

PATIENT AND CLINICIAN EXPERIENCES OF VIRTUAL CARE AFTER
SURGERY

PATIENT AND CLINICIAN EXPERIENCES OF POST-DISCHARGE VIRTUAL
CARE FOLLOWING NON-ELECTIVE SURGERY: A QUALITATIVE
DESCRIPTIVE STUDY

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ABSTRACT

Remote patient monitoring (RPM) and virtual care is a burgeoning field, with considerable uptake within chronic medical populations and recently expanding to include surgical populations. Patient and clinician experiences of participating in at-home, postoperative RPM or virtual care interventions are not well described in the current literature. The objective of this study was to understand the experience of patients and clinicians who participated in a 30-day RPM and virtual care program following non-elective surgery at the beginning of the COVID-19 pandemic in Canada. The study also aimed to identify ways to improve postoperative RPM programs for future interventions. Qualitative descriptive methodology was used to describe the participants experiences of the phenomena in everyday language. Purposive, maximum variation sampling was used to recruit a heterogenous sample that included participants from all five sites of the trial and focused on recruiting patients with prior surgery. Forty-three participants (21 patients, two patient spouses, 10 nurses, 10 physicians) took part in semi-structured telephone interviews, approximately 30 minutes in length. Data was transcribed by an independent transcriptionist and confirmed by the researcher. Reflexive thematic analysis was employed, and analysis was completed by the primary researcher and triangulated with two additional researchers, guided by the Conceptual Model for Telehealth Nursing. Themes generated include: *'Virtual care is valued and holistic care, at home'*, *'From a wide scope towards a refined intervention'*, and *'A shared responsibility: Significance of interdisciplinary collaboration'*. Postoperative RPM and virtual care provides an opportunity for patients to recover at home with skilled clinical oversight, with patients

and clinicians highlighting reassurance and access to clinicians during a vulnerable period, particularly within the context of the COVID-19 pandemic. Improvement for the future may include more patient-centred scheduling for interventions including reduced video calls and vital signs measurements.

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LIST OF ABBREVIATIONS

COVID-19	coronavirus disease 2019
ICD	implantable cardioverter defibrillator
PVC-RAM	Post-discharge After Surgery Virtual care with Remote Automated Monitoring
QD	qualitative description
RPM	Remote patient monitoring
SMArTVIEW	Technology Enabled Self-Management – Vision for remote automated patient monitoring and Empowerment following Cardiac and Vascular Surgery
TA	thematic analysis

CHAPTER 1: Introduction

Surgery is necessary and can be lifesaving, however it also presents a considerable risk to patients, particularly when recovering at home after non-elective surgery. In a study by Spence and colleagues (2019), it was reported that patients who developed major complications (e.g., bleeding, infection, sepsis, myocardial injury, acute kidney injury, stroke, venous thromboembolism, heart failure) within the first 30-days following non-cardiac surgery were found to have a greater mortality risk than those without complications, and present a considerable burden on the healthcare system through readmission and hospitalization. Following discharge from hospital is a particularly vulnerable time for patients undergoing surgery, with 29% of deaths occurring at home in the first 30-days following non-cardiac surgery (Spence et al., 2019). Comparatively, very few deaths occur intraoperatively for this population (0.7%), which is a period with intensive, frequent monitoring by skilled and specialized clinicians (Spence et al., 2019). Non-elective surgery, otherwise referred to as emergent or urgent surgery, (defined as surgical intervention completed less than 24 hours or within 24 to 72 hours from the acute condition), was found to be independently associated with a higher risk of mortality (5.5%), compared to elective surgery patients (1.4%) (Spence et al., 2019). Non-elective surgery patients were also found to have significantly higher rates of complications (45.7%) and readmission rates (19.6%), in comparison to elective surgery patients (21.4%, 11.5%) (Morris et al., 2014). Thus, considering increased risk within the first 30-days of complications, mortality, and subsequent readmission to hospital to their elective

surgery counterparts, there are distinct differences in recovery considerations and experiences for non-elective surgery patients within this period.

Recovery at home following discharge therefore represents a particularly vulnerable time for patients undergoing non-elective surgery, during which there is minimal clinical surveillance or skilled support for ongoing recovery and monitoring of potential complications. In studies utilizing data from the American College of Surgeon's National Surgical Quality Improvement Program, approximately a third of surgical complications are diagnosed after discharge to home, and post-discharge complications were found to be a more significant driver of readmission to hospital than complications occurring during the initial hospitalization following surgery (Bilimoria et al., 2010; Morris et al., 2014). Patients who develop major complications following surgery have reduced physical and mental quality of life in a 12-month period, however increased availability of clinician support may augment this impact (Archer et al., 2019). In the current system of postoperative recovery, the burden of care following discharge is consequently on the patient and their family, when available, to recognize complications and evaluate their recovery, despite having limited infrastructure or specialized knowledge to do so. Studies have indicated that a significant factor of the development of stress and anxiety in patients and their families, is a lack of support and knowledge for meaningful recovery at home (Bailey et al., 2010; Sibbern et al., 2017). Structured and accessible surgical care following discharge from hospital can provide a bridge in care delivery and may facilitate positive health outcomes in vulnerable surgical populations.

Over the past decade there has been considerable interest in research utilizing virtual care and remote patient monitoring (RPM) to support patients at home through monitoring and/or care delivery assisted through technology. Virtual care through remote patient monitoring is a subset of telehealth, or telemedicine, and encompasses digital and audiovisual technology to facilitate clinical care and assessment from a distance (McGillion et al., 2018). RPM may utilize both synchronous and asynchronous technologies and can generate data from multiple sources including wearable sensors, patient surveys, remote vital signs monitoring, or video/pictures to be transmitted to a healthcare provider via information and communication technology (McGillion et al., 2018). Review of the transmitted data may be active, with regular reviews by a clinician, or passive in which the clinician is alerted when the data is within a pre-determined parameter. There has been substantial application of RPM in chronic adult medical populations (e.g., heart failure, diabetes, dialysis, chronic obstructive pulmonary disorder) to reduce symptoms, encourage self-management, and attempt to reduce frequent hospitalizations (Farias et al., 2019). While various RPM modalities have been studied broadly in these chronic conditions, application to adult surgical patients has been expanding, but with limited rigorous evidence to date (Farias et al., 2019). In patients who have undergone non-elective surgery and are recovering at home, RPM presents a unique opportunity to provide clinical oversight and monitoring for complications, as well as offering patients access to clinical expertise and care not otherwise available to them when discharged home. Postoperative virtual care allows for patients to access healthcare

in a time and place which normally is absent of intensive monitoring and readily available clinician knowledge and oversight.

Context

On March 11, 2020, the World Health Organization declared a pandemic of coronavirus disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, which had significant global implications across multiple realms, particularly within healthcare. After the announcement of a pandemic, many countries adopted closures and restrictions to varying degrees to prevent pathogenic spread and protect finite resources within essential services. In response to the declaration of a pandemic, Ontario's Ministry of Health directed hospitals to reduce elective and non-emergent clinical activities, in anticipation of an increased strain on hospital capacity and health human resources due to COVID-19 patients (Ministry of Health, 2020). In response to this change in surgical care, the Population Health Research Institute initiated a multi-centre, randomized controlled clinical trial of post-discharge virtual care and remote patient monitoring for non-elective surgical patients known as PVC-RAM (Post Discharge after Surgery Virtual Care with Remote Automated Monitoring Technology). This trial was adapted from an ongoing randomized controlled trial, SMArTVIEW (Technology Enabled Self-Management: Vision for Patient Remote Monitoring and Empowerment Following Cardiac and Vascular Surgery), which included a virtual care RPM intervention following discharge from hospital for patients undergoing major cardiac and vascular surgery.

Participants were eligible for the study (PVC-RAM) if they were the age of 40 or older, had an urgent or emergent, non-elective surgery, had at one night stay as an

inpatient postoperatively, and were discharged to home. Exclusion criteria included those who were discharged to rehabilitation or convalescent centres for greater than one week, who could not communicate with research staff, patients who could not use a tablet due to cognitive, language, visual, or hearing impairments, and those who lived in regions without adequate mobile phone coverage. Participants were randomized to either standard of care, or the 30-day post-discharge virtual care RPM intervention.

Participants randomized to intervention were provided a digital health kit from Cloud-DX that included a Bluetooth-enabled cellular tablet to video conference, as well as Bluetooth-enabled vital signs machines (blood pressure monitor, pulse oximeter, weight scale, thermometer). Participants had video calls with a virtual care registered nurse daily from days 1-15, and every other day from days 16-30 post-discharge home; participants also took their biophysical measurements three times a day, took wound pictures, and completed daily surveys for the full 30-day intervention. During video calls, virtual care nurses evaluated participants' overall well-being and symptoms, assessed patient wounds if needed, reviewed health education on principles of surgical recovery, and reconciled medication. On days without scheduled video calls per intervention protocol, nurses could initiate an unplanned video call if there were any concerns with the patient's biophysical measurements, or other issues identified. Daily rounds were completed by the virtual care clinical team, consisting of physicians, ranging in specialties from internal medicine, anaesthesia, and general surgery, alongside the virtual care nurses. PVC-RAM virtual care nurses could also escalate care to a physician at any time under their discretion, and when patients' biophysical measurements exceeded

protocolized thresholds. Patient participants had access to the virtual care clinical team 24 hours a day, seven days a week and were advised to call with any issues beyond scheduled video calls. The trial took place between April and August 2020 at multiple hospitals across Canada, within the cities of Hamilton, London, Kingston, Ottawa, and Edmonton. In total, 905 patients were recruited to the trial, and 451 participants were randomized to the virtual care intervention. The primary outcome was days alive at home following hospital discharge in the first 31 days, and secondary outcomes included: acute hospital care, brief acute hospital care, hospital readmissions, visits to the emergency department or urgent care centre, hospital stay in days for all causes, detection of drug error, correction of drug errors, pain, and death. Multiple tertiary outcomes existed that covered a variety of postoperative complications and costs of utilization of healthcare services. While the trial outcomes were comprehensive from medical and health systems perspective, they did not address the experiences of the patients and clinicians, and how the intervention could be improved for future use.

Research Questions and Purpose

In the current literature, there is a paucity in understanding the experiences of patients and clinicians who participate in post-discharge virtual care programs with remote monitoring interventions. With continued increase in research within the field of virtual care and remote patient monitoring, currently accelerated by its use during the COVID-19 pandemic, it is important to understand if there is patient uptake and satisfaction with intensive monitoring at home, along with optimizing workflow experience for clinicians within a virtual context.

The first purpose of this study was to describe the experience of patients, family members, nurses, and physicians who participated in PVC-RAM within the context of the COVID-19 pandemic. Additionally, the purpose was to understand how to improve the virtual care RPM interventions for future applications within the adult surgical population, from the perspective of both patients and clinicians. Due to the increasing use of virtual care following the COVID-19 pandemic, and the overwhelming backlog of surgeries because of pandemic restrictions, information on how to improve post-discharge surgical RPM interventions may be useful in practice, although little is known on the optimal model from patient and clinician perspective due to the novelty of the current situation.

The research questions included the following:

1. What is the patient and family member experience of receiving post-discharge virtual care with remote patient monitoring after non-elective surgery in Canada during the COVID-19 pandemic?
2. What is the experience of nurses and physicians delivering post-discharge virtual care with remote patient monitoring after non-elective surgery in Canada during the COVID-19 pandemic?
3. How can post-discharge virtual care with remote patient monitoring after surgery be improved in the future?

Reflexivity – Positionality Statement (excerpt)

As qualitative research is inherently contextual, reflexive practice in qualitative provides an opportunity for the researcher to reflect on their personal lens and take responsibility to clearly state their biases, beliefs, and experiences on the research and understand their role in the creation of knowledge (Berger, 2015). The positioning of the researcher is an exercise in recognizing the motivations and therefore angle of inquiry of the researcher, so that the reader can determine if findings are impacted by how they are situated within the research (Thorne, 2016; Berger, 2015).

In consideration of why I may be an appropriate person to conduct this research, I reflected on my personal and professional experiences prior to completing my master's thesis work. I am a registered nurse with a clinical background in adult critical care, and therefore I bring understanding of the importance of close patient monitoring through my work in the intensive care unit, and how timely intervention can prevent decompensation. Furthermore, I have additional training as a critical care response team nurse, providing care to patients who may be deteriorating outside of the intensive care unit, which has given me perspective on how appropriate monitoring and early detection of decompensation can impact outcomes for patients, particularly within surgical populations.

During my graduate degree, I worked as a virtual care nurse for the SMARVIEW project, which provided RPM and virtual care follow-up to cardiac and vascular surgery patients. My experience as a virtual care nurse for this population allowed me to understand the day-to-day experience of virtual care, how patients interacted with

technology, and how this virtual care modalities can be utilized in post-discharge recovery care. I also have a personal experience with a close loved one dying in the immediate 30-day period from a postoperative complication following major non-elective surgery, during a care transition when monitoring was reduced. This experience influenced my decision to become a critical care response team nurse and has fueled my interest in exploring how care transitions can be re-imagined ensuring patients can be safely supported during their surgical recovery and given opportunities to engage in their own care.

I acknowledge that I come to this research as a white, heterosexual, cis-gendered woman who is university educated and has stable socioeconomic status, and this puts me in a position of privilege in terms of accessing healthcare and being included within traditional healthcare systems. Additionally, I recognize that my identity as a registered nurse may position me in a potential power dynamic with patient participants, and that I may be perceived in this role as part of an oppressive system to disadvantaged or marginalized groups.

CHAPTER 2: Literature Review

RPM has become a rapidly developing field in healthcare, as it presents an opportunity for adaptive and supportive care for patients while at home utilizing a range of technology. There has been application across a range of patient populations, as well as across various care modalities and interventions. The purpose of this literature review was to explore how the literature describes the experiences of adult patients and clinicians who participate in RPM and virtual care interventions, as well as an overview of the current use of RPM. The databases CINAHL, MEDLINE, PsychInfo, and PubMed were searched from January 2010 to December 2021 with combinations of the following terms: *remote patient monitoring, remote monitoring, virtual care, telehealth, telemonitoring, experience, description, patient experience, clinician experience, home, and discharge*. A secondary search was completed with the previous terms, with the addition of video and *video consults*. The references of articles meeting inclusion criteria were reviewed by a single researcher to identify further eligible studies. Criteria for inclusion were: (a) research article focused on the experience of virtual care and/or remote patient monitoring for adult patients, and (b) English language article. Articles focused on virtual care or RPM experience within hospital context were excluded due to the impact of the environment and difference in care model. Paediatric RPM and virtual care interventions were excluded from this literature review as the research question is centred around experience, and the many differences between adult and paediatric care delivery and the population itself would greatly impact experience. Additionally, a particular focus on

video consultation interventions was included, due to the nature of the PVC-RAM intervention including frequent video calls between patients and clinicians.

This literature review will briefly describe the current state of RPM to give context, and then explore studies that focus on experience of adult patients and clinicians who participate in RPM and/or virtual care interventions at home for a variety of medical conditions. Following this, a focus on experience of patients and clinicians using virtual care modalities that have video components will be discussed.

Remote patient monitoring

RPM as a care modality presents a wide array of applications and uses, across a variety of populations. A systematic review by Farias and colleagues (2019) of 272 studies found that most of RPM studies and interventions focused on chronic adult medical issues, including heart failure, diabetes, renal failure, and chronic obstructive pulmonary disease. In comparison, 2.6% of articles in this systematic review represented postoperative monitoring in surgical populations. The RPM interventions in this systematic review ranged from telephone consultations to wireless monitoring modalities and implantable devices. Smartphone apps comprised the most used intervention, with approximately three-quarters of the studies utilizing this type of intervention (Farias et al., 2019). This demonstrates the gap in research in utilizing RPM technology for surgical patients and indicates that a large portion of existing interventions do not include intensive interventions as employed in PVC-RAM with daily video calls and multiple biophysical measurements per day. A significant limitation of this publication is the lack

of comprehensive list of the studies included for systematic review, limiting readers from appraising the quality of primary data independently.

Within the adult medical populations with chronic conditions, a systematic review of 62 articles was conducted by Vegesna and colleagues (2017) to identify key factors and trends in RPM via non-invasive digital technologies (i.e., smartphones, wearable sensors, computerized systems). Vegesna and colleagues (2017) determined that RPM was associated with positive health outcomes for patients across a range of technologies that include asynchronous smartphone or web-based tool, wearable biosensors, and multimodal interventions (Vegesna et al., 2017). These outcomes ranged from increased self-management behaviours, reduced symptomatic episodes and hospital admissions, and improved quality of life through self-activation behaviours (Vegesna et al., 2017). This systematic review did include mostly randomized controlled trials (70.9%, n=44), and the studies had small sample sizes and limited follow-up periods. The authors chose to not look at effectiveness or efficacy due to diversity in trial outcomes, but rather categorized results as positive, neutral, or negative health outcomes to show overall trends in the field of RPM. While this does not look at patient experiences, having reduced symptoms and increased quality of life may have an impact on patients' experience with RPM technology and how it can augment healthcare within the home environment.

The current state of RPM in literature demonstrates that there is potential for use of this technology in adult populations, however higher-powered studies focused on surgical populations, or those with intensive interventions and thorough follow-up are needed to demonstrate the use of these interventions within care models.

Experiences in post-discharge virtual care

RPM and virtual care have been adapted in a variety of patient populations and settings, to augment the current practice, or provide additional care beyond the standard. The experiences of patients and clinicians who participate in these interventions are important to consider, to determine whether there is acceptability and engagement with the technology and change in care delivery. Below is a review of literature describing the experiences of patients and/or clinicians participating in RPM and virtual care interventions at home, including within surgical populations, patients with medical conditions, and interventions that include video application.

Surgical Populations Exploration of the end-users' experiences of RPM interventions remain limited in number, and frequently limited in the depth of information due to chosen methods. Gunter and colleagues (2016) systematically reviewed the use of RPM in post-discharge surgical populations in the United States and found that patients and clinicians participating in telemedicine post-discharge care had high rates of satisfaction, and patients reported ease of use. Patients also reported satisfaction related to cost effectiveness and time saving related to remote follow-up. While this demonstrates acceptability of post-discharge surgical RPM for both patients and clinicians, there were no qualitative studies included beyond limited survey data. A limitation of this systematic review is the level of evidence included, as only three studies of the 21 included were randomized controlled trials, and almost all studies had small sample sizes. There was bias included in a large portion of trial due to inequitable pre-requisites for participation such as requiring your own smartphone or Wi-Fi connection for the intervention. With an

inadequate number of studies to date, there remains a need for adequately powered, and rigorous high-level research for surgical RPM interventions, and thorough qualitative examination of end-user experiences of these interventions.

Patients with Medical Conditions Studies exploring the experiences of patients and clinicians participating in at-home virtual care RPM for medical conditions (chronic or episodic) exist more readily than surgical populations, most likely due to the greater number of virtual care and RPM studies within this population. The following section will discuss the literature of experience in RPM and virtual care for a variety of medical conditions that include chronic obstructive pulmonary disorder, heart failure including those with pacemakers and/or implanted cardiac defibrillators, dialysis, oncology patients, obstructive sleep apnea, and obstetrical patients with hypertension.

A survey on Veteran Affairs patients in the United States using video-based telehealth services found that two-thirds of participants preferred virtual care, or that it was equivalent to in-person care. Themes found around the preference towards virtual care centred around the perceived improvements in access to care, a differential quality of care to current standard, the feasibility of obtaining care, and technology related challenges (Slightam et al., 2020). Although not precisely parallel clinical experiences, there is a knowledge gap in the literature currently regarding surgical perspectives of post-discharge virtual care with RPM, and this literature can provide insight into how these care modalities are perceived by patients and clinicians. Walker and colleagues (2019) completed a systematic review and thematic synthesis of qualitative studies of RPM in adult patients with chronic conditions, which included 16 studies from mostly

Western countries that included diagnoses of chronic obstructive pulmonary disorder, heart failure, diabetes, end stage renal disease, and hypertension. Thematic synthesis concluded with four themes, and multiple sub-themes. The first, ‘gaining knowledge and triggering actions’, included patients tracking and responding to changes, having timely and accessible care, and which allowed for increased self-management and shared decision-making. This led to the second theme, ‘reassurance and security’, in which there was safety in being independent at home, and a peace of mind in which their anxieties were reduced while alone. Contrastingly, the following two themes: ‘concern about additional burden’, and ‘jeopardizing interpersonal connections’, present the concerns and challenges of RPM interventions for patients. This includes a lack of trust in technology and reluctance to change or something new, along with avoidance of increased costs. Relationally, patients were also concerned about losing face-to-face interactions, and losing humanity by being just data (Walker et al., 2019).

Chronic Obstructive Pulmonary Disorder Fairbrother and colleagues (2013) completed a qualitative study embedded within a randomized controlled trial on telemonitoring and self-management for patients with chronic obstructive pulmonary disorder in the UK. The study included 38 patients and 32 ‘professionals’ defined as nurses, physicians, information technology staff, and support services staff. Patients were overall positive in their feedback for the telemonitoring program, and found that it increased their knowledge base, reinforced their decisions, and provided reassurance and support with easy-to-use technology (Fairbrother et al., 2013). Contrastingly, the professionals interviewed reported a deferred responsibility of management from the

patients to the clinicians, and worried about dependency increasing, rather than self-management. The inclusion of both patients and healthcare workers in this study, and the contrast in their perceptions of the care modalities demonstrates the importance of incorporating all end-users and their experiences.

Heart Failure, Pacemakers, Implanted Cardioverter Defibrillator In a similar study conducted by the same primary author (Fairbrother et al., 2014) exploring experiences of a telemonitoring program for heart failure patients that included symptom surveys and vital sign measurements, patients reported feeling more knowledgeable and reassured while in the program. Clinicians reported concern that patients were over-reliant and not as independent in symptom management than patients not participating in the intervention (Fairbrother et al., 2014). Another telemonitoring program for heart failure patients focused on a mobile phone application with daily weight, blood pressure monitoring, and symptom surveys, along with a weekly single-lead electrocardiogram (Seto et al., 2012). Patients reported similar themes to Fairbrother and colleagues (2014) that included increased knowledge and confidence, reassurance and reduced anxiety, and ease of use of the technology (Seto et al., 2012). Again, similar to themes reported by Fairbrother and colleagues (2014) of heart failure RPM, clinicians discussed the potential for increased workload and change in workflow as a barrier to implementation was discussed by clinicians, along with a concern for patients to become dependent on the program long-term (Seto et al., 2012). This study provides insight into workload and workflow for clinicians utilizing RPM and virtual care, an aspect of experience that is not captured if patients are the sole focus of qualitative inquiry for these interventions.

Fraiche and colleagues (2021) explored the views patients and providers (including cardiologists, electrophysiologists, cardiology nurse practitioner, device nurses, and device technicians) of RPM for pacemaker and implanted cardioverter defibrillator devices. Three domains were generated from the data: knowledge and understanding, managing alerts, and cost transparency (Fraiche et al., 2021). Patients and providers both noted lack of knowledge toward understanding how RPM works and felt there was insufficient formalized education regarding the technology. There was discordant understanding between patients and providers about understanding the concept of RPM, with patients understanding it as more of a constant alarm system, while providers viewing it as information to empower patients to make health decisions. Providers did not want patients relying solely on remote monitoring, but to have patients to continue self-management and assess symptoms (Fraiche et al., 2021). Overall, patients had trust in the RPM technology, but there were knowledge gaps to be addressed to allow for better education and more patient-centred decision-making.

In a questionnaire-based study following a long-term remote patient monitoring program for patients following insertion of an internal cardioverter defibrillator device (ICD) in Western Europe, patients found the technology easy to use and trustworthy, and reported that they believe it improved their health awareness and adherence to treatment protocol (Timmermans et al., 2019). Almost all patients in this study found that RPM was an improvement to current standard of care and would recommend it to other patients due to a feeling of reassurance, time and/or cost savings, and independence. The patients who reported that they preferred in-clinic follow-up were more likely to have lower

socioeconomic status (less education, unemployed), or suffer from comorbid chronic obstructive pulmonary disorder (Timmermans et al., 2019). This study provides insight into the consideration that patients may not prefer RPM or virtual care, even if provided in addition to standard of care, and the demographics of which patients this may be.

A mixed methods study explored the experiences of patients and nurses in the context of RPM for ICD follow-up in Sweden through surveys. The authors found both participant groups had favourable comments overall, however nurses noted more downsides with the program than patients (Liljeroos et al., 2020). Patients described more ‘normal life’ after RPM due to fewer in-person appointments, and with increased security and safety at home. Patients seemed to have a knowledge gap to how the RPM intervention worked, noting a need for more rigorous patient education prior to implementation (Liljeroos et al., 2020). Nurses described RPM as ‘invisible work’ that was not thought of as time-intensive by others, however they felt it was burdensome due to the number of alarms and clinical data accumulated (Liljeroos et al., 2020). Nurses also reported issues with assisting patients in utilizing the RPM technology, once again added to their workload. Finally, very few patients reported anxiety related to RPM, but in contrast the nurses felt that the responsibility of managing patients virtually via RPM to be a stressful undertaking (Liljeroos et al., 2020). Overall, studies within the cardiac medical population found that patients had knowledge gaps and did not fully understand RPM and virtual care modalities, however mostly found it reassuring and acceptable. Clinicians had concerns that this population may not be fully engaged in self-management

of their conditions and symptom monitoring and had concerns of how the technology could be integrated into their current workflow.

Dialysis Walker and colleagues (2020a, 2020b) conducted two qualitative studies focusing on RPM of those receiving at-home peritoneal dialysis treatment - one with patients and caregivers, and another with clinicians. The intervention included a peritoneal dialysis machine that automatically uploads data to a remote clinician for assessment, allowing for modification of dialysis treatments and prescriptions remotely (Walker et al., 2020a). Patients found they felt more reassured and supported with remote monitoring of their peritoneal dialysis, particularly in the older patient population. Through remote monitoring, patients and caregivers reported feeling increased empowerment through improved knowledge and understanding of dialysis treatment and how it related to signs and symptoms (Walker et al., 2020a). Remote monitoring was also viewed as a means to improve access to care, with reduced time and financial cost to patients (Walker et al., 2020a). Patients did caution that remote monitoring should not replace in-person interactions totally and would like to have clear communication on when they would be contacted (Walker et al., 2020a). The clinicians (13 registered nurses, 12 nephrologists or nephrology residents) were also interviewed in a separate study by Walker and colleagues (2020b) and the authors noted similar themes: ‘promoting and maintaining’ with perceived reassurance and confidence for patients, ‘enhancing patient-focused care’ with reduced barriers to accessing care, ‘enabling data-driven decisions’ with providing timely care with the clinical RPM data, and ‘establishing boundaries for use’ (Walker et al., 2020b). As dialysis is a time and resource intensive

intervention for both patients and clinicians, with potential for sudden physiological decompensation, the experience of RPM and virtual care in this patient population may have some parallels to surgical populations, as there is more close monitoring needed due to rapid changes and more use of objective measurements rather than self-reported symptoms.

Obstructive Sleep Apnea Nicosia and colleagues (2021) completed a qualitative evaluation of veterans with obstructive sleep apnea participating in a telemedicine program that included virtual clinical encounters, at home testing, and web application symptom and sleep quality monitoring. The thirty participants interviewed reported overall positive experiences and found that they had improvements in health and life quality (Nicosia et al., 2021). Access to care was notable for participants, by removing distance and travel barriers, and allowing participants access to their own sleep data. This was ‘comforting’ to participants, to know that clinicians were monitoring this data, but also for themselves to monitoring and self-manage based on the RPM data (Nicosia et al., 2021). Improvements moving forward included a more streamlined appointment scheduling process, more centralized care that allows for continuity across different clinicians, and better access to equipment refills and refitting (Nicosia et al., 2021). As this was a multi-modal approach rather than a singular virtual care intervention, including virtual care consults, this provides some similarities to PVC-RAM’s dual RPM and virtual care intervention.

Oncology A systematic review and thematic synthesis of oncology patients’ experiences with telehealth, found that across 22 papers there were three themes:

‘influence of telehealth on the disrupted lives (convenience, independence, burden)’, ‘personalized care across physical distance (time, space, human factor)’, and finally ‘remote reassurance – a safety net of health care professional connection (active, passive, missed)’ (Cox et al., 2017). Patients noted that while there was value in telehealth in terms of convenience and minimized disruption in their lives, it should be balanced against the burden to patients in participating and tailored to patient needs rather than impersonal standardized patient outcomes (Cox et al., 2017).

Obstetrical Patients with Hypertension In a survey following a randomized controlled trial of remote blood pressure monitoring for postpartum hypertension, Thomas and colleagues (2021) looked at the perception of quality of care, ease of use, effectiveness of equipment, problems encountered, and the perceived security or security with telehealth. Descriptive analysis found that most participants found the telehealth intervention overall satisfying, with no undue burden of care, and an overall easy to use and secure system (Thomas et al., 2021). Participants who had conditions who put them at risk for complications, had new-onset hypertension, or started medications after discharge, were more likely to be satisfied with the program and recommend it to others (Thomas et al., 2021). This may suggest that not all participants may benefit from virtual care and RPM similarly, and there may be more uptake in patients with novel diagnoses or medications, or those perceived at higher risk for morbidity or mortality.

In another questionnaire-based study, Lanssens and colleagues (2019) followed-up patients and clinicians (midwives, obstetricians) who had participated in a randomized controlled trial for prenatal remote monitoring for hypertensive disorders of pregnancy.

Patient participants found that RPM gave them a sense of security through their pregnancy and had no issues with privacy and security of their personal health data, while clinician participants noted they thought follow-up care via RPM for this patient population was important for high-risk pregnancies and would recommend it to colleagues and patients. There were discrepancies on what patients and clinicians felt would be an acceptable follow-up to abnormal biophysical measurements; patients preferred a 3-to-12-hour follow-up, while clinicians felt a 24-to-48-hour follow-up would be more acceptable (Lanssens et al., 2019). This patient population has a more episodic care trajectory, and thus provides a similar periodic experience of RPM and virtual care that would be seen in surgical populations such as PVC-RAM.

Experience of patients and clinicians within adult medical populations interacting with RPM and virtual care describe reassurance and overall acceptability to using the modality to supplement care, however, are cautious for the modality to entirely supersede in-person interactions. Clinicians have concerns that the current design of these interventions in medical populations provide little opportunity for patients to self-manage and may disengage patients from their own care process. Additionally, workflow and burden on to clinicians should be explored, particularly when RPM is in addition to standard clinical duties rather than provided in a dedicated virtual care role.

Experience regarding Video Consultations

A key aspect of the PVC-RAM experience are video calls conducted between patients and registered nurses over the course of the 30-day intervention. A qualitative systematic review on the perceptions of videoconferencing in clinical settings by

registered nurses and midwives included 9 studies, with 6 of them focused on remote assessment of patients in home (Penny et al., 2018). Videoconferencing was found to be useful by providing more opportunity for care interactions and reduced travel for patients, but does not replace ‘real-life’ interactions, although was found to be more in-depth than telephone interactions. Video modality was also described as advantageous because it allowed for nurses and midwives to visualize patients for assessment, as well as to have collaborative care with family members. Some barriers to care included the increased work time required when utilizing this modality, as well as concerns with safety and privacy for the patients (Penny et al., 2018). Within an Ontario context for patient perspective of video-based virtual care, Kelley and colleagues (2020) conducted a mixed methods evaluation of a large pilot focusing on primary care virtual visits, both synchronous (video calls or phone calls) and asynchronous (messaging with healthcare providers). The majority of patients (87%) requested the use of asynchronous messaging over a video or phone call, potentially due to the burden on the patient to access technology. The participants were not wholly representative of the Canadian population, as the vast majority had high computer proficiency, post-secondary education, and yearly income above \$30,000 (Kelley et al., 2020). Additionally, in this intervention, patients were seeking out care themselves rather than being followed-up, and were doing so for mostly chronic medical concerns, rather than acute surgical complications. Both factors may have influenced the preference for asynchronous, rather than video-based virtual care.

In Norway, Rygg and colleagues (2021) explored the lived experiences of four oncology nurses following up with patients at home via video conferencing. The nurses described virtual care as a choice of video conferencing follow-up based on patient care need considerations, so as to not put undue burden on those undergoing cancer treatment, with considerations to patients' health situation, expected deteriorations in health, and seriously worsened illnesses (Rygg et al., 2021). Their experience also included using video conferencing on portable tablets to facilitate effective follow-up that provides reassurance to patients, and that virtual care can be adapted in person-centred and goal-oriented healthcare practices (Rygg et al., 2021). Overall, the nurses described many relational considerations for this vulnerable patient population, with great consideration for the individualism of care and appropriateness of utilizing technology. As oncology patients often undergo surgical intervention during their treatment, there may be overlap with considerations in both these populations.

In a study of primary care physicians who used video consultations for patients in Sweden, Bjorndell and Premberg (2021) found that the participants described that clinical experience and communication skills were key for video assessment, and that video consultation may reduce access to care barriers that exist for patients. The participants did note that the effectiveness of video consultation was contingent on whether the patient's condition was suitable for virtual care rather than in-person clinic visits, and some participants voiced worries that the accessibility of video consultations may increase healthcare resource utilization due to health anxiety (Bjorndell & Premberg, 2021). In the intervention of PVC-RAM, there are on-going monitoring and consultation via video

conferencing over a 30-day period, which may help to improve communication and decrease utilizing RPM resources due to health anxiety.

Arnaert and colleagues (2021) interviewed patients who participated in a similar intervention to PVC-RAM, tailored towards patients undergoing bariatric surgery in Quebec during the first 30-days of recovery at home. Five themes were identified about the 22 patients' experiences with this intervention: a readiness to embrace digital healthcare, a relief of burden to traditional forms of follow-up care (i.e., cost, time, comfort), access to immediate follow-up care, the care-related benefits of telenursing (i.e., psychosocial and interpersonal relationships), and need to adapt virtual care platforms (Arnaert et al., 2021). Focusing on improving similar interventions in the future, Arnaert and colleagues (2021) do caution towards both the varying intrinsic motivation and patient engagement to RPM interventions, as well as the need for validated follow-up tools and rigorous data on the number of measurements needed to make appropriate clinical decisions within the RPM context. Additionally, the authors do not mention the specific RPM system used for the intervention but note that the type may greatly impact the patient experience.

Overall, patients with medical conditions participating in virtual care interventions have reported similar perceptions: increased reassurance and support, increased knowledge, and empowerment. Clinicians have been found to be concerned with patient reliance or dependence on clinical support rather than self-management, as well as the increased or restructuring of workloads with the implementation of virtual care modalities. In a surgical population, over-dependence on clinician support may not be as

significant of a concern due to the temporal nature of the issue compared to an ongoing, chronic medical condition. As patients often do not have clinician interaction in the immediate period following hospital discharge, the finding of concern regarding reduced interpersonal interactions in patients with medical conditions may not be as relevant, as postoperative RPM such as PVC-RAM is not replacing, but rather in addition to the current standard of care. Additionally, there were found to be knowledge gaps, particularly in patient understanding of RPM interventions, which may lead to confusion of the level of clinical oversight involved, and the role and responsibility of patients and clinicians.

CHAPTER 3: Methods

A qualitative descriptive approach was used to explore the experiences of patients and clinicians participating in post-discharge virtual care during the onset of the COVID-19 pandemic. Qualitative description is a form of naturalistic inquiry that is focused on comprehensive summary of a phenomena or event, using everyday language (Sandelowski, 2000), and may be used when there is little to nothing known of a phenomenon (Bradshaw et al., 2017). There is flexibility due to low-level interpretation that can be atheoretical, allowing researchers to “stay closer to their data and to the surface of words and events” through rich description (Sandelowski, 2000). This contrasts with other qualitative methodologies that have specific theoretical underpinnings and require highly abstract inference of data (Colorafi & Evans, 2016). The purpose of qualitative description studies is aimed at the who, what, where, and why of events or experiences (Neergaard et al., 2009), making qualitative description well-suited for health research as it provides applicable knowledge regarding multi-faceted and complex phenomena or events for both practitioners and stakeholders (Colorafi & Evans, 2016; Loiselle, 2018). This methodology is often used when researchers aim to understand or describe a phenomena, process, or worldview of the participants, and the knowledge is gained directly from those experiencing it (Bradshaw et al., 2017). The main element of qualitative description within health research is that participants' description can be used as knowledge to influence and direct interventions (Sullivan-Bolyai et al., 2005). As the purpose was to understand and describe patient and clinician experiences of the post-discharge virtual care program, along with understanding facilitators and barriers to

improve for future iterations of the program, qualitative description was determined to be the appropriate methodological choice.

Sampling

Purposive sampling, which is a non-probabilistic method, is often used in qualitative health research as it aims to recruit and include participants who may provide information rich and relevant data (Luciani et al., 2019). There are three considerations in purposive sampling, according to Creswell and Poth (2018): the individuals or site of study, the sampling strategy, and the size of study sample. Maximum variation sampling, a type of purposive sampling method, was used to ensure adequate representation of the study population with an emphasis on heterogeneity. For clinician participants, consideration for characteristics relating to gender, age, clinical speciality, years of experience overall, and years of experience in perioperative care. For patient participants, sampling considerations included characteristics of age, sex, and type of surgery. Patients who had prior major surgery were prioritized in recruitment, to allow for comparison of the current surgery recovery with the patients' previous experiences. Initially, a proposed sample of 90 participants, with 30 patients, 30 virtual care nurses, and 30 virtual care physicians was proposed, or until information power was achieved. Information power was used in place of the more traditional data saturation, as it aligns with the constructivist lens of the chosen methodology, which allows for multiple truths for interpretation (Braun & Clarke, 2021). Information power is the justified and delineated point in which data collection can end due to the depth and richness of data (Malterud et al., 2016). Due to the local variations in care provided across the five research sites, an

initial sampling goal included minimum one participant per group (i.e., patient, nurse, physician) from each research site (Hamilton, London, Kingston, Ottawa, Ontario and Edmonton, Alberta), with a projected goal of 5 participants per group recruited from each research site. Traditionally, sample sizes of approximately 20 to 30 participants were typically deemed sufficient for data collection to cease, the point at which no new patterns or themes are generated by the researcher (Sandelowski, 1995; Marshall et al., 2013). However, a constructivist paradigm using information power would suggest that there is no adequate sample size, but merely a reasonable estimation by the researcher based on their understanding of the data (Malterud et al., 2016).

Recruitment

Following approval by the Hamilton Integrated Research Ethics Board, recruitment commenced. In August and September 2020, patient participants were recruited during their 31-day follow-up interviews via telephone, which was standard protocol for intervention participants in PVC-RAM main trial. These interviews were completed on the first day following the completion of the PVC-RAM virtual care intervention and were conducted by a site-specific research coordinator. The coordinator was not a clinician, to prevent perceived coercion for patient participants from their care team. If the patient indicated they were interested in participating in this study, their name and contact information was provided to the researcher, who subsequently contacted them by phone. During the initial phone call, the study was explained in detail to the patient by the researcher, and verbal consent was obtained if they were interested in proceeding with participating. At the time the patient consented to participating, a time and date for the

interview was arranged at the participant's convenience. During September and October 2020, clinicians, including physician and nursing staff, who participated in PVC-RAM across all five study sites were contacted by the researcher directly via email about the study and how to express interest to participate. Clinicians who emailed to express interest were subsequently contacted directly by the researcher by email. At that point, the study was explained to them in detail, and a time was arranged for telephone contact by the researcher at the participant's convenience, and verbal consent was obtained by the researcher over the telephone.

Data Collection

Semi-structured interviews were conducted by a single researcher between August and November 2020 with participants, with patient interviews commencing first. One-on-one telephone interviews was the method chosen for interviewing, due to provincial COVID-19 gathering restrictions, and comfort level of participants for in-person interactions during the pandemic. Phone calls were chosen over video to allow for more equitable accessibility for participants, and to circumvent cyber security concerns for the protection of personal health information being shared by participants over third-party platforms. The date and times of interviews were chosen at the participants' convenience, and the interviews were audio-recorded with participant permission, and subsequently transcribed by an independent transcriptionist. Open-ended questions were asked following an interview guide (Appendix A), with further follow-up questions guided by the participants' responses, as well as by previous interview data. Background

demographic data was collected during the interview, to give context and aid the researcher in conducting maximum variation sampling.

Data Analysis

Qualitative description (QD) interprets the meaning of participants' subjective experiences of events through rich description, while "staying close" to the data (Neergard et al., 2009). Braun and Clarke's (2006) reflexive thematic analysis (TA) was utilized, as its epistemology aligns with the chosen methodology of qualitative description. Both QD and reflexive TA employ a constructivist lens, in which meanings and patterns are generated from the researcher's subjective interpretation of the participants' experience, accepting that there are multiple interpretations of reality and no one truth to be determined (Braun & Clarke, 2021; Bradshaw et al., 2017). In contrast, many other qualitative paradigms in which themes 'emerge' from the data, implying that there is one objective truth to be found by the researcher within the data (Braun & Clarke, 2021). Reflexive TA does not employ a specific theoretical framework, granting for flexible and broad application to qualitative analysis, however when choosing a guiding theory or framework, the researcher needs to ensure that there is methodological congruence (Braun & Clarke, 2021).

There are six distinct phases of reflexive TA according to Braun and Clarke (2006): familiarization with the data, generating initial codes, generating initial themes, reviewing themes, defining and naming themes, and producing the report. In the initial phase, researchers often begin familiarization through transcribing the audio interview data, which some researchers argue is the beginning of analysis (Braun & Clarke, 2006).

Transcription was not employed as a method of familiarization in this study, as a separate, non-researcher completed the transcription due to time constraints and a large volume of data. Instead, familiarization commenced when the primary researcher did an initial review of the transcript, while concurrently listening to the audio file for each interview to ensure fidelity of the transcription. The transcript was then reviewed a second time by the primary researcher, this time without the accompanying audio file, to allow for consideration of the interview as a whole. All audio data was sent to the transcriptionist immediately following the interview, and was reviewed immediately by the researcher upon completion, to facilitate the ongoing, iterative data collection and analysis process (Braun & Clarke, 2006). Due to the large amount of qualitative data, all text-based data analysis tasks were completed within NVivo data management software initially by the primary researcher.

Coding was completed using an inductive and iterative approach, which can be described as “bottom-up”, in place of traditional line-by-line coding that is associated with grounded theory methodology (Braun & Clarke, 2006; Braun & Clarke, 2021). First, broad, and descriptive codes were generated that aligned with the research questions and were subsequently refined as more interview data was collected and reviewed. Using comprehensive codes on the onset of analysis, rather than detailed and specific coding, encourages researchers to consider the data beyond what is currently known and generate new meanings (Thorne, 2004). For example, during the coding process the researcher used “access to clinicians” initially, rather than “reaching out to virtual care team”, “requiring hospital care”, “follow-up with primary care”.

The third phase of reflexive TA analysis included the primary researcher generating initial themes through reviewing codes for consistent patterns, with combination of the codes at the discernment of the researcher (Braun & Clarke, 2006). Due to the requirements of the Hamilton Integrated Research Ethics Board, the patient interviews were completed first, and thus the participant groups were coded separately to allow for iterative coding while data collection occurred. Initial codes and themes were subsequently reviewed with a thesis supervisory committee member with previous experience in qualitative work and virtual care. As an iterative approach was used, the data collection and analysis happened concurrently and informed the research process in sampling and interview questions. In one instance, repeated mention of pay for physicians was noted, and questions were added in subsequent physician interviews to reflect this.

Patton's (2015) criteria for assessing internal homogeneity and external heterogeneity were utilized following data collection and identification of initial themes. The purpose is to assess if the data combine to create a meaningful and coherent theme (internal homogeneity), while maintaining recognizable distinctions between themes (external heterogeneity). This phase of data analysis in reflexive TA occurs in two parts: considering the specific themes, and contemplating the overall, broader meaning (Braun & Clarke, 2006). When considering the specific themes, all codes and the associated data were read, to reflect on a consistent pattern and readjust themes as needed. Following consideration of each specific theme, the primary researcher looked at the themes as a whole, to contemplate if there was an overarching message and meaning generated. As a result of the process of considering the data's overarching meaning, data analysis was

reconsidered and structured to include participant data as a whole, rather than analyzing patient and clinician data separately, as had been done initially. The reflection required at this point of data analysis allowed the researcher to consider the interwoven experience of patient and clinicians within a healthcare environment, and new initial themes were generated and subsequently reviewed as described previously. Following this, the new themes were reviewed by two thesis supervisory members, as well as a novice qualitative researcher, for the fifth phase of reflexive TA: define and name. Determining the essence, or what the researcher is capturing from the data, is integral to this phase and is elucidated through the naming of themes and sub-themes (Braun & Clarke, 2006). Braun and Clarke (2006) encourage rich and in-depth themes, while cautioning researchers on creating overly complex themes that may dilute meaning from data. As qualitative descriptive methodology was used, avoiding complex themes is important to ensure that the end result remains close to the participant's original descriptions. The interpretive narrative of the data is important to consider at this point, with each theme coherently related to it (Braun & Clarke, 2006). The use of triangulation with the supervisory committee and additional novice researcher allowed for consideration of a consistent narrative from the themes, different perspectives, and to provide new insights that allow the primary researcher to consider beyond their own observations (Patton, 2015; Creswell & Poth, 2018).

Conceptual Framework

Theories and conceptual models in healthcare help inform research and guide the development of clinical practice recommendations (Nagel & Penner, 2016) and with the

expansion of virtual care technology and application in healthcare, it is imperative that nurses incorporate ongoing theory-informed research to ensure they are providing safe and appropriate evidence-based care. Nagel and Penner (2016) created a conceptual model for telehealth nursing practice, to provide guidance in the complex delivery of holistic nursing care within this unique environment. Eight sources related to telehealth clinical practice were included, with four being qualitative studies, six related specifically to nursing, and a mix of telephone interventions (n=5) and a more diverse range of technologies (n=3). The key themes derived from these sources for the conceptual model include: (a) ‘creating a picture of the person and context into which the person exists’, (b) ‘knowing the person’, (c) ‘having pre-existing clinical knowledge, developing requisite competencies for telehealth’ (i.e., assessment, communication, relational practice), and (d) ‘decision-making processes with the person receiving care’ (Nagel & Penner, 2016). This was created as a relational and holistic model, in which the patient is not a passive recipient of services but is the central focus of outcomes and is engaged in all aspects of care. The conceptual model has ‘holistic, person-centered care’ in the middle, surrounded by the requisite nursing abilities of communication, assessment, and relational practice. Beyond the core, there are four intersected dimensions of telehealth nursing: ‘knowing the person (presence)’, ‘building a picture (contextualization)’, ‘clinical decision making (collaboration, prioritization, shared)’, and ‘nursing competencies’ (Nagel & Penner, 2016) (Appendix B). A limitation of this conceptual model’s application is that it mostly used data related to telephone-based telehealth and synchronous interaction between patient and client, which may be limited in application for the video calls and

asynchronous RPM data-based interventions in PVC-RAM. This conceptual model was used to triangulate findings during the data analysis process.

Rigour

To enrich rigour and trustworthiness of the findings, Lincoln and Guba's (1985) evaluative criteria were chosen due to their orientation to the concept of naturalistic inquiry, and therefore alignment to qualitative descriptive methodology (Sandelowski, 2000). A variety of both output- and process-oriented approaches were used throughout the research process to provide evidence of quality of the research and data produced through qualitative methods. Reflexivity was employed throughout the process to promote transparency and trustworthiness (Berger, 2015) – first, in a positionality statement, in which a portion is included in this thesis, and secondly, in ongoing reflective journaling throughout the data collection and analysis process.

Credibility is sometimes considered to be the truth or accuracy of the findings; however, this is not congruent with the study's chosen methodology and constructivist paradigm. Rather, credibility can be understood as alignment of the participants' experience and views, and the researcher's subsequent representation of them (Lincoln & Guba, 1985). Methods used to promote credibility include multiple triangulation methods: investigator (involvement of thesis supervisory committee), theory (Nagel & Penner's Conceptual Model of Telehealth Nursing), and data triangulation (patients, nurses, and physicians as data sources) (Carter et al., 2014).

Transferability is the ability to apply the findings of the study to future research (Stenfors et al., 2020; Lincoln & Guba, 1985), and was accomplished through the 'thick

description' of the context and methods of the study, as well as the use of maximum variation sampling to ensure a breadth of different experiences and contexts were captured in the findings.

It could be argued that confirmability is a positivist ideal of a singular truth, however, can be reimagined in a constructivist lens as the capacity to clearly connect the data to the proposed findings (Stenfors et al., 2020). By providing multiple descriptive quotes of each theme and sub-theme, the reader can determine if the construction by the researcher confirms their understanding of the reality of patient and clinician experiences in virtual care.

Dependability, or the ability to recreate the findings through the same research process and context (Lincoln & Guba, 1985) was not included as a method of trustworthiness, as it implies the ability of only one truth from the data, which is incongruent with the chosen methodology.

Ethical Considerations

Ethical approval for this study was obtained through the Hamilton Integrated Research Ethics Board (CTO#2172), through an amendment to the original PVC-RAM trial protocol. Informed consent was obtained by the researcher prior to conducting interviews and was done verbally over the phone due to the COVID-19 pandemic and subsequent gathering restrictions. Participants were explained the purpose of the study, their role in knowledge generation, the identity and background of the researcher, the objectives of conducting the research, and how the results would be used and/or published. Participants were informed they had a right to withdraw from the study at any

time, the right to decline the audio recording, as well as the ability to decline to answer any question they did not want to answer or have the audio recording stopped during the interview. An opportunity was given to participants to ask questions to the researcher prior to giving their consent, and then again after the interview was completed.

As the study focused on healthcare experiences, it was imperative that confidentiality and anonymity were maintained throughout the research process. For patients, it was to protect their personal health information, and for clinicians this was significant to feel comfortable speaking openly about their work without fear of retribution. Telephone interviews were conducted instead of video interviews to circumvent any issues surrounding cybersecurity and ownership of data that included health information, and to provide more equal access for participation. After initial transcription, all identifiers (i.e., names, geographic locations) were removed to protect the participants' identity. The digital audio recordings, researcher's notes from interviews, transcriptions, and demographic information were all stored on a password protected computer with an encrypted document with no identifying information in the title. The physical audio recordings were stored in a locked drawer and destroyed promptly following transcription. All digital files will be kept for five years, to allow for any potential audits or secondary analyses to be completed, and then will be permanently destroyed.

CHAPTER 4: Findings

This chapter reports the findings of the study and is separated into multiple sections to detail each theme and sub-theme. First, demographic data describing the patient and clinician participants will be presented, to give context to the sample of participants. Next, each of the three themes and their respective sub-themes will be reported with supporting quotes used to emphasize the participant’s descriptions and to ‘stay closer to the data’ (Sandelowski, 2000). The first theme, “*Virtual care is valued and holistic care, at home*” described how patients and clinicians valued having the opportunity to interact during a time in recovery that there is minimal oversight, in a way that was meaningful and valued for patients from multiple perspectives. The second theme, “*From a wide scope, towards a refined intervention*” describes that while the intervention had value to patients and clinicians, participants felt that there were ways to streamline or tailor the intervention to needs more appropriately. The final theme, “*‘A shared responsibility’: Significance of interdisciplinary collaboration*” speaks to the critical importance of frequent communication and established collaboration amongst all clinicians involved in care for PVC-RAM patients.

Demographics

Patients

A total of 21 patients participated in semi-structured interviews, with 13 females (61.9%) and 8 males (38%) total, with an additional two family member (i.e., spouses) who joined two participant’s calls and took part in answering questions. Most of the participants (n=18) had a previous surgery prior to their current surgery, which was

specifically recruited for to compare recovery periods. There was a range of surgical interventions patients underwent, including: cardiac bypass graft, hysterectomy, bowel resection, hernia repair, extremity amputation, various neurosurgical intervention, mammectomy, enucleation, and Whipple procedure.

Clinicians

In total, 10 nurses and 10 physicians participated in semi-structured interviews over the phone, and each study site had at least one clinician from each group participate. Nurses were all female, with mostly backgrounds in medical-surgical nursing, critical care, and post-anaesthesia recovery room. Age ranged from 22 to 55 years old, and a mean average of nursing experience of 18.4 years. No nurse participants had participated in virtual care prior to the PVC-RAM trial. Physicians from general internal medicine, general surgery, and anaesthesia participated in this study, with age ranges from 35 to 64 years old, and a mean average of experience as a physician of 16.3 years. A few physicians had participated in telehealth consults/calls before, but nothing that included RPM.

Theme One: Virtual care is valued and holistic care, at home

Patients and clinicians reported that post-operative virtual care and remote monitoring following discharge had value in both physical and psychosocial domains and provided care that would not have otherwise been accessible to patients in this period. Participants described that, alongside important postoperative physiological concerns, PVC-RAM presented a unique opportunity to provide emotional and social support to patients during a potentially isolating time while recovering at home, particularly during

the COVID-19 pandemic when there were social distancing and gathering restrictions in effect. Building trust and rapport with the care team, especially the virtual care nurses, and with the added benefit of visualizing one another through video conferencing, patients and clinicians described a holistic care model that was meaningful to participants. The sub-themes identified that encompassed this theme included: 1) *reassurance and security*, 2) *access to clinical expertise*, 3) “*My care was their priority*”: *Nurse-patient relationship*, and 4) *importance of visualization*.

Reassurance and security

Patient participants described an overwhelming sense of reassurance and security while participating in post-discharge virtual care, especially in comparison to previous surgical recovery periods, and often used the words “reassuring”, “security”, and “comforting” to describe the experience. As one patient described it: “Well, for me it was more the comfort of knowing there was a phone call away for any kind of problem.” (Patient 4). Most patients interviewed for this study had experienced a previous major surgery prior to PVC-RAM, and stated that they felt there were notable differences in how they felt recovering at home, that there was a ‘security’ in knowing that a clinician was frequently in contact with them, and they did not have to seek out access to healthcare and navigate it by themselves.

“It was wonderful because you had somebody checking up on you, and you knew that they would be checking up on you. So, you have a lovely sense – or I had a lovely sense of security.” (Patient5)

The reassurance and security were described as related to the consistency and easy access to the virtual care clinicians, as well as the openness and non-prescriptive nature of the interactions with the nurses and physicians:

“They were always there, and I could count on them. If I had any questions, I wrote them down and I had them ready to ask whoever my nurse was that day. So, I really liked that reliability. It was nice to have someone there every day, because every day some little thing happened, or you thought about.” (Patient2)

Patient participants noted that even if they did not have any complications post-discharge to home, it relieved their mental burden at home to know that there was a virtual care team overseeing their care and allowed them to feel at ease during their post-operative recovery at home. Participants who had experience with previous major surgery recovery at home noted that they noticed a difference in their mental well-being comparatively, and when asked, most patient participants felt that this should be implemented as a standard of care moving forward. Clinician participants also noted that they believed the program provided reassurance to patients, especially considering the context of the uncertainty at the beginning of the COVID-19 pandemic.

“What was very clear was that patients appreciated having someone to talk to, to explain these unexplainable things, right? Whereas perhaps they would have just suffered in silence and just kind of wondered, if we weren’t there.” (Physician2)

Clinicians recognized that the virtual care program provided an opportunity for patients to ask questions that may not have been addressed with standard of care visits due to time limits and the need to focus on major issues. The frequency of contact with clinicians

allowed patients to not prioritize their needs to only major issues, but rather were open to explore more day-to-day issues during their recovery period.

“I have a feeling that some of the patients wouldn’t have wanted to go in to the Emerg if they had problems or wanted to see their surgeon if they had questions. And so, in that way, knowing that we were going to call every day, I think gave them some reassurance” (Nurse 5)

Across all participant groups, the concept of reassurance and security for patients was brought up consistently, due to the frequency and nature of the intervention in a particularly vulnerable period, in the context of a significant worldwide pandemic.

Patients often emphasized in their interviews that these feelings were significant to their experience of the intervention.

Access to clinical expertise

Both patient and clinician participants highlighted that the access to clinical expertise during the PVC-RAM intervention was paramount to the patient’s experience. This included both the video call schedule, clinician-monitored vital signs measurements, and the 24-hour nurse-operated phone line. This was especially relevant considering the context of the COVID-19 pandemic, as there was wide-spread closing of in-person services, including family medicine offices and other clinic-based healthcare services.

“... Because we found that a lot of the doctors’ offices were closed, and a lot of the secretaries of those offices were working from home and they were so difficult to contact. So, I think if the patients didn’t have PVC-RAM they would be quite in a bind. They wouldn’t have anyone to contact, even if they were concerned about

anything. So, they would probably just end up going to the ER for little things, which would have just congested the emergency room, right?” (Nurse 3)

Patients reported feeling supported in their ability to navigate their post-operative recovery from home, knowing that clinicians were frequently contacting them, and that there was around the clock access to an emergency line. This allowed patients to feel empowered to handle issues that arose at home, including complex wound care, with the support of PVC-RAM clinicians.

“... I spoke to my virtual nurse, and she or he got the doctor and we discussed everything and got everything taken care of. And I went back to see the surgeon and had a few staples taken out, and she packed it for the first time and arranged for the wound care nurse to get in touch with me. I don't know that I would have done all of that. I probably would have phoned my doctor, but because of the pandemic I wouldn't have been able to go see him anyway. So, this was great. I didn't have to leave the house, all the help was sent to me, and it was just marvellous.” (Patient2)

Due to the frequency of video calls, patients had more opportunities to discuss a wide range of issues that included pain, wound care, sleep, eating, bowel routine, and activities of daily living such as house chores or maintaining hygiene. Frequent (i.e., daily for two weeks, and then every other day for the final two weeks) video calls with familiar nurses allowed for a low-pressure situation for patients to explore holistic concerns on a day-to-day basis in their recovery, rather than in an episodic, and brief, clinic visit.

“When you say that last question of how – would you have contacted a healthcare professional for anything if you hadn’t had a chance to talk to me? And most of them, they said no. But meanwhile we’ve talked about their bowel routine and healthy eating and exercise and norms for continued pain and continued tiredness. And what I liked was, I felt like they probably would have just been sitting and wondering, and I was able to give them some answers to maybe questions they didn’t even realize they had” (Nurse 5)

Patient and clinician participants felt that the access to clinical expertise was a noticeable difference to the standard of care for postoperative patients recovering at home they have previously experienced or provided care for, and found that this access to clinicians was valuable both within and outside the context of the COVID-19 pandemic. Some physician participants had a perspective that while it was beneficial to patients to have access to clinicians, they feared an over reliance on clinicians and monitoring was not an efficient or cost-effective choice – please see this explored more in the second theme’s sub-theme, *Tailoring intervention intensity*”.

“My care was their priority”: Nurse-patient relationship

Patient and nurse participants spoke positively of the therapeutic relationships that developed over the 30-day intervention period, and often reflected fondly on the experience. Patients noted that the relationship was not just focused on clinical data points and assessment - but were patient-centred and holistic in nature.

Oh, the nurses were absolutely wonderful. When we would talk, when we’d call every day, we’d have a couple of minutes just to chit-chat, just to see how things

were going, and in general how things were and how I was feeling and what my mental state was like. So, it made me feel very reassured, you know, that it wasn't just clinical, it was like, you know, they knew me. (Patient 3)

Patient participants stated they often had the same nurses for video calls and had developed a rapport with the nurses that they found they missed once the 30-day intervention was completed.

“The girls [nurses] are really good. ‘What time can we call?’ So, we had our mornings were organized around that. And to tell you the truth, after about a week, I missed those girls! [laughs] They were amazing. They were a lot of fun” (Patient4)

“Actually, I was very interested with them, and I think at some point we definitely had a bond going there with some of them. Which was very nice because I always anticipated in the morning to see who I was going to talk to. I was never disappointed because they were all wonderful” (Patient4)

Nurses described building therapeutic relationships with patients over the intervention period, and thought that the non-clinical settings helped to facilitate these interactions. Factors included following the same patient for an extended time, the reduced number of distractions with other care tasks, and the interaction with patients within their home environment. Social distancing measures and lockdown mandates were also mentioned as potential factors to fostering robust nurse-patient relationships, as patients were less likely to have routine social contacts during their recovery period.

“So, I think that all the patients with all our nurses, we really had good rapport. They felt really connected with us, and they’d say, “Oh, you’re back! How’s your weekend?” As we moved on into the weeks there’s a connection, absolutely there’s a relationship developing.” (Nurse1)

“I had a wonderful relationship with some of these patients. I think some of the older patients really looked forward to talking to me every day, and sort of saved up some other questions too that were health care related but not necessarily related to their surgery. It was a really great relationship to see a patient outside of the hospital as they’re getting better. You feel like you kind of get to know the real self, because in the hospital when they’re sick and they’re not feeling well, you don’t always get to know the real patient.” (Nurse5)

Having the experience of caring for patients in a different phase of their recovery, beyond their acute hospital phase, was brought up by multiple nurses as significant to their experience. Nurses found that it offered a more insightful perspective on individual patients, as well as of the overall process of recovering from major surgery in general, which some noted would be helpful in their understanding of acute care nursing, particularly regarding discharge instructions and organization. Nurses noted that they often have brief interactions with patients when in acute care settings, when patients are not feeling well, whereas the longitudinal nature of the intervention, coupled with the more relaxing environment for patients at home allowed nurses to foster more connection with patients. Some physicians also echoed this sentiment in their interviews, with one

participant noting:

“Personally, because I’m not a surgeon, it gave me a better insight to what happens to patients post-op. And even if I was a surgeon, and I’m kind of extrapolating here, typically surgeons would see the patients a few weeks after the surgery, but this gave me some insight into what’s happening to them in between, right? ... You get to see it as it’s progressing even. So, there was some good insight that I learned there” (Physician 2)

Importance of visualization

The use of video conferencing modality, rather than telephone, for regularly scheduled communication and assessment between patient and clinicians was noted by all participant groups to be an important part of the virtual care experience. For patients, the non-verbal communication that was afforded through video conferencing allowed them to build rapport and trust with the clinicians. Patients felt it was important to their experience that the clinicians regularly saw them, and that the intervention would not have been the same if it were solely telephone conferences with the clinicians. As one patient participant described:

Because you see a friendly face on the other side. I mean, the tablet computer is really, really good idea because you have a virtual meeting. So, you get to see the person talking to you and that makes it so much easier to relate to them, you know, rather than just a voice on the line” (Patient1)

Another patient participant elaborated on the impact that video conferencing had on their perception of clinicians seeing them holistically:

But I think the visual part of it was a big factor in why I felt so comfortable with them. And it was the same two or three people. It was always – you got a familiar face. I didn't feel like I was just another number on a page. I really felt like I was a person. But I think that visual of being able to see them and they could see me was part of why I felt that way.” (Patient21)

From a clinician perspective, both nurse and physician participants thought the video conferencing provided more robust assessment opportunities, as it provided visual data and did not rely solely on patient's subjective report. A physician with experience in telehealth reflects on the utility of video conferencing for assessment:

But when it came to wounds, I can't assess a wound on the phone. So, for wound related stuff it was integral ... Also, it was useful sometimes to get a sense, for the acutely unwell patients on video, like you can get a sense of how they're breathing ... It helps you make a better decision about it, they're acutely unwell or not. I found it quite useful. (Physician 5)

Both nurses and physicians found it important to visual patients before escalating care or recommending a change in treatment. It was noted that video modality was pertinent for assessment of wound care, both for monitoring as well as assisting patients in managing wound care at home.

“But it was nice to be able to still see them, video as opposed to just telephone as well, because then you could do a visual inspection of a wound and say, ‘You know what? That's actually not looking normal.’ Or ‘Yes, that redness around your staples that's perfect. That happens to some people. Don't worry about that.’

Whereas if it was just the telephone, then we would have lost that piece as well”

(Nurse 5)

Video conferencing was described as providing means for rapport and relationship building, while also presenting opportunity for clinical assessment. Participants often mentioned that the intervention would not have been the same if there was telephone conferencing used instead, and felt that video was an integral aspect to the intervention.

Theme 2: From a wide scope, towards a refined intervention

The virtual care intervention for the PVC-RAM trial was based on an already existing virtual care trial in cardiac and vascular surgery that utilized a different patient monitoring device platform, and was developed rapidly to address a need in the changing healthcare landscape due to the COVID-19 pandemic. These conditions meant that the intervention was designed to be broad in scope, to be more inclusive and capture a wider array of patients receiving urgent and emergent surgery at this time. This theme explored the operational aspects of the intervention more in-depth, including clinician workflow, considerations regarding intervention criteria, and potential barriers within the current model of care. This theme includes four sub-themes: (1) *Being more selective of patient populations*, (2) *Tailoring intervention intensity*, (3) *More clearly delineated physician roles*, and (4) *Remuneration for physicians*. While this theme does present the clinician experience more prominently, it did not solely include nurses’ and physicians’ participant data, as patients also commented on day-to-day workflow of the intervention, particularly in regards to how it impacted their experience, mainly regarding video call schedules and vital signs monitoring.

Being more selective of patient populations

As the PVC-RAM trial was not specific to a narrow patient population or particular surgical type, the intervention captured a range of patients undergoing different types of surgical procedures, ranging in complexity. Clinicians, both nurses and physicians, felt that this resulted in perhaps an over-monitoring of stable patients and potential misappropriation of health resource in a frequent and intensive monitoring schedule such as PVC-RAM. One nurse reflected that this type of virtual care intervention with frequent follow-up and video conferencing capabilities might better serve patients with more complex wounds, or those with major cardiac or gastrointestinal surgeries:

“I mean, certainly the majority of patients who go home after surgery wouldn’t have this. And I mean, I don’t think it’s necessary for everybody. We had some people on this study that they’d pop in; it would be a five-minute appointment because there’s nothing wrong with them. They have no issues. They’re just happy to be a part of it. But for some people, like those big bowel surgeries or the heart surgeries, they definitely seemed to benefit from it. Especially with the open-heart surgeries. Several of my patients had questions about their incisions or concerns about their sternal incisions, or swelling in their legs ... I think it really helped those people.” (Nurse 7)

Beyond considering the type of surgery, some clinician participants mentioned that using the intervention to access more rural communities and provide consistent follow-up to geographically isolated areas may provide a more meaningful impact due to the scarcity

of health resources in those areas. One physician reflected on his experience trying to arrange for outpatient services for these patients:

“I mean, it was probably the hardest to deal with the patients who were far away.

But I think I also made the most impact on those patients. Like I got them x-rays

and stuff, diagnosed the [... with out-patient, 17:42] and got it sorted out. I think it

was particularly helpful for those patients actually. (Physician 5)

While patients did not directly mention being more selective of populations included for the intervention, some did mention that while they found the experience overall to be positive, it may not have been necessary for them. Patient participants who did feel that intervention was not necessary for them, did reflect that they felt the experience would be beneficial for others, including those who were isolated due to the pandemic, or elderly patients with less oversight at home. Patients mentioned social supports at home and their prior medical knowledge as reasons why they may not have fully benefitted from such an intensive postoperative virtual care program.

Tailoring intervention intensity

The virtual care intervention for PVC-RAM included frequent video calls (every day for first 15 days at home, and then every other day for the following 15 days),

alongside two to three vital signs measurements a day for the 30-day intervention period.

Although patients mentioned overall positive experiences with the intervention, and felt it was a benefit in totality, they did note that it required a significant amount of time to participate in on a day-to-day basis:

“I mean, it takes some time to do your vitals three times a day, and you need to be organized in there, too, for your call and so on. But it was certainly a time investment that I figured was highly worthwhile to make.” (Patient6)

Patients and clinicians both mentioned that the frequency and amount of monitoring, both via video conferencing and vital sign measurements, could be reconsidered, especially towards the end of the 30-day intervention. Patients mentioned that their needs were not as intense at this point, and the calls generally were much shorter in length in the final weeks: “... towards the end I was getting a little bit tired of it [chuckles] because I was feeling so much better, and they didn’t really have anything to say.” (Patient 15)

Some patient participants also referenced that the entirety of the intervention had some level of burden to it, due to impeding their rest during a painful or difficult time in recovery, while others stated that the frequency of monitoring required them to change their routines to accommodate the vital signs measurements and video conferencing.

Despite the intensity and duration of monitoring, patients did often mention that they found overall benefit to the intervention, and some mentioned they understood that they understood that this was to be expected when participating in a study. As one patient stated: “So, you know, it was a little inconvenient occasionally, but the benefits totally outweigh the problems.” (Patient14).

Clinician participants had similar concerns about the frequency of monitoring, particularly the nurses who were directly engaging with patients daily via video conferencing and vital signs monitoring. Efficiencies needed in workflows, health human resource use, continued engagement of patients, and economic sustainability of the

programs were brought up as potential concerns in ‘over monitoring’ through virtual care. One nurse reflected that after the initial two weeks of postoperative recovery at home: “... Maybe it could be just a check in or something like that. Maybe the intensity kind of changes, and the need.” (Nurse 10). For the totality of the 30-day period, another nurse found the monitoring “... became kind of tedious a little bit”, and that the virtual care nurses found themselves “... trying to figure out how to make it more efficient and concise so we don’t have to take up too much of the patient’s time” (Nurse3), and that the patients in particular started to disengage and “...get a little more tired towards the end of the process” (Nurse 3).

Physician participants noted that they had concerns about potential ‘over monitoring’ and that too much intervention through frequent video monitoring and vital signs measurements may not be the best use of resources. As one internal medicine physician commented s:

“Are we monitoring the right things? Are vitals the way to go or is there something else that we can monitor that’s more indicative of patients actually running into trouble, or more indicative of something terrible happening? Because that’s what we’re trying to do. We’re trying to rescue people before something terrible happens. So, what are those markers and what is the technology needed to detect those? Is it actually necessary? And I’m speculating here, I’m just talking out loud. As much as patients love it, is it really necessary to call them every day?” (Physician2)

Other physician participants felt that the amount of patient data could become burdensome on rounds, and potentially distracted from real concerns, or “actionable items that needed stuff done” (Physician 4). Participants stated that it was integral for the virtual care nurse to triage the monitoring data appropriately, considering the volume of data being produced daily from video assessments and vital signs measurements. As one physician participant put it: “... I wasn’t surprised that patients loved PVC-RAM, but from a physician point of view, I wonder if it’s a good use of our time” (Physician 2). This participant noted they had concerns regarding physician burn out with adding additional clinical duties through intensive virtual care interventions, and that it would need to have value beyond patient satisfaction to mitigate this potential harm to physicians.

More clearly delineated physician roles

The PVC-RAM trial occurred across multiple hospital sites in five cities across Canada and was scaled up rapidly due to the COVID-19 pandemic, leading to a variation in physician coverage models for the virtual care intervention. These models were determined by the site primary investigators based on available health human resources, and feasibility. The physicians involved in providing care for intervention patients ranged from internal medicine specialists and sub-specialists, general surgery, and anaesthesia. In some centres, a singular physician was responsible for a determined period, while other centres adopted a hybrid model of internal medicine and anaesthesia physicians. In sites where there was a hybrid model of coverage, there was not a consensus amongst internal medicine and anaesthesia participants about what this model of care looked like: whether

it was a shared governance, or with a most responsible physician alongside a consulting service. This ambiguity in governance is reflected in this quote from an internal medicine physician:

“There was a second physician with me, who’s an anesthesiologist on call that week ... There was some confusion, maybe not confusion, but some ambiguity as to who was the primary person responding. Because sometimes when you have pain, for example, like the anesthetist certainly will have a certain view about post-operative pain, and then I would have my internist point of view. And it wasn’t very clear, well, who gets to say, ‘This is going to be the way forward? This is how we’re going to manage it; this is what the pain really means’. So, sometimes I wish that it was a little bit more clear. In my week, the anaesthetist sort of deferred to my opinion quite a bit. But I’m not even sure that that’s appropriate. [laughs] I just kind of said, ‘Okay, if you’re going to defer to me, I guess I’ll tell you what I think, then’, right? So that could have been made clearer.” (Physician2)

Anaesthesiologists involved in this shared governance model felt that the most responsible physician was, or should be, the internal medicine physician based on both the structure of call schedules and their expertise in managing multiple co-morbid conditions, with anaesthesiologists giving perspective on pain management and the expected post-operative recovery. This is reflected in the following quote from an anaesthesiologist:

“So, I think my perspective was that the internist was the MRP (most responsible physician). Because, based on scheduling, the internist was on the whole week. As an anesthesiologist we can’t guarantee – we don’t run a clinic, so I can’t be out of the OR for an hour every day. I can’t. I can make it happen for a few days a week ... And so, I felt more like the internist was the MRP. But then when there was a question of pain or “is this normal post-op?” it was a discussion for the group”
(Physician 4)

This sentiment was also echoed by a fellow anaesthesiologist, in the following statement regarding the physician responsibility structure in a shared governance/hybrid model:

“... I was not the primary physician in the care of the patient. I was part of the team, but I wasn’t the primary physician at our site, and it should be the internal medicine physician. So, my involvement, while active, was I would call it ancillary, so I wasn’t called about certain things overnight. My role was very much limited to the rounds, and my opinions during the rounds ... I hesitate to say it, but it almost would be like a consultant. That’s probably an incorrect way of putting it, but there were certain aspects of the care during which my opinion mattered more. But certainly, I was not the MRP (most responsible physician).”
(Physician 6)

In addition to variations in physician models for PVC-RAM, participants also mentioned the overlap in care provided by family physicians and the PVC-RAM virtual care

clinicians, and how this may have been due to the closure or ramping down of outpatient services during the beginning of the COVID-19 pandemic.

“During the pandemic it was ... because we were filling in a lot of the gaps that family doctors, like things that they would have been doing. It started pretty early in the pandemic, and not fully adapted to tele-medicine and virtual care yet. So, I think that helped. That also meant a lot more work outside of our scope, and administrative work, that we wouldn't have” (Physician 5)

Another concern was the lack of formalized communication to family physicians while patients were receiving care from PVC-RAM clinicians, as there was no structured communication until after the patient completed the intervention and a ‘discharge summary’ was sent to their primary care office. Some physicians interviewed felt that they were taking on responsibilities beyond perioperative recovery, to broader management of chronic conditions best suited for a primary care provider.

“And then another thing is that, I would say, like as I was telling you, we were dealing with issues which should be dealt with by the family doctor. Family doctors were not being kept in the loop because we were doing their duties. Or maybe their office was closed because of the Covid time. So, I don't know, like there were some issues, which are not especially related to the patient's post-operative medications. Their own medications, and that includes vitamins and all those 20 medications.” (Physician1)

Physician participants noted that they found it outside of the scope of practice they expected from a post-operative virtual care program, but understood that the intervention

was filling a gap during an uncertain time in healthcare services. Participants did note that moving forward, it would be important to have a structure in place to ensure that physician responsibilities for PVC-RAM were clearly delineated and allowed the opportunity to refer patients to their family physician for chronic management and non-postoperative issues.

Remuneration for physicians

In Ontario and Alberta, where the PVC-RAM trial occurred, physician compensation for clinical work is done through a complex billing system through the provincial insurance plan that includes fee-for-service models. The remuneration structure for physicians participating as clinicians for PVC-RAM was not abundantly clear to the participants, and seemed up to the individual physician about how to navigate this. When asked about how they billed for their clinical work, there was a variety of answers from the interviewed physicians, including not billing at all, billing for specific patient encounters, and billing for all instances. Reasons to not bill included: expecting that it was a research project without remuneration, not knowing how to bill for rounding on virtual care patients, or not having appropriate billing codes for certain activities related to virtual care.

“I mean, I think I went into it with the expectation that I might not get paid at all ... I guess I didn’t have any problems because it wasn’t clear to me that we were getting paid at all. What wound up happening was I only billed for the times that I actually called the patient and did some intervention there. The meetings themselves I could not really think of a way to justify billing for those times. So

yes, I think there are still some questions left as to how are we going to be remunerated for this kind of work, absolutely.” (Physician2)

The most common activity not billed for by the physicians was virtually rounding on the PVC-RAM patients, an activity that occurred at least once daily, with variable time requirements based on patient load and acuity.

“So, unless you had to specifically intervene ... so then I billed for that. But for our daily rounds and things like that, which is the most time-consuming aspect of it, there was no billing.” (Physician7)

Often, physicians mentioned that they only billed if they had to conference with a patient individually, either by phone or video, to assess or discuss a particular concern.

“So that’s very complicated and I actually struggled with recruiting other internists in my group because of that problem. The time spent doing rounds, I don’t know maybe at other centres they billed for it, but the time spent doing rounds I didn’t bill for any of that. If I did a separate visit with a patient, like a virtual visit, which to be honest I think I only did one, over the phone, I did a phone call with the patient, I billed for that because that was like a separate event...But I do think that that’s a bit problematic going forward, in terms of getting buy-in from multiple physician groups.” (Physician3)

As mentioned above, due to unclear remuneration structure for clinical work, physicians recounted both having difficulty recruiting physicians to participate in providing clinical care for the intervention patients, and were concerned with sustainability of the intervention moving forward. Physician participants described their clinical work as

volunteer, on top of their other clinical duties:

“To make it sustainable, it has to be. I mean, I volunteered an hour of my day for a week. Like it’s not that big a deal for me from a research perspective. I know the researchers here and so I was happy to help. But I know that that was prohibitive for many people in my department, to take an hour out of a Saturday and Sunday in the middle of the summer to – like, that’s okay... It’s fine. And I did it. But if this were a long-term thing, goodwill is going to start to wane. So, I think that there has to be a financial incentive to it. I feel like I’m a good person, I’m happy to volunteer my time, but weekend summertime is so precious” (Physician4)

“And so essentially this falls into volunteer work in its current form, unless they were to change the billing code, this is essentially volunteer work and, therefore, unsustainable in a grander approach.” (Physician6)

There was at least one physician interviewed who did state they billed for their time at PVC-RAM and felt adequately compensated for their time, and did share that they had previous experience billing for telehealth services and felt competent in navigating this. Overall, most physicians stated they were usually not remunerated for their time providing clinical care and medical oversight to PVC-RAM patients, but did not expect typical compensation due to the care being delivered in the context of a study. Some participants did comment that this would need to be changed in long-term practice to have buy-in from physician colleagues, but acknowledged that this would require change at the provincial level.

Theme 3: “A shared responsibility”: Significance of interdisciplinary collaboration

The final theme relates to the collaboration and communication of the clinicians caring for PVC-RAM patients; most notably the virtual care nurses, PVC-RAM physicians, and the surgeons responsible for the patient’s operation. The sub-themes include: (1) *A need for formal integration of surgical teams*, (2) *positive working relationships amongst PVC-RAM clinicians*, and (3) *A need for information systems integration*. These sub-themes explored the importance of making connection and having established ways to communicate with colleagues, to ensure safe, expedient care for PVC-RAM patients. As this pertains to collegial relationships amongst clinicians, no patient participants interviewed mentioned experiences related to this theme, and therefore the data used to generate this theme was compiled from nurse and physician interviews.

A need for formal integration of surgical teams

As mentioned in previous sub-themes, the physician coverage model for PVC-RAM varied in each study site, and could include internal medicine specialties, anaesthesiologists, and/or surgeons. Multiple clinicians from a variety of study sites mentioned that there was a lack of formalized communication and consultation with the patients’ surgeons. As a post-operative virtual care program, clinicians felt that it was imperative the surgeons be involved in PVC-RAM, especially regarding surgical issues and complications:

“I don’t know how it was at different centres, but a bit more surgical engagement

for some of the more specific surgical issues ... or engaging them somehow.

Because some of these things are their responsibility and I don't think that should be completely taken away from them. And I think many surgeons like to know that their patients have had problems.” (Physician3)

Non-surgical physicians providing care to PVC-RAM patients stated that they would appreciate having the ability to consult the patient's surgical team regarding more complex postoperative issues, such as the following scenario regarding a potential wound infection described by this participant:

“But there was one instance where I had reached out to – we had seen a wound and I was getting a little bit concerned ... I reached out to the surgical group with a picture, and they kind of said, ‘Okay, well, we’ll keep an eye on it. We’ll bring the patient in’. And then two days later the patient still hadn’t heard from them. The wound was getting worse ... so I made the executive decision to start the patient on antibiotics until they could be seen, and emailed again the group of surgeons and said, ‘You know, I’m concerned about this wound’ and got a little bit of a negative response initially in terms of ‘We don’t start a patient’s on wounds, even if there’s purulent discharge, sometimes that’s normal’. It was a little bit frustrating because we had sent the pictures and didn’t really get that interaction. And only when we kind of took action ... I was kind of given a bit of a slap on the wrist, that that wasn’t the proper thing to do from a surgical perspective, yet had been given very little direction prior to that ... So, I think

there would have been better – there could have been better interaction with our surgical colleagues themselves.” (Physician 7)

Participants felt that more formalized ways of communicating and engaging surgical team members with the postoperative virtual care intervention would allow for more open collaboration, less time potentially wasted from trying to get in contact with one another, and more streamlined and consistent care for the patient. Some non-surgical physicians in PVC-RAM stated that they did not feel that it was necessarily appropriate for them to assume to be ‘most responsible’ over surgical and postoperative issues that would normally be the responsibility of the surgical team, if the patient had not received the virtual care intervention.

“I think there was a bit of a frustration that we were assuming care and responsibility for surgical procedures that we were not involved with at all in terms of either pain or wounds or some of the complications of, you know, a patient after urological procedures having issues with voiding and those types of things. And that there was a bit of a middleman issue in terms of communicating back to the surgical group, yet feeling that you have a sense of responsibility to the patient to address the issue. So, I think that more direct involvement from the surgeons would be very beneficial.” (Physician 7)

Participants stated they did not think it was necessary to forgo models of care with internal medicine and/or anesthesia as PVC-RAM clinicians, but rather felt that surgical teams should be included in a formalized consulting aspect to the ongoing management of the postoperative patient at home.

Positive working relationships amongst PVC-RAM clinicians

The virtual care nurses and physicians worked alongside each other daily to provide care for patients, most without prior experience providing care in this capacity, and within the context of a significant pandemic. Most nurses providing care to PVC-RAM patients were redeployed to the study from various areas in the hospital with a range of nursing experience. With a diverse background of knowledge working together, one nurse participant described it as: "... we all kind of see each other's strengths in a different light" (Nurse 7). Nurse participants described informal consultation amongst the nursing group to validate assessment findings and collaborate on appropriate next steps. Some nurse participants likened it to mentorship found in other areas of direct nursing care, with one participant stating "... it was really kind of, very similar to any team nursing. If you work together you're more powerful. That's for sure." (Nurse10) Other nurses described the consultation experience as being able to 'bounce things off one another' (Nurse 5), or as explained below:

"Any time I had a concern, the nurses we would talk to each other first and then kind of decide, does that need to be escalated to the physician on-call or not? ... So yeah, there was often daily collaboration and also a review of patients every day. So good communication, good collaboration." (Nurse6)

“... you may have taken care a patient who’s not on your team anymore, someone else has them, and they’re asking questions. Like, ‘Oh, did anyone else notice this on their assessment?’ Or if we had trouble getting a hold of someone, ‘Were people able to get a hold of this person? Is it usual that they wouldn’t pick up?’

Like, ‘Oh no, he’s at his trailer this week. Here’s the number.’” (Nurse7)

Nurse participants also spoke about the teamwork that occurred navigating the virtual care technology required for the intervention, which was integral to their daily workflow. This included understanding how to utilize the video conferencing program, navigate the Cloud-DX platform for monitoring vital sign measurements, how to access wound photos, submitting electronic documentation, as well as to develop proficiencies in troubleshooting the Cloud-DX patient monitoring kits for patients.

“I remember there were a few nurses who weren’t as savvy technologically as some of us younger crowd, and that sort of posed a bit of frustration at the beginning. But ultimately, we were able to work it out, just as with any kind of change, right? ... That was a big part of the beginning, yeah.” (Nurse4)

Both nurse and physician participants described overall positive experiences with working alongside one another, with nurses describing the PVC-RAM physicians as “open and available ... very respectful” (Nurse 5) and “very supportive” (Nurse 9)

The PVC-RAM physicians accounted that they relied on the assessment of the virtual care nurses, especially during daily rounding, stating that: “We got a lot of information just from the nurses interaction, which acted like a second opinion. So, it’s always good to have two different eyes on the same issue” (Physician2). Physician participants

acknowledged that communicating about the patient's condition with the virtual care nurses was important, as they had frequent contact with the patient and had a reliable baseline:

“I think being able to talk it out with the nurse was helpful. And especially because they know the patients better, they've been following them longitudinally” (Physician5)

Physician participants mentioned that there was trust and rapport built with the virtual care nurses after working together, and nurses were able to triage patients' needs appropriately and were adept at assisting patients independently when possible, so that physicians could focus on the patients requiring intervention. This was particularly helpful for physician workflow, especially if the physician had additional clinical or administrative duties while covering PVC-RAM.

“The nurses did an excellent job of picking up people who were having problems, and then I could focus on those; and if there were people who were fine, then I could basically let those go, right?” (Physician9)

“Yes, I was definitely doing clinical service and it was a bit stressful at the beginning, trying to make sure that there was no issue. But you know what? It actually worked very well because, fortunately, the nurses were very experienced” (Physician10)

There was also collaboration amongst physician colleagues, particularly at study sites that adopted a hybrid model of internal medicine and anaesthesia simultaneously providing

coverage. Internal medicine physicians mentioned appreciating the expertise of anaesthesia regarding pain management for surgical issues, including accessing services in the community:

“It was a shared responsibility. We don’t have a dedicated perioperative service at the [hospital] ... So, we didn’t have an MRP. We had a shared responsibility. I would say that in the majority of cases, probably internal medicine took the lead, unless it was directly a pain-related issue ... anesthesia felt a bit more comfortable with the process given their involvement in kind of pain management clinics and things like that. So that was the original driver to have the collaboration ... it went very smoothly, and it was helpful ... If somebody for some reason was called away urgently to do something else, then there was still the availability of a physician to be there to attend the rounds.” (Physician7)

Physicians in the hybrid model also described learning from one another, and appreciating the opportunity to build their own competencies through informal, peer learning in clinical encounters:

“... we were kind of in a unique situation where anesthesiologist and internal medicine docs were involved. I really liked that dynamic. My specialty is not chronic hypertensive diabetic management at all. So, I couldn’t really contribute to those types of discussions, but when it was pain management or we had an acute patient that we had to call in to come in urgently to the hospital, and I can probably talk about that example a bit more later, but that part was very relevant to me. And I felt like I could contribute to that component, of when to be

concerned and also kind of what's within the realm of normal immediately post-operatively. I loved it because I learned a lot, sounds selfish, but I did. I learned a lot. I think it was really neat to do rounds with an internist and to hear their perspective on managing hypertension. I thought it was really valuable for everybody.” (Physician 4)

Some participants did mention more neutral descriptions of their collaboration with other PVC-RAM colleagues, mostly due to lack of opportunity interaction, for example between physician colleagues in sites where there was a singular physician coverage model.

A need for information systems integration

As PVC-RAM was an at-home virtual care intervention that occurred after hospital discharge, all charting for the program occurred within a separate electronic record supported by Cloud-DX, and documentation was done by both virtual care nurses and physicians. Physician participants mentioned that integration with the hospital system's electronic medical record (EMR) would allow for a more continuous and accessible way to document and track patient care. Physicians mentioned that there was also duplicitous charting happening due to the multiple EMR associated with caring for PVC-RAM patients:

“The other big thing is that it requires a lot of infrastructure, it's integrating this with electronic health records at the hospital. That's a patient safety issue and it's also a workload issue, right? We're documenting in PVC-RAM, in the Cloud DX, we're documenting there, and then we're also doing the paperwork that the patient

needs, and then documenting stuff again in the electronic health record of the hospital ... For the one visit, I'm documenting two different places. That's really inefficient and also prone to error.” (Physician5)

Relative to the previous sub-theme relating to remuneration for physicians, some participants mentioned that lack of EMR integration was a barrier for them billing for their services, including daily rounding, as they needed to document properly to do so, and the study-related documentation on the Cloud-DX platform was not sufficient for this:

“And part of the problem ... is you can't bill for something unless you document it in the patient records. So, there was no way to really document what we were doing on rounds, because those patients weren't entered into our medical records system and there was no visit linked to my name.” (Physician3)

Physicians mentioned operational issues with using the allowances of their hospital EMR, including in terms of their speciality and the ability to utilize this in an outpatient setting. For example, an anaesthesiologist describes issues generating a prescription for a patient at home, as they usually do not see patients outside of the hospital setting:

“... we did have to fax over a prescription for a patient ... the problem that I had was I was unable to generate a script by virtue of the fact that our current electronic medical record did not permit me to do so because that is outside the scope of my regular practice.” Physician6)

Most physicians felt it would be important that if post-operative virtual care interventions became standard of care, that it would be imperative to integrate the EMR with hospital

systems. Continuity of care was the biggest motivator towards this, with consideration to being able to understand the patient's hospital course and also be able to have virtual care data accessible to hospital staff if patient presented to the emergency department and/or was readmitted.

Conclusion

The experience of patients and clinicians across the five sites of PVC-RAM presented a constructive but optimistic view of virtual care and RPM used in post-discharge recovery for surgical patients. Care was described in a variety of patient-centred ways, that brought reassurance to patients and families during an uncertain time of a pandemic, and the teamwork of the virtual care team was important to support this. The intervention itself was noted to be intensive from both the expectations of the patient and from a human health resource perspective, and perhaps could be more tailored towards certain populations who could best benefit from such rigorous monitoring during recovery.

CHAPTER 5: Discussion

This chapter will review the main purpose of the study and summarize the key findings of the experiences of patients and clinicians participating in the PVC-RAM trial, a post-operative virtual care and RPM intervention that occurred within the context of the COVID-19 pandemic. These findings will be discussed in relation to the conceptual framework for telehealth nursing developed by Nagel and Penner (2016), as well as relevant literature. Implications and recommendations for future practice application and research will be explored in this chapter as well, alongside considerations of the limitations of the current study.

With the advancement of technological abilities, virtual care and other telehealth modalities have been considered in a variety of circumstances to optimize delivery of care and reconsider current provision of healthcare services. The recent COVID-19 pandemic has provided an opportunity to explore how virtual care can be utilized, with a particular focus on access to care continued during government restrictions and increased demands upon traditional healthcare delivery systems. When implementing novel healthcare service models, particularly technology-centered, it is important to consider not only if it can address a clinical issue or impact a measured outcome, but also the acceptability and experience of the patients and clinicians using the technology (Liddy & Keely, 2018). End-user experience and adoptability are particularly important in instances when there is a divergence from traditional care models, such as the virtual care and RPM intervention

of PVC-RAM. As there is limited understanding of the perspective of end-users in home-based virtual care and RPM care modalities, especially within surgical patient populations, the purpose of this study was to describe the experiences of patients, nurses, and physicians who participated in a post-operative virtual care and RPM intervention at home following urgent and emergent surgery. To support future iterations of post-discharge surgical virtual care and RPM, the second purpose was to explore the facilitators and barriers of the intervention from the perspective of the end-users of the technology. The main findings of this study are: (1) patients value the holistic care and access to clinical support through video-based virtual care, (2) patients and clinicians did not find the virtual care intervention burdensome, but refinements to intensity of schedule may ensure ongoing acceptability and sustainability of resources, (3) collaboration and formalization of responsibility structures are important for cohesive care. This is an initial study in an emerging body of research exploring patient and clinician experiences of virtual care in the surgical patient population; a previous review by Gunter and colleagues (2016) note that only survey data was available. Most of the current literature is focused on virtual care within chronic medical populations with less intense or asynchronous interventions, and often do not consider the experiences of patients and clinicians as a cohesive, but rather as distinct entities.

Key Findings in Relation to Literature

Overall, participants in this study described the experience of virtual care positively, highlighting that they perceived the intervention as valuable and meaningful for patients during their post-operative recovery at home. A generally positive patient

experience is often expressed in virtual care experience literature, (Gunter et al., 2016; Slightham et al., 2020; Fairbrother et al., 2013), although it can be vaguely described without specific words to express what is positive about the experience, perhaps due to limited survey data. In this study, through semi-structured interviews patients and clinicians described that the intervention went beyond their understanding or previous experience with the current standard of care for post-discharge surgical patients, and provided reassurance, unfettered access to skilled clinicians, connection through video medium, along with the ability to develop therapeutic relationships over time. Patients and clinicians both identified reassurance and access to clinical care as integral to this intervention experience, particularly in a time described as vulnerable or isolating, exacerbated due to pandemic restrictions on healthcare services and social distancing measures in place.

Nurse participants described that the frequent video calls facilitated the development of meaningful therapeutic relationships with patients and their family members, with patients echoing that the continuity of clinicians over time allowed for building of trust and respect. Video calls have mostly been presented in previous studies as a comparable option to in-person videos, with the exception found in a Canadian study focused on video follow-up primary care where most participants preferred in-person (Kelley et al., 2020). Most virtual care interventions described in current literature do not include video functionality, but rather are telephone or smartphone based (Farias et al., 2019), which restricts communication to only verbal/text-based mediums. Other studies describe patients that are concerned about the impact of virtual care on developing

relationships with clinicians or replacing in-person care opportunities (Walker et al., 2019). As the PVC-RAM intervention was not a substitute but was rather in addition to the current standard of care, this may have mitigated the impact of concerns surrounding video calls in this context.

Physician participants described a more unique experience than the nursing and patient participants, which may be due to reduced face-to-face interactions with patients and the virtual care technology itself, compared to nurse participants. The shared experience between nurses and patients existed in day-to-day interactions with video calls and monitoring virtual care data, while physicians had a more of an oversight role within virtual care. Participants noted refinements that could be made to the intervention in future iterations which would allow for a more focused and sustainable approach that prioritizes more purposeful care encounters and a reduced intensity of intervention. The inclusion of the perspective of the experience the clinicians personally had interacting and providing care through virtual care, rather than the physician's perspective of the patient's experience and care trajectory, is a relatively unique perspective offered by this study.

Clinicians, both nursing and physicians, had a more nuanced description of their experience, that mentioned some positive aspects mainly geared towards patients' experience and value to their recovery process, with some criticisms of interventions (Lanssens et al., 2019; Cox et al., 2017). This study reflects a similar pattern in findings, in which patients described an overall positive experience with some general areas for refinement of the intervention. In comparison, nurse and physician participants had more robust and tangible criticisms for improvement. Patients may have less to critique about

the intervention for multiple reasons, including a less robust understanding of healthcare systems, heightened emotional connection to the program, and recognition that the intervention provides care beyond the current standard. Comparatively, clinicians experience of an intervention is focused on workflow and efficiency (Lilijeroos et al., 2020), and are aware of how care is delivered in other settings, providing comparisons to then which base their suggestions for future improvement.

Reassurance and security for patients is a frequent finding in literature when describing experience in at home virtual care interventions, attributed to both patient and clinician participants (Fairbrother et al., 2013; Fairbrother et al., 2014; Seto et al., 2012; Walker et al., 2020a; Walker et al., 2020b; Walker et al., 2019; Cox et al., 2017; Timmermans et al., 2019; Lilijeroos et al., 2020). This was a significant finding in this study as well and reflects the intangible value patients find in virtual care, and demonstrates that patients can adapt to innovative methods beyond the current traditional models of healthcare delivery.

Virtual care and RPM in chronic medical conditions population highlight concerns from clinicians regarding patient over-reliance on program and decreased ability to participate in self-management or active engagement with care processes (Fairbrother et al., 2013; Fairbrother et al., 2014; Seto et al., 2012; Fraiche et al., 2021). These themes were not found in the current study, which may be related to the difference in care trajectory and patient ability to be self-sufficient in care for ongoing chronic disease medical management compared to acute surgical recovery. This demonstrates the need to explore virtual care experiences for surgical patients, as there are distinct considerations

and needs not represented within chronic medical populations. Clinicians in both the nursing and physician groups described how important ongoing collaboration and communication with the patient's entire care team (i.e., surgeons, family doctors, wound care, home care) is to effectively care for surgical patients recovering at home with virtual care. As post-discharge surgical patients are being cared for in a less traditional environment, there is not a current standardized responsibility structure for physicians, which can potentially lead to confusion for patients, interpersonal conflict between care teams, or gaps in care delivery. Formalization of care models and integration of surgical teams, with a standardized approach to responsibility over the patient would allow for more comprehensive and cohesive care in future iterations of post-discharge virtual care in surgical populations.

An unexpected finding was the significance of remuneration to physician experience, and how the practice of compensation for clinical work in the intervention varied across physician participants. Remuneration was not a subject initially raised by the interviewer, but became a recurrent concept in physician participant interviews, leading to adaptation of the interview guide to include a question specifically for physicians. The interview guide for nurses was not adapted, as their pay was a standardized per-hourly rate, consistent with acute bedside care. No virtual care experience literature makes mention of remuneration for physicians, but this may be because a significant portion (over one third) of virtual care studies occur in the United States, which does not have publicly funded healthcare that relies on government billing structures (Farias et al., 2019). Appropriate and standardized remuneration for physicians

participating in virtual care will help to ensure sustainability of providing care in these modalities, however it can be constrained by current billing codes within the Canadian provincial healthcare systems. Adaptation of virtual care RPM to supplement coverage with salaried nurse practitioners on a salaried position may be an option to explore in future interventions if lack of remuneration impacts physician ability to engagement with virtual care.

A Conceptual Model of Telehealth Nursing Practice

The core concept of Nagel and Penner’s (2016) conceptual model for telehealth nursing is ‘holistic, person-centered care’ which is parallel to the first theme of this study: *‘Virtual care is valued, holistic care at home’*. Furthermore, three of the four intersecting dimensions of the model (Appendix B) are congruent with the first theme’s sub-themes: *“‘My care was their priority’”: Nurse-patient relationship*, *‘Importance of visualization’*, and *‘Access to clinical expertise’*. Patients should remain central when innovating care delivery methods, and recognition that high quality care is multi-faceted and considers the patient in totality. Developments of a synchronous RPM intervention should consider this when designing care models due to the lack of interpersonal connection through technology, to ensure patients, not data points, are the focus.

“‘A shared responsibility’”: Significance of interdisciplinary collaboration, the third main theme of this study and its sub-themes are representative of the final intersecting dimension of the conceptual model which describes clinical decision making as collaboration, prioritization, and shared (Nagel & Penner, 2016). Virtual care should prioritize the inclusion of all relevant stakeholders and promote shared decision-making,

including with patients and caregivers. As innovative virtual care models do not have a standardized approach at present, there should be conscious effort to minimize redundancies (i.e., patient reporting symptoms to wound care nurse, virtual care team, and surgeon), optimize resources, and promote open communication amongst all members of the care team, especially those not directly involved in the virtual care intervention.

Implications for Research

The findings provide a unique insight into the day-to-day experience of patients and clinicians participating in a post-discharge virtual care RPM intervention, in easily accessible language with suggestions on optimization of the intervention. As the findings of this study and others in literature demonstrate that patients and clinicians generally accept the use of virtual care technology to augment care delivery, research should address how to integrate virtual care into mainstream healthcare services. Research should be focused on resource and cost optimization, while ensuring opportunity for meaningful connection between patients and clinicians to not degrade the experience described in this study. This study has informed the protocol and interventions of several ongoing virtual care studies, including two new iterations of the PVC-RAM trial. The information gained from the second theme helped to streamline the virtual care delivered while still maintaining the aspects that were particularly notable to patients (i.e., access to clinicians during recovery, video chat over phone). Qualitative studies exploring the experience of end-users in the new PVC-RAM interventions would help to build upon the knowledge gained from this study, allowing for continued optimization and refinement of virtual care in surgical populations

Future studies within virtual care should evaluate the populations who would be best suited for these types of interventions, and how experiences may differ in how these groups interact with technology and virtual care. This includes: the type of surgical patient, patient age, patient's comorbidity burden, patients in rural and remote areas, and those with reduced social and economic supports, and a variety of healthcare teams (i.e., registered nurse, registered practical nurse, nurse practitioner, internal medicine physician, surgeon).

Implications for Practice

The Quintuple Aims (Nundy et al., 2022) is a widely used framework for designing and optimizing effective healthcare systems and include patient experience, reducing costs, population health, provider experience, and recently expanded to include health equity. Ontario's Ministry of Health's current vision statement for building sustainable healthcare (Ministry of Health, 2019) is based around the previous Quadruple aims, and is focused on integrated health services that provide improved care at transitions and reduce unnecessary access of acute care services. With patient experience of healthcare delivery, a key component of the Quintuple Aim, the intangible value of patient assurance and support afforded through non-traditional healthcare models should be considered when deciding on priorities within the broader healthcare system.

Within the Quintuple Aim framework, provider experience is included to acknowledge the impact of the clinician's well-being on providing effective healthcare. To ensure sustainability of physician involvement and oversight in clinical activities of RPM interventions and prevent burnout due to expanding work obligations, remuneration

for virtual care activities should be addressed to provide appropriate compensation for their time and expertise. Furthermore, if virtual care becomes standardized in the approach to care for patients at home following major surgery, protected time away from traditional duties to provide clinical support should be afforded to physicians.

Reducing expenses, focused upon cost-effective measures that are sustainable, allowing for reduced resource utilization while maintaining safe and effective care is a core concept of the Quintuple Aim framework (Nundy et al., 2022). The resource commitment and financial investment of healthcare institutions needs to be considered when applying a virtual care RPM intervention, due to the amount of health human resources required for an intensive post-discharge virtual care interventions like that of PVC-RAM.

The newest concept to the framework, health equity, is defined as the state in which everyone has the opportunity to reach their health potential, without obstructions or disadvantages due to social position or circumstance (Nundy et al., 2022). A fundamental finding in this study was that the continued and easy access to clinical expertise and care was a significant component of patient experience. Consideration is needed of how this finding can be adapted to improve access to care in more disparate or disadvantage groups, including those in remote/rural communities, indigenous populations, older adults, patients with low socioeconomic status or those with unstable housing, and those with minimal social supports.

Limitations

This study had several limitations, some of which were contextual and unavoidable. The study took place within the context of the beginning of the COVID-19 pandemic, with the PVC-RAM intervention occurring within the first 6 months, and this study's interviews conducted within the first 9 months. As this was a significant, worldwide event that had immense influence on many facets of human life, the experience of the participants may have been impacted. This includes how participants perceived access to healthcare, value of social interactions and therapeutic relationships, anxiety around health and well-being, and the potential burden in participating in a high-intensity intervention. To attempt to mitigate the context of recovering from major surgery at the onset of a significant viral pandemic, the study was designed to prioritize the recruitment of patients who had experienced a previous major surgery, defined as staying in hospital at minimum overnight, to compare their recovery period in virtual care with the previous experience. The inclusion of questions regarding comparing previous surgical recovery periods for patients, as well as inquiring whether participants thought there was value in offering similar interventions beyond the pandemic, helped to elicit considerations beyond the specific context the study existed within.

The patient population included in the PVC-RAM intervention were all adults receiving urgent and emergent surgeries and therefore included a broad range of surgical interventions across cardiac and non-cardiac surgery (i.e., general surgery, vascular surgery, neurosurgery, otolaryngology surgery, urology, obstetrics). With a large variation in surgical populations presents several different factors including risk factors

for complications (Spence et al., 2019), differences in length and acuity of recovery periods, and a range of potential additional medical interventions patients experienced concurrently with virtual care (i.e., wound care, chemotherapy, etc.). Patient experience, particularly regarding the suggestions for improvement and refinement of the intervention, may have captured a wide breadth of suggestions, that have limited application when applied to very specific subset of patients.

Due to requirements for ethical approval, there was a limitation imposed on the recruitment of patient participants. As this was a sub-study of a larger randomized controlled trial (PVC-RAM), potential patient participants were not allowed to be contacted beyond the previously agreed upon period set forth in the main trial. Therefore, patient recruitment was only permitted during the 31-day follow-up interview for the main trial, which occurred the day following the end of the intervention period. As a result of this restriction and the timeline for receiving ethical approval, only the final one-third of the patient population from the intervention were eligible to be recruited, which excludes the patients who participated in the intervention at the beginning of the trial. Clinicians described their experiences in the beginning as different, with more ease with the intervention over time, and this was not able to be captured from the patient perspective in the same manner.

During data analysis, a choice was made to analyze the participants' data as a collective, rather than considering the participant groups separately (i.e., patients, nurses, physicians). The collective analysis was a purposeful choice for a cohesive picture of the PVC-RAM experience across the major end-users, and thus provides a unique perspective

not commonly represented in literature. However, conceptualizing the data as a whole rather than distinct experiences may result in losing the richness of data within these groups. To moderate this effect, it was decided to split the main themes into sub-themes to allow for more granularity in describing the experiences of all participant groups.

Final Reflexivity

As reflexive thematic analysis was utilized, it was imperative to remain awareness of the positionality of the researcher, and the impact on the process. The analysis was undoubtedly influenced by the reflexive process, particularly in consideration of the participant groupings. Initially, analysis included patient and clinician participant groups separately, as is seen in a majority of clinical experience literature. Through the researcher's reflections however, it became evident that this was not in line with the researcher's position as nurse, how they viewed experience in healthcare contexts, nor did it align with Nagel and Penner's *Conceptual Model of Telehealth Nursing* (2016), which includes the patients as actively engaged in the care process. Therefore, due to ongoing reflection a decision was made to restart analysis and consider the participant group as one cohesive entity, rather than individual categories.

The experience of completing this research was both challenging and familiar, as I came to this with knowledge and experience both in nursing, virtual care, and qualitative nursing, but had never been the one to truly lead an entire body of work. This work allowed me to recentre my core values as a nurse and research: in particular, the importance of the inclusion of patient and caregiver perspectives whenever possible.

Conclusion

Post-discharge virtual care and RPM for adult patients undergoing urgent or emergent surgery provides an opportunity to provide quality care and accessible support in the home environment, delivered in a method that patients and clinicians find valuable. Aligning with the qualitative descriptive methodology, the experiences of patients and clinicians were presented in plain language, using their own words. Without high level of interpretation and abstraction, the information presented here can be easily applied in research or practice, which is pertinent due to the increased growth of virtual care RPM intervention, particularly following the COVID-19 pandemic. The findings of this study contribute to the overall understanding of the experience of virtual care RPM programs within the post-discharge surgical population, a context that is under-explored in current literature. Furthermore, this study collected data from both patient and clinician participants, and analyzed them as a whole to describe the totality of the experience, which is uncommon in literature. Consideration should be given to the intensity of the intervention and monitoring schedules, as well as scrutiny about which patients would most benefit from this. Opportunities for communication and collaboration amongst all members of the care team should be encouraged, through organic opportunities day-to-day, written documentation via integrated electronic medical records, or through well-defined consulting physician roles. In future, cost efficiency studies of virtual care RPM should be considered alongside experience to ensure sustainability for practice, including appropriate remuneration for physicians, and exploring the most effectively structured care model.

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Appendix A

PVC-RAM Clinician and patient interview guide and script

Patient (family) Interview Script

After completion of the 30-day post-discharge intervention period, the following will be asked to participants in the *intervention arm* of the trial.

Would you be interested in participating in an additional, brief interview about your experience in the PVC-RAM Trial. As you know, the purpose of PVC-RAM is to help people who received non-elective surgery during the COVID-19 pandemic, and to trial virtual care at home following discharge after surgery. After the trial had started, we found that we really need information from our patients (and families) about their personal experience in participating in the virtual care intervention. This follow up interview will take approximately 20 minutes to complete.

Would you be interested in participating?

No – No problem at all. Thank you for taking the time to speak with me today, and thank you for your participation in the trial, please call if you have any questions.

Yes – That is great. Someone from our research team will call you shortly to complete the interview. Is there a day or time that would be best?

Qualitative Interviewer will contact the participant

Thank you for taking the time to speak with me today. As the research team mentioned, we found that really need information from our patients (and families) about their personal experience in participating in the virtual care intervention. The follow up interview will take approximately 20 minutes.

Are you still interested in completing the interview?

No – Thank you for your time. Have a good day.

Yes - Is now a good time for you?

No – No problem. Please let me know when you would like me to call back.

Yes – Great. Before we get started, I would like to share a bit of information with you about the patient/family experience interviews and how the data will be stored.

We will interview about 30 PVC-RAM patient participants who, like yourself, participated in PVC-RAM as a virtual care participant at one of the six participating hospitals across Ontario including in Hamilton, London, Ottawa, and Kingston. As you may recall, the PVC-RAM Trial is looking at the outcomes of patients who undergo non-elective surgery during the COVID-19 pandemic and receive a 30-day virtual care intervention following discharge from hospital, compared to those who receive standard care of follow up after their surgery.

As with the PVC-RAM trial, your identity will be kept separate from your responses in this interview to protect your privacy. With your permission, I will be recording our conversation to ensure that your responses are reported accurately. We are doing this for write up in a paper (again, all anonymous) so we can share what we are learning about PVC-RAM with others - it is really important for us, as a team, to understand what the experience of the PVC-RAM intervention is like.

The recording will be anonymized so it cannot be linked directly to you, and it will be sent by a secure file transfer system (encrypted and password protected similar to security standards used by banks), in the same way that all data collected from you for this research trial is. The recording will only have a number associated to it and we are the only ones that can link this number back to you. This linked number will be stored in our locked research office on a password-protected computer. After 10 years, the ID link will be removed, and it will be completely anonymized. After 25 years, the recording will be destroyed in a secure and confidential manner.

Once the interviews have been completed, a research analyst who specializes in this type of research will listen and code your responses to provide a summary of the PVC-RAM patient experience. This summary will be submitted for publication in a medical journal. It is our hope that the article will bring awareness to the importance of the patient experience in this clinical research of virtual care at home following non-elective surgery

and provide insight to policy makers, physicians and nurses who care for, and manage, patients who receive surgery and recover at home.

You can decline answering any question by saying, “pass” and you can request to stop the interview at any time.

Is that ok with you?

No- Thanks very much for considering participating and taking the time to speak with me today, and thank you for your participation in the trial, please call if you have any questions.

Yes - That’s great, thank you. I have some questions to ask you regarding your experience as a patient (and/or family member) in the PVC-RAM trial.

Do you have any questions before I turn on the recorder and ask you these questions about your experience in PVC-RAM?

Please feel free to elaborate to whatever degree you are comfortable with, including any examples that come to mind from the time you were in hospital until now.

Thank you for taking the time to participate in the patient experience interview.

Patient and Support Person Interview Guide

1. How are things going for you since your surgery?

2. What was a typical recovery day like for you as a patient (family member) after coming home from the hospital while receiving PVC RAM care?
3. Compared to when you had surgery in the past, what was it like for you to receive recovery care virtually with PVC-RAM? What was the prior surgery you had? Did you need to visit the emergency room?
4. What did you find useful about PVC-RAM? What did you not find useful?
5. What impact did it have on your relationships with your family?
6. What impact did it have on your relationships with your nurse?
7. What impact did it have on your relationships with your physician?
8. Given the context of the COVID-19 pandemic, what do you think is the value of receiving virtual care through PVC-RAM?
9. Beyond PVC-RAM what other services or healthcare support did you require after your surgery? How did you obtain this support? When you were looking for support, did anything help or get in the way?
10. What suggestions would you give us to improve PVC-RAM in the future?

Thank you for your answers. We would like to ask a few questions about you. As always, your information will be kept confidential, and you are free to pass on any question you do not wish to answer.

1. What is your highest level of education?
2. Are you currently working for pay?

3. Have you worked, or are you currently working, in a healthcare profession?

That is everything. Do you have any questions for me?

Thank you so much for your time today and for your participation in the trial, please call if you have any questions. Would you like us to send you a copy of the results when we have them?

Clinician Interview Script

After completion of one rotation of the 30-day post-discharge intervention period, the following will be asked to clinicians (virtual care nurses, and perioperative physicians and surgeons) after they confirm via email that they would like to participate.

As you know, the purpose of PVC-RAM is to help people who received non-elective surgery during the COVID-19 pandemic and to trial virtual care at home post-discharge from surgery. After the trial had already started, we found that we really need information from the clinicians about their personal experience in participating in the virtual care intervention. This follow up interview will take approximately 20 minutes to complete.

Are you still interested in participating?

No – No problem at all. Thank you for taking the time to speak with me today, and thank you for your participation in the trial, please call if you have any questions.

Yes – That is great.

Before we get started, I would like to share a bit of information with you about the clinician experience interviews and how the data will be stored.

We will interview about 30 PVC-RAM nurses and 30 PVC-RAM physician/surgeon participants who, like yourself, participated in PVC-RAM as a virtual care clinician in one of the sites across Ontario including in Hamilton, London, Ottawa, and Kingston. You have participated as a nurse/physician in PVC-RAM, our randomized trial, comparing regular care after surgery after discharge with virtual care for 30-days after discharge via our nurse-perioperative physician shared care model and using the Cloud DX Connected Health Kit and software.

Your identity will be kept separate from your responses in this interview to protect your privacy. With your permission, I will be recording our conversation to ensure that your responses are reported accurately. We are doing this for write up in a paper (again, all anonymous) so we can share what we are learning about PVC-RAM with others - it is really important for us, as a team, to understand what the experience of the PVC-RAM intervention is like for the clinicians who are delivering care within this model.

The recording will be anonymized so it cannot be linked directly to you, and it will be sent by a secure file transfer system (encrypted and password protected similar to security standards used by banks). The recording will only have a number associated to it and we are the only ones that can link this number back to you. This linked number will be stored

in our locked research office on a password protected computer. After 10 years, the ID link will be removed, and it will be completely anonymized. After 25 years, the recording will be destroyed in a secure and confidential manner.

Once the interviews have been completed, a research analyst who specializes in this type of research will listen and code your responses to provide a summary of the PVC-RAM clinician experience. This summary will be submitted for publication in a medical journal. It is our hope that the article will bring awareness to the importance of the clinician experience in this clinical research of virtual care at home following non-elective surgery and provide insight to policy makers, physicians, and nurses who care for, and manage, patients who receive surgery and recover at home.

You can decline answering any question by saying, “pass” and you can request to stop the interview at any time.

Is that ok with you?

No- Thanks very much for considering participating and taking the time to speak with me today, and thank you for your participation in the trial, please call if you have any questions.

Yes - That’s great, thank you. I have some questions to ask you regarding your experience as a nurse/physician/surgeon in the PVC-RAM trial

Do you have any questions before I turn on the recorder and ask you these questions about your experience in PVC-RAM?

Please feel free to elaborate to whatever degree you are comfortable with, including any examples that come to mind from your time working as a clinician for the PVC-RAM trial.

Thank you for taking the time to participate in the clinician experience interview.

Clinician Interview Guide

1. Have you done anything like PVC-RAM before, in terms of virtual care? If so, what was it?
2. How did PVC-RAM go for you/how is it going for you? Prompts: what was it like at the beginning versus the end? Did your experience of PVC RAM change over time?
3. What is a typical day like for you as a nurse/perioperative physician caring for a patient using PVC-RAM?
4. What do you find useful about PVC-RAM? What do you find not useful?
5. What impact did it have on your relationships with
 - a. your patients and their family members
 - b. nurses and perioperative physicians/surgeons
6. What has it been like for you to make decisions about your patients' care using PVC-RAM technology? What enabled your decision making and what got in the way?

7. How have you obtained the community and hospital services your patients have needed since their surgery?

8. Given the context of the COVID-19 pandemic, do you think providing virtual care through PVC-RAM has value? If yes, what value do you think it has? If not, why not? Please explain.

9. Do you have any suggestions for improving this care model?

10. What do you think about this type of approach being scaled up?

Thank you for your answers. We would like to ask a few questions about you. As always, your information will be kept confidential, and you are free to pass on any question you do not wish to answer.

1. How long have you worked as a nurse/physician/surgeon?

2. What is your background? Please include your age, specialty, and relevant clinical experience.

3. Do you have experience in caring for surgical patients such as those in PVC-RAM before the trial? How many years of experience do you have caring for this population?

That is everything. Do you have any questions for me?

Thank you so much for your time today and for your participation in the trial, please call if you have any questions.

Would you like us to send you a copy of the results when we have them?

Appendix B

Conceptual Model of Telehealth Nursing (Nagel & Penner, 2016)

