective/Cost Implications	Equity Aspects	Patient/Caregivers Experiences	Provider Experiences
1	Higgins (2020)	No statistical differences in any clinical outcomes (pain scores, limb-specific monitoring questions or physiotherapy range of motion (ROM) measurement).	Costs incurred by the health care system and patient costs per person were significantly greater in the conventional group than the intervention group.	<p>Inclusion criteria: patients who were competent using mobile devices and spoke English.</p> <p>Exclusion criteria: Patients with a history of chronic pain, taking narcotic medications regularly, or had an allergy to local anesthetics/narcotic-type medication.</p>	<p>No statistically significant difference in satisfaction scores between groups. However, satisfaction was high (either excellent or good).</p> <p>Found that patients were more actively involved in their own care and recovery by actively using the app. Improved adherence to medications and rehabilitation protocols, as well as lower readmission rates and ED visits.</p>	Less time consuming for surgeons, as it typically takes less than five minutes to respond to patient's results.

2	Lyman (2020)	Recovery occurred earlier than expected. Patients more likely to achieve pre-operative steps earlier after THA than after TKA. Recovery was faster in THA patients than in TKA patients. Most of the improvements in pain scores and recovery of steps occurred within the first 30 days in TKA and 50 days in TKA.	Not specified.	Some patients mentioned that they had privacy concerns with this technology.	Not specified.	Not specified.
3	Arnaert (2022)	Interview themes: 1. Readiness to embrace digital health, 2. Relief of burden to traditional care - a common benefit reported by 17 participants was to mitigate trips to the hospital for their follow-up appointments, 3. Access to immediate follow-up care - timely access and evidence-based answers from a HSP was another considerable benefit, 4. Psychosocial benefits.	17 participants noted that they avoided heavy traffic, travel expenses and loss of workdays. "It saved a lot of money and a lot of headaches, because I had to hire someone to drive us [to in-person appointments]." Other expenses [for in-person appointments] include the cost of gas, parking fees and the cost of accommodations specific to those living further away.	A tablet was provided if the patient did not have a device, or their computer was outdated. Blood pressure machines were provided to patients. One week before the surgery the tele-nurse scheduled an appointment (in person or telephone) to install and educate the patient on how to use the platform on a mobile device or desktop computer. Although 9/22 participants had limited computer skills, they all appreciated the time the tele-nurse took to provide a comprehensive overview of the tele-monitoring platform in all its functions. "I was happy to be able to	Overall positive.	Not specified.

				do this in the comfort of my home, instead of going to Montreal each time. For many living in remote areas, accessibility to the hospital is difficult."		
4	Carandina (2019)	Three patients were re-hospitalized during the first 15 days after the surgery (3.1%).	Not specified.	<p>Patients completed a form concerning the degree of their familiarity with the internet, presence of a home internet connection, possession of an email address, and presence of one of the following three conditions: computer and smartphone, smartphone and tablet, or computer and tablet. To reduce the risk of data loss owing to connection problems or malfunction of the only available device, patients without at least one of these pairs of devices were excluded.</p> <p>Each patient received three connected devices: wireless brachial cuff, pulse oximeter, an electronic scale.</p> <p>A nurse went to the patient's home to ensure good instrument connection.</p>	<p>95% of patients felt well informed when they left the hospital.</p> <p>92% of patients felt safe when they returned home, and in 83.5% of cases the first 2 nights went well.</p> <p>92% of patients would recommend this way of managing the post-operative period.</p>	Not specified.
5	Cooper (2022)	35.7% reduction in face-to-face physiotherapy appointments compared with standard practice.	Not specified.	Recruited participants were provided with the sensor, application, and training during pre-operative joint school.	>80% of users who completed the feedback questionnaire reported a positive experience using the device, finding it easy	BPM pathway communication features were well utilized by both participants and clinicians

		<p>The rate of participant compliance with exercises using the device was 32.3% for thrice-daily compliance and 52.4% for once-daily compliance.</p> <p>Positive correlation between patient compliance and the degree of improvement in patient ROM.</p>			<p>to understand and reporting that it motivated them to perform their exercises.</p> <p>The vast majority of participants who completed the questionnaire stated that they enjoyed using the device, were able to use it independently, and were motivated to continue with their rehabilitation.</p>	<p>to engage in discussions regarding rehabilitation.</p>
6	Crawford (2021)	<p>There were no significant differences between groups in post-operative urgent care visits, or readmissions within 90 days, with significantly fewer ED visits in the treatment group (16 (8.2%) vs five (2.5%), $p = 0.014$).</p> <p>The use of the smartwatch/smartphone care platform demonstrated non inferiority of clinically significant outcomes to traditional care models, while requiring significantly less post-operative physiotherapy and fewer ED visits.</p> <p>Use of the smartphone-based care platform resulted in no significant difference in post-</p>	<p>This platform could aid in decreasing post-operative costs.</p>	<p>Patients were provided with a smartwatch and smartphone application.</p> <p>Patients enrolled to either treatment or control group were required to possess an Apple iPhone capable of pairing with the Apple Watch and were required to be mobile with no more than a single walking stick/single crutch for assistance pre-operatively.</p>	<p>Not specified.</p>	<p>Not specified.</p>

		operative knee range of motion, clinically significant patient reported outcomes, post-acute care requirements for hospital visits, or urgent care visits, while demonstrating a significant decrease in physiotherapy visits and ED visits.				
7	Crawford (2021)	Post-operative PT use was significantly lower in the treatment group (34%) than in the control group (55.4%; $p = 0.001$). There were no statistically significant differences in complications, readmissions, or outpatient visits. The 90-day outcomes showed no significant differences in mean hip flexion between controls (101° (SD 10.8)) and treatment (100° (SD 11.3); $p = 0.507$) groups. The Hip Disability and Osteoarthritis Outcome Score, Joint Replacement (HOOS, JR) were not significantly different between control group (73 points (SD 13.8)) and treatment group (73.6 points (SD 13); $p = 0.660$). Mean 30-day Single Leg Stance time was 22.9 seconds (SD 19.8) in the control group and 20.7 seconds (SD	Could potentially reduce overall health care costs.	Patients were provided with a smartwatch and smartphone application. Patients must have an iPhone capable of pairing with the Apple Watch and were required to be mobile with no more than assistance from a single walking stick/single crutch pre-operatively.	This technology allows patients to rehabilitate on a more flexible schedule and avoid unnecessary health care visits. No clinically significant differences in patient-reported outcomes.	Not specified.

		<p>19.5) in the treatment group ($p = 0.342$). Mean Timed Up to Go test time was 11.8 seconds (SD 5.1) for the control group and 11.9 (SD 5) seconds for the treatment group ($p = 0.859$).</p> <p>The use of the smartphone care management system demonstrated noninferior early clinical outcomes to traditional care pathways, along with a significant decrease in PT use while using significantly less post-operative health care resources. Noninferiority was demonstrated with regard to complications, readmissions, and ED and urgent care visits.</p>				
8	Scheper (2019)	Not specified.	Cost of revision surgery for one patient is about the same as the costs for the development of the app. App may be cost-effective by preventing diagnostic delays, however it needs larger studies to be done to show cost-effectiveness.	Must have access to their own personal device (not equipped).	High perceived usefulness and ease of use. Patients felt engaged with their health and with the care provided by the hospital. Involvement was consistent during the use of the app. More patient involvement in their treatment.	Not specified.
9	Wang (2018)	Physiological quality of life functions (physical functioning, role-physical, bodily pain, general health, vitality) were improved. Hip function scores were higher after intervention.	Not specified.	Must have smartphone with easy access to internet.	This intervention allows nurses to use their fragmented time to communicate with patients quickly and more efficiently due to their large amount of clinical and management work.	Not specified.

10	Yang (2018)	Not specified.	Not specified.	Not specified.	Patients expressed that this program allows for clear communication and a safety net.	Not specified.
11	Mouli (2021)	Five patients measured low blood pressure and high heart rate and hypotensive symptoms and received virtual guidance. For their second set of readings, all patients showed resolution of their hypotensive symptoms and second readings.	Holds promise in decreasing financial costs associated with inpatient, post-operative care.	Patients were provided with a Body Trace blood pressure/heart rate monitor in the PACU. A member of the research team also provided detailed written and verbal instructions during the enrollment process and again in PACU prior to discharge to guide the patient through the instructions.	Ease of use had a mean satisfaction of 8.94/10 where 10 represented perfectly satisfied. Mean rating for belief in the protocol improving patient safety was 8.35/10.	Not specified.
12	Grubbs (2022)	80 of 89 patients (89.8%) were successfully discharged on the post-operative day, 0.3 patients were readmitted within 30 days. Zero deaths and no morbidity that would have been prevented with post-operative admission. No patient comorbidities were associated with greater LOS. There was a significant difference in readmission rates between the group who was discharged on the post-operative day, 0 (n = 2, 2.5%) and those who were admitted post-operatively (n = 1, 11.1%) (p = 0.026).	Not specified.	Physiological devices were given to patients.	Not specified.	Not specified.

		Higher readmission rate among patients who were not discharged home on the same day.				
13	Mehta (2020)	<p>No difference in the rate of discharge to home between usual care arm (57.3%; 95%CI, 48.5%-65.9%) and intervention arm (56.8%; 95%CI, 47.9%-65.7%).</p> <p>There was a mean increase in daily step count of 833 (SD = 177) in both groups combined from week 2 to week 6, but there was no significant difference between the gamification and social support arm (arm 2b) compared with feedback alone (arm 2a).</p> <p>There was a statistically significant reduction in rehospitalization rate in the intervention arm (3.4%; 95%CI, 0.1%-6.7%) compared with the usual care arm (12.2%; 95% CI, 6.4%-18.0%) (P = .01), as well as a reduction in the mean number of rehospitalizations (4.2 vs 13.0; P = .02).</p> <p>There were no differences in hospital LOS, number</p>	Not specified.	<p>Patients in the intervention arms received an activity monitor, and if needed, a smartphone for texting and syncing their monitor to the Way to Health platform.</p> <p>These devices were either mailed to the patient for self-setup or set up in person after surgery at the hospital, depending on the patient's comfort level with technology.</p> <p>The intervention was offered to patients remotely in their homes or a facility after discharge.</p>	<p>Of the 96 patients receiving monitoring, 55 (57%) completed the post-intervention survey. On a scale of 1 to 10 (1 = extremely unlikely, 10 = extremely likely), participants expressed a mean score of 8.8 (SD = 2.1) in describing the likelihood of recommending the RCM program to other patients undergoing joint replacement surgery and 85% reported a score of 8 or higher.</p> <p>Participants also agreed that the program made them feel more connected to the care team (71% strongly agreed or agreed) and more comfortable going home (64% strongly agreed or agreed).</p>	Not specified.

		<p>of days at home, number of office visits, number of ED visits, or Timed Up to Go scores post-surgery between arms.</p> <p>Activity monitoring and text messaging program did not increase the rate of discharge to home after hip and knee arthroplasty but was associated with a reduction in rehospitalizations. Activity levels were modest after hospital discharge, and gamification with social support did not significantly increase step count.</p>				
14	Nijland (2021)	<p>SDD success rate of 88% (44/50 patients) was achieved. 5 patients (10%) presented at the ED, 2 of whom (4%) were readmitted because of a complication within 30 days after surgery. Overall, patients who followed the SDD protocol reported high satisfaction scores.</p>	<p>The value and cost-effectiveness of remote monitoring in this particular group should be addressed in order to assess if it is scalable.</p>	<p>Both the patient application and medical devices were purchased by the bariatric centre without funding and patients were loaned the devices.</p>	<p>Most patients would recommend this way of treatment to others.</p>	<p>Not specified.</p>
15	Zhang (2019)	<p>90 patient cases in the study cohort were linked to a total of 104 ED visits and hospitalizations related to the patients' orthopedic procedure in the first 90 days post-surgery. Over half (57%) of the visits occurred during the first 3 weeks.</p>	<p>Upfront costs may or may not be offset by downstream cost savings - more research needed. However, granting patients real-time access to their surgical team may result in more prompt management of wound problems that helps</p>	<p>Must have smartphone with easy access to internet. No indication that this was provided.</p>	<p>Older adult patients are willing to and can successfully use mHealth applications. However, more work can be done to improve patient engagement, especially with older patients.</p>	<p>Providers were willing to base treatment decisions on photographic findings.</p>

		There were no substantial differences in platform log-in rate between patients who went to the hospital and who did not (68% vs. 69%, P $\frac{1}{4}$.87).	prevent development of additional complications requiring reoperation and additional costly hospitalizations.			
16	Tripuraneni (2021)	HOOS, JR score was statistically lower in the low-compliance group in net change from pre-operative scores at 3 months (P $\frac{1}{4}$.046) and 6 months (P $\frac{1}{4}$.032) than that in the control group; difference was noted at 6 months for the high-compliance group, P $\frac{1}{4}$.036. However, these did not meet the threshold of 8.02 units for HOOS, JR minimal clinically important difference. No differences were seen in PROMs at other time intervals and in manipulation rates or ROM. Post-operative outcomes including manipulation under anesthesia, ROM, and PROMs were not different when a smartwatch paired with a self-directed PT mobile application was compared with traditional formal PT.	Not specified.	Each study patient was provided with a smartwatch; all control patients did not have any digital trackers. Inclusion criteria owns an iPhone and independently mobile without the need for a gait aid more than a single cane or crutch. Exclusion criteria: current drug/alcohol abusers, members of a protected population such as prisoners and mentally incompetent, patients with systemic inflammatory arthropathies.	Not specified.	Not specified.
17	Summers (2022)	Post-operative knee ROM was greater in the HCTS group at all time points throughout the study period (P < .001 at 2, 6,	Not specified.	Electro-mechanical therapy device was delivered directly to the patients' house.	Not specified.	Not specified.

		<p>and 12 weeks). Visual analog scale and the HOOS, JR functional scores were statistically better ($P < .001$) in the HCTS group at all time points and exceeded the threshold for MCID for both visual analog scale and HOOS JR. There were significantly fewer cases of arthrofibrosis requiring manipulation under anesthesia in the HCTS group (1.48 versus 4.44%).</p> <p>In-home rehabilitative protocol utilizing the novel HCTS outperformed a standard outpatient STP. The HCTS patients had substantially less pain, higher total knee ROM, and improved patient reported outcome measures at the 2-, 6-, and 12-week post-operative time intervals.</p> <p>Regarding pain, the HCTS group not only had statistically less pain, but clinically less pain (below the MCID of less than or equal to 1.5), at all time periods during the 12-week recovery.</p>				
18	Pronk (2020)	No statistically significant differences in pain scores between the two groups and opiate use was	Not specified.	Exclusion criteria: did not possess a smartphone or tablet, did not have an email address, did not	Not specified.	Not specified.

		significantly reduced by 23.2% in the Pain Coach group when compared with the finding in the control group.		have internet at home, and did not have a thorough command of the Dutch language.		
19	Zhang (2022)	No significance difference between control group and non-control group for baseline Harris Hip Scores, Activities of Daily Living scores, Functional Independence measure scores -- there was a gradual improvement in both groups. There was a shorter time for the telerehabilitation group for Timed Up to Go scores (somatic integrative ability). Collectively, patients using the mobile app for the home programme showed slightly better improvements in outcomes than those who received telephone follow-ups.	Not specified.	Not specified	Not specified.	Not specified.

Appendix G: Supporting Quotations

Table G1. Additional supporting quotations organized by theme.

Themes	Supporting Quotation(s)
<p>Buy-in</p>	<p>“Our second challenge was just in getting buy-in and referrals from discharge planning at the acute care sites. We met numerous times with this group, and they had nothing but positive feedback and praise for the idea of the program and the RCM technology, but the reality was that they just have so many programs and referrals to manage and think of, that this program was just another add to their list. We consulted with them several times trying to reduce the barrier to refer and we significantly condensed our referral form.”</p> <p style="text-align: right;">Site Document, SJCCC</p> <p>“We did have at some time some physicians who didn’t want to participate because they felt that there would be liability, but we really have to frame it in the sense that the information that’s on the app is no different than what you would provide them. So, I’ll just give you an example: one physician said if the app triggers the patient to go to the ED and the patient wouldn’t go to the ED and there was a catastrophic event, does that make the physician liable? But in the same token, if the patient is provided with a sheet of paper to say if you experience these symptoms you go to the ED and they don’t go, you know, it’s good [with regards to liability]. So, despite that, some physicians have opted out, but that particular physician opted in in the end.”</p> <p style="text-align: right;">OL, HSN</p> <p>“It took some time to get a lot of buy-in for our program, which is normal, coming from a social work lens, people have, sometimes, some trust issues in programs - do they really work?”</p> <p style="text-align: right;">OL, TGHC</p> <p>“I feel it's due to ... the pandemic recovery period. And just the [health and human resources] challenges that exist in general, across the province, across Canada, actually. So, people are reluctant right now. We're finding clinical people, admin people, everybody is reluctant to take on new challenges.”</p> <p style="text-align: right;">OL, RHC</p>
<p>Caregiver Support</p>	<p>“Even though I am a health care provider myself and I see emergencies ... you would think that I am ... comfortable with monitoring my own daughter at home, but she was a newborn, and it was scary at the time. So, it was just nice to know that there was someone checking on her every day and that if I did have a concern, I had that actual phone call with a nurse and that did happen once or twice.”</p> <p style="text-align: right;">COVID-19 Caregiver, MGH</p> <p>“There’s not only that technology safety net but the staffing as well and I think just that level of security not only impacts the clients feeling that way but also the families. I think that was sort of a secondary factor we realized along the way was how we can really help with caregiver burnout.”</p> <p style="text-align: right;">OL, TGHC</p> <p>“The other thing that I noticed, my husband said this, because he was signed up for the app as well. He was getting the daily check-in notifications that I was getting, and he’s like, ‘why do I keep getting these? They’re not for me to fill out, they’re for you to fill out’. So, having the app ... more customised, a version customised for ... the person that’s caring for you versus the patient. And maybe some information there for [the caregiver] so that they know what to do in a certain situation that’s specific to them. Like, ‘when you go to pick [the patient] up from the hospital, make sure you’ve got a garbage bag so she can slide across the seat’. Stuff like that, that they should have versus me having. Because I’m completely out of it because I just had surgery.”</p> <p style="text-align: right;">Surgery Patient, WOHS</p>
<p>Continuity of Care</p>	<p>“We’ve used ... the RCM program to kind of be an extension of our program, to keep an eye on some clients that we can’t see. Whether it's daily, weekly, monthly, they've been an excellent resource for us.”</p> <p style="text-align: right;">HSP, SJCCC</p>

	<p>"I find that when I see the patients in the ED, I'm able to develop a plan of care. And the RCM program really supports to ensure that that plan of care is delivered and that it's established, completed."</p> <p style="text-align: right;">HSP, SJCCC</p> <p>"There [are] so many procedures now that are same-day surgery or one night stay. Patients need follow-up to ensure good recovery at home and it reinforces teaching, decreases their anxiety, provides support [and] continuity of care from just going home right away."</p> <p style="text-align: right;">HSP, HSN</p>
Digital Literacy	<p>"Before we started, there was pretty significant concern amongst our group as to whether the technology was going to be 'easy enough' and/or whether our patients were 'cognitively well enough' to understand and properly use the technology. Our program was specifically targeting a predominantly senior/geriatric population with many meeting our year-one OHT target population of frail, senior, and ALC. We have been pleasantly surprised with the adoption rate and success of these patients as a whole being able to take advantage of the technology. In some cases, we lean on a spouse or other informal caregiver for support but overall, we have been very successful in deploying RCM with this type of population."</p> <p style="text-align: right;">Site Document, SJCCC</p> <p>"We kept the technology very simple based on affordability and knowledge. The knowledge transfer we kept it very simple in order to engage our clients so they will use the system."</p> <p style="text-align: right;">OL, TGHC</p> <p>"[It takes] exactly two minutes to learn the gadget – you understand you push once, or you push twice. If I have a fall, I push the button twice. When I plug it in to the electrical to charge, it will buzz, and the voice will come on the machine...I know I have to push it once to turn it off to tell them I'm okay. So, it's very easy. I mean, anybody could literally do this."</p> <p style="text-align: right;">Hearing-Impaired Patient, TGHC</p> <p>"When I signed up on the app, I had a phone call right away from someone who is administering the app or in charge of it kind of explaining it all to me. So that was ... very good as well. So, I just thought that ... sometimes when you do online things, you're kind of left in a blur wondering if you've done it right and what to expect. But ... the telephone call was real, with the actually talking to someone about what to expect, what to do, like turning on your notifications or not. So is it going to help you remember, to fill it out, you know what time of day to fill it out, they gave you the numbers, if you've gotten in trouble, and you had concerns, because things are spiraling downhill, there was an alternate, so I didn't have to wait till the next day to check in, I had a number I could call."</p> <p style="text-align: right;">COVID-19 Patient, MGH</p>
ED Prevention	<p>"You'll get a call right away because they're going to ... ask you more questions about it, give you some guidance on how to deal with it. So, to me it was very preventive oriented. You ... don't spiral downward too far, but you've got to get help. A person or nurse talking to you about ... what to do and when to get excited about it and ... when to seek further help. So, I thought that was very good."</p> <p style="text-align: right;">COVID-19 Patient, MGH</p> <p>"I just think it's great...given our health care system right now...has a lot of pressure to say the least. I just think ... it's a great program, like the ability for patients to feel comfortable being at home knowing that they have access to a specialized team, instead of getting like, they either a) need to go see their family doctor, which is quite difficult now, especially with phone appointments, and b) a lot of the time they do come to the ED just for that check. And say, you know, I just wanted to make sure my vital signs were normal ... [and] that this wasn't going to get worse. I think it's an amazing program that can help relieve some of the stress in the health care system."</p> <p style="text-align: right;">COVID-19 Caregiver, MGH</p> <p>"I think it has to continue. I mean it is avoiding visits. So, we need to support patients post-operatively so they remain safe at home otherwise we will see them come back to hospital ... I see it as part of the care now to have that extension added."</p> <p style="text-align: right;">OL, HSN</p>
Equity	<p>"The remote communities have poor internet access and some [patients] are just, you know, 'I'm just not using any electronics, like absolutely not,' then we offer a family member to be able to sign up on their behalf to follow them in their journey. So that's a possibility. So, the uptake though is pretty good. There's not a lot [of patients] that opt out, but we do have some for sure."</p>

	<p>“Accessibility, I think language services is a big one for us, it’s something on our radar. Just in terms of the alerts from the pendants, when it talks to you, they are in English, which is why we’ve had to be really good about making diagrams and brochures and things like that, so language would be a big point of improvement for us.”</p> <p>“Our other barrier to being able to provide equitable care the way that we intended, is that while a number of our patients who are very remotely located do have some form of cellular access, the service isn't great.”</p>	<p>OL, HSN</p> <p>OL, TGHC</p> <p>HSP, RHC</p>
Funding	<p>“So funding is always an issue. I mean though we might be saving ... days and LOS or ED visits, it’s not that ... there’s no other patient taking up that bed, there’s somebody else coming in to take the bed. So, it’s been difficult to kind of with no net new funding allocate resources, but we’re trying to find efficiencies to be able to continue and support the program.”</p> <p>“Once the program is established there will be cost to maintain and update and user license for sure. But one of the things that has stopped us from going to a lot more pathways is the cost ... and also the funding for the nurse. We’re reaching a point now where with the staffing we have we’re going – there is a certain number.”</p> <p>“One of the things that we’re looking into pain point wise is, as we grow, we have to grow technology, so the pain point is to ensure that we have the equipment readily available. So, we have data to support us in terms of how fast we should get into the details, how fast do we have to get supplies into the system, right. So that’s one of the biggest challenges and you can’t go too fast because you need the money to do so.”</p> <p>“We are continually being asked, what can you do for the underserved in your community? How can you target the, specifically the frail elderly that are in your population ... And I would say we have – there's no limits to the desire from St. Joe's to offer more services. The real barrier for us is really sustainable funding that would allow us to provide care and services outside our walls, where we are always going to have money and be able to move things around, to be able to provide care to the people here. It's just that we don't have the funding or the mandate to start extending ourselves into the community and start offering services out there, if you know what I mean.”</p> <p>“As an organization we recognise and value sustainability planning ... The biggest challenge around that is the way it's funded makes it really challenging to do long term sustainability planning when you're receiving yearly funding envelopes halfway through the fiscal year.”</p>	<p>OL, HSN</p> <p>OL, HSN</p> <p>OL, TGHC</p> <p>OL, SJCCC</p> <p>OL, MGH</p>
Patient Reassurance	<p>“The mental calm for lack of a better word that this little gadget gives you when you're in my situation is amazing. It relieves the panic; the fear and it enables you to go out again and to see the world.”</p> <p>“It was a perfect fit for me, as I said, you know, living alone and I mean, which I don't mind, I have friends and everything and family but and worrying because I do have a health issue that makes me...more vulnerable. So, it was just nice to have someone hold my hand through it. So, I just felt really far more secure, less vulnerable, knowing that I had this access daily and at my fingertips if I needed more.”</p> <p>“I knew that there was somebody there that if something happened to me – because at the time I was having different kind of tests and everything ... but I knew that if something happened, that somebody was there, you know what I mean? ... One night I wasn't feeling so good, so he said that you should contact, if something happened, there's a number at the bottom, I just got to call ... I knew there was somebody there, so I wasn't by myself. To me I think it's a great thing.”</p>	<p>Hearing-Impaired Patient, TGHC</p> <p>COVID-19 Patient, MGH</p> <p>Surgery Patient, SJCCC</p>
Quality of	<p>“It's given me my life back ... The mental part of it is just so vast ... the depression I had after my husband died because of fear because of being</p>	

<p>Life</p>	<p>alone because I'm constantly having to watch what I'm doing and how I'm doing it so I shouldn't fall and not being sure if I fell if, I could get to a phone if I was able to crawl that far. The mental relaxation, for lack of a better way of putting it, that this little machine gave me is ... it's priceless. Absolutely priceless.”</p> <p style="text-align: right;">Hearing-Impaired Patient, TGHS</p> <p>“My patient told me that now she can afford TV channels so that she doesn't go crazy staring at her walls all day. Because she was paying for Lifeline because she knew she needed it, but she couldn't afford anything else. So, she's so happy she can now watch TV and be safe.”</p> <p style="text-align: right;">HSP, TGHC</p>
<p>Responsive-ness</p>	<p>“I was filling out these questionnaires every day and telling them where my pain level was, where I was having problems...and they were very responsive in contacting me and following up with me and saying, ‘well you're not taking your pain meds, you need to take them’, or whatever the issue was. Telling me when I needed to go see the doctor and when that was normal and not to worry. So, I felt like it was much better health care than I've had without an app.”</p> <p style="text-align: right;">Surgery Patient, WOHS</p> <p>“The minute the buzzer goes off by accident. Somebody is checking on me. I don't mean to put it off, but because it's easy to hit the button. The other day I was getting undressed, and I hit the button and I can't hear it, right. And the next thing I know, somebody is calling to make sure I'm okay. Okay, and I know I've set off the button when that happens. So, it really is, you know, for the few times I've sent off to somebody has been at the other end immediately. That in itself, again, is a feeling of safety. It's a feeling of help, somebody reaching out to help makes a big difference in somebody who has disabilities.”</p> <p style="text-align: right;">Hearing-Impaired Patient, TGHS</p> <p>“They told me everything I needed so that I could easily use the app. I mean, it was perfect. And they called basically, within minutes of me signing up. So, my phone was still in my hand. And they're calling like, they saw me start everything and sign in. And then they call to explain it all.”</p> <p style="text-align: right;">COVID-19 Patient, MGH</p> <p>“And then even about the anxiousness, it wasn't so bad until I had that infection then it's like OK, I'm feeling a little bit stressed because nobody's getting back to me.”</p> <p style="text-align: right;">Surgery Patient, HSN</p> <p>“The thing that I thought was just really incredible was that I had [the RCM lead]. So, you could text in, you could message in. If you answered something different, she immediately checked back with you. So, it wasn't like your answers to the questions, which, again, was very easy to use— but it wasn't like it just went into the abyss and nobody cared, right? They were being monitored and there was a real person on the other end who was actually looking out for you. That was huge.”</p> <p style="text-align: right;">Diabetes Patient, RHC</p> <p>“If someone was on the program, we have consistent communication, say for 7 days, and then maybe they're starting to feel better at the end and day 8, 9, 10 we're calling and they're not answering. We're leaving voice mails, and no one is getting back to us, and it leads up where we have people continuing going on over 10 days, maybe 11, 12 and they're not communicating back to us until we text their cell phone, ‘hey we're trying to contact you, if we don't hear back from you, we have to send a safety check to your home.’ And then that's when they perk up and say, ‘okay yeah, I'm fine’. So, just that respect on both ends to say I'm okay, because it feels like we were so supportive in the beginning and then you're holding onto us and as soon as you don't need us, it's bye, I'm not answering you anymore.”</p> <p style="text-align: right;">HSP, MGH</p>
<p>Workflow</p>	<p>“Advice maybe for other programs, [is having] clerical support. Because of the mixed population of some having the app [and] some not, it also allowed the nurses to focus on nursing work, versus occupying their time doing...clerical work. That really can be a bit of a time sucker, so we were able to, and I'm always a strong proponent of the right person doing the right job. So, I think having that clerical support really allowed the nurses to focus on nursing.”</p>



	<p style="text-align: right;">OL, MGH</p> <p>“In terms of my day, it does fit in, because in between me seeing patients on the unit, whenever I have a few minutes, I just go to my office, and I’ll call the patient. It’s not a formal appointment time because that wouldn’t work for me, but [the bundled care coordinator] does give them the heads up.”</p> <p style="text-align: right;">HSP, WOHS</p> <p>“We created a ‘hub-and-spoke’ model ... TGHC RCM hub and spoke model relies less on health human resources as it has relieved the workload strain of the on-site staff, and therefore, helping on a systems level. This hub and spoke model allowed us to spread and scale to other organizations, discharge to proactively prevent unnecessary admission to [general internal medicine] from ED and a faster discharge from [general internal medicine] or rehab to prevent ALC.”</p> <p style="text-align: right;">Site Document, TGHC</p> <p>“[The RCM lead] really weeds out the necessary patients for me to see, so she does a lot of education, and she’s really good at identifying the types of patients I would need to see, so that does make my workload easier. I don’t know, but I think she probably has a big workload.”</p> <p style="text-align: right;">HSP, RHC</p> <p>“Unlike inpatient – where we have tons of those data – where, you know, at a [Complex Continuing Care] and you have 20 beds you need [a] one to five nursing ratio as an example, but with this because it’s so new, we don’t have that data. So, we’re constantly putting those data together so that we know at what point we need to put in more staff. So, ... our goal was ... [for] all calls to be intercepted by a live voice. We did not want an answering machine. And so, what we did was if there [were] 5% [of] calls that come in that we miss, we will then look at adding staff. So, the biggest lesson is understanding staff ratio and hiring at the appropriate time.”</p> <p style="text-align: right;">OL, TGHC</p>
<p style="text-align: center;">Increased Burden</p>	<p>“The only thing is, is it didn’t really – like sometimes it would remind you that, ok, you have to do your daily check in, right? And then you’ve done a daily check in and then it would force you into this two-week check in ... and then that was a much longer sort of time commitment, which wasn’t a problem, but maybe I thought oh, I’ve got five minutes before my Zoom meeting starts, and then now I’m in this bigger thing.”</p> <p style="text-align: right;">Diabetes Patient, RHC</p> <p>“It’s definitely very client-specific who the program works for. We love it for our gestationals ... [and] newly diagnosed people that have a lot of questions. But in terms of our older diabetics that don’t have access to the program, or they’ve been diabetic for a long time, or things like that, it’s not a benefit. Then we have a lot of people that aren’t necessarily compliant with their diabetes care. And if they’re on the program, there’s a lot of alerts. But we’ve fine-tuned all those things. So, it’s a lot better, as long as we were selective as to who we’re putting on the program.”</p> <p style="text-align: right;">HSP, RHC</p> <p>“So, some like the contact, and some people, you can kind of see at some point that they’ve had enough.”</p> <p style="text-align: right;">HSP, RHC</p>

Appendix H: Operational Definitions

Alternate level of care: Level of care provided to patients, usually occupying a hospital bed, who do not require the intensity of resources/support provided in that care setting (8).

Digital literacy: Refers to the ability to solve problems using technology with comfort and ease (9).

Escalation: A process that is initiated after an alert is sent out to the monitoring team whereby the RCM/clinical team contacts the patient, or the patient reaches out to other supportive services (i.e., calling 911).

Length of stay: The number of days a patient is admitted to a care setting (10).

Organizational Leads: Senior managers and directors involved in the implementation of the remote care management program.

Remote care management: A model of care, enabled by technology, that facilitates the timely detection and resulting clinical action at the onset or early deterioration of illness.

Scalability: Refers to the spread (number of sites) and case load (number of patients served) of the RCM program.