

CLINICAL PRECEPTORSHIP IN VIRTUAL HEALTHCARE SETTINGS

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Preface

Article #1: Precepting Postgraduate Medical Trainees in Virtual Healthcare Settings: A Scoping Review

R.C.W. Lee-Krueger, K. Moreau, and D. Archibald were responsible for determining the aims of this scoping review. In collaboration with L. Sikora, R.C.W. Lee-Krueger formulated and conducted the literature database search strategies. Literature screening and data extraction were completed by R.C.W. Lee-Krueger and C. Krueger, independently. R.C.W. Lee-Krueger synthesized the evidence and wrote the original manuscript. All authors contributed substantive input during the processes of article synthesis and editing. All authors have approved this manuscript.

Article #2: Treading in the Virtual Care Classroom: An Exploratory Sequential Mixed Methods Study on Precepting Family Medicine Trainees in Virtual Care

The conceptualization of this article stemmed from R.C.W. Lee-Krueger and evolved from discussions involving with two other co-authors (K. Moreau and D. Archibald). R.C.W. Lee-Krueger engaged in all stages of data collection and analyses, alongside the assistance of M-H. He as a second reviewer for thematic analysis. R.C.W. Lee-Krueger drafted the paper, with substantial inputs from K. Moreau and D. Archibald. All authors will review the final draft and approve the manuscript prior to journal submission.

Article #3: Closing Voids of Educational Continuity in Virtual Healthcare Settings

R.C.W. Lee-Krueger, D. Archibald, and K. Moreau were responsible for conceptualizing the aim of this manuscript. R.C.W. Lee-Krueger wrote the original manuscript with edits and suggestions from co-authors. All authors approve the final version of this article.

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My doctoral co-supervisors, Drs. Douglas Archibald and Katherine Moreau, for their mentorship and guidance throughout this vocational journey. Their commitment to advance education systems have greatly influenced me to be an inquisitive researcher – one who is driven for discovery, integrity for evidence-based pedagogies, and an optimistic heart for building impactful medical education.

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Dedication

In memory of my grandmother, who was a wiser woman of her time.

Abstract

N.B., Word count applies to English abstract only. A French version follows.

Clinical preceptorships that nurture virtual care competencies among family medicine residents or physicians in-training remain understudied. Guided by epistemological views of pragmatism and social constructivism, I designed and implemented a three-phase exploratory mixed-methods study to address the following research questions:

- How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education?
- What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?
- To what extent do preceptors involve, prepare, and assess family medicine residents in virtual healthcare settings?
- How do preceptors assess and provide feedback to family medicine residents in virtual healthcare settings?

In phase I, a scoping review identified 24 peer-reviewed articles (published before February 25, 2021) relevant to clinical precepting with postgraduate medical trainees in virtual healthcare settings. In a sequential manner, I then led a one-time online survey (phase II; $n = 38$) and key informant interviewing (phase III; $n = 13$) with preceptors of family medicine residents.

National data confirmed that clinical precepting in virtual healthcare settings can be characterized by individual factors, preceptor-resident behaviors, and workplace artefacts. Additional insights supported preceptors' ability to engage family medicine residents in virtual care activities, along with the constraints and strategies to supervise them effectively. Opportunities to assess competency are possible; however, preceptors identified gaps in assessment practices to identify underperformance in the virtual therapeutic frame. A key research deliverable is a thematic framework illustrating the experience of clinical precepting in virtual healthcare settings. Drawing on adaptive expertise, actor-network theory, and praxeology, the final article elucidates how this work contributes to educational solutions and research directions for competency-based family medicine education.

Word count (278/300)

Résumé

Les préceptorats cliniques qui permettent de renforcer les compétences en soins virtuels des résidents en médecine familiale ou des médecins en formation sont toujours peu étudiés. Sur la base des points de vue épistémologiques du pragmatisme et du constructivisme social, j'ai conçu et mis en œuvre une étude exploratoire à méthodes mixtes en trois phases afin de répondre aux questions de recherche suivantes :

- Dans le domaine de la formation médicale des études supérieures, comment le préceptorat clinique est-il conceptualisé dans des environnements de soins de santé virtuels?
- Dans le domaine de la formation médicale des études supérieures, quelles sont les lacunes dans la façon dont le préceptorat clinique dans des environnements de soins de santé virtuels est conceptualisé?
- À quel point les précepteurs impliquent, préparent et évaluent-ils les résidents en médecine familiale dans des environnements de soins de santé virtuels?
- De quelle façon les précepteurs évaluent-ils les résidents en médecine familiale et leur fournissent-ils des commentaires dans des environnements de soins de santé virtuels?

Dans la phase I, un examen de la portée a permis d'identifier 24 articles évalués par des pairs (publiés avant le 25 février 2021) ayant trait au préceptorat clinique avec des stagiaires en médecine des études supérieures dans des environnements de soins de santé virtuels. De façon séquentielle, j'ai ensuite réalisé un sondage en ligne non récurrent (phase II ; n = 38) et une entrevue avec des informateurs clés (phase III ; n = 13) auprès des précepteurs des résidents en médecine familiale.

Les résultats de ces phases ont confirmé que le préceptorat clinique dans des environnements de soins de santé virtuels peut être défini par des facteurs individuels, les comportements entre le précepteur et le résident, et les artefacts du lieu de travail. Des observations supplémentaires ont soutenu la capacité des précepteurs à faire participer les résidents de médecine familiale à des activités de soins virtuels, ainsi que les contraintes et les stratégies permettant de les superviser efficacement. Les possibilités d'évaluer les compétences sont envisageables; cependant, les précepteurs ont identifié des lacunes concernant les pratiques d'évaluation pour identifier les mauvais résultats dans le cadre des soins virtuels. L'un des principaux aboutissements de la recherche est un plan de travail thématique permettant de

présenter l'expérience du préceptorat clinique dans des environnements de soins de santé virtuels. En se basant sur l'expertise adaptative, la théorie de l'acteur-réseau et la praxéologie, le dernier article précise comment ce travail contribue aux solutions pédagogiques et de recherche en matière d'enseignement de la médecine familiale axé sur les compétences.

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List of Acronyms and Abbreviations

ACGME	Accreditation Council for Graduate Medical Education
Audio-COT	Audio-Consultation Observation Tool
CanMEDS	Canadian Medical Education Directives for Specialists
CanMEDS-FM	CanMEDS-Family Medicine
CBME	competency-based medical education
CFPC	College of Family Physicians of Canada
CMA	Canadian Medical Association
CPA	Core Professional Activities
COVID-19	Coronavirus Disease 2019
DFM	Department of Family Medicine
EMR	electronic medical record
FMRAC	Federation of Medical Regulatory Authorities of Canada
O-SCORE	Ottawa Surgical Competency Operating Room Evaluation
PGY	postgraduate year
TH	telehealth
TIPS-TC	Teaching Interpersonal Skills for Telehealth Checklist
WHO	World Health Organization

Section One: Introduction

This section highlights the foundations for a mixed-methods study exploring the practice of clinical preceptorship in virtual healthcare settings¹. To begin, Section One provides an overview of the research problem investigated as it pertains to existing knowledge gaps in virtual care education and the roles of clinical preceptors in these workplaces. Following a description of the research topic, I provide a literature review that addresses clinical preceptorship, virtual healthcare, and education topics with this landscape of healthcare delivery. The background provides necessary information for studying clinical precepting experiences in virtual healthcare settings. Next, I present a conceptual framework to illustrate connections between the theoretical constructs that ground this research. I discuss the study design and methods utilized to address a series of research questions. Section One concludes with an outline to help readers navigate my dissertation and understand how each article presented in the subsequent sections contributes to the field of medical education.

Research Problem

Clinical preceptorship is essential in the teaching of physicians in-training (i.e., medical residents), and the act of precepting enables workplace learning to occur for the novice. While the existing literature predominately examines clinical preceptorship when patient care is delivered in-person at hospitals or community clinic-based environments (Farrell et al., 2016; Gatewood & De Gagne, 2019), little is known about how resident teaching occurs when physicians deliver care virtually.

Virtual care occurs when the patient and healthcare provider(s) are not simultaneously present in the same room (Jamieson et al., 2015). Virtual care allows physicians to address patients' medical concerns while obviating the need for in-person meetings. Unprecedented efforts in healthcare now allow physicians to adopt and deliver virtualized treatments across different medical specialties (Jung & Padman, 2014; Verhoeven et al., 2010). Such examples

¹ For this study, the operational definition of virtual healthcare setting is a setting where physicians (preceptors/attending physicians, residents) can provide medical services and synchronously interact with their patients without being in a shared space. For physicians, the virtual work setting can be at home or in a conventional office at their clinic. Factors such as virtual visit scheduling, variability in problems treated within a clinical practice, and accessibility to virtual care technology may determine the preferred work setting. CMA. (2020a). Virtual care playbook. 1-15. Retrieved August 10, 2022, from <https://www.cma.ca/virtual-care-playbook-canadian-physicians>

include virtual ambulatory care for acute and chronic medical conditions, urgent care for minor complaints, and interfacility emergency consults (Schwamm, 2014; Shah et al., 2018; Silva et al., 2012). In response to the Coronavirus Disease 2019 (COVID-19) pandemic outbreaks, building and expanding physician capacity to provide patient care virtually became priorities for health institutions worldwide (Donelan et al., 2019; Webster, 2020; Wosik et al., 2020). Possible advantages with accessing virtual care consist of improved efficiency to medical advice and reduced logistical or financial burdens with patients committing to in-person medical appointments (Lougheed, 2019). A recent study also suggests that most patients who attended virtual visits found them helpful in resolving their immediate health issues (McGrail et al., 2017). Despite these notable benefits, limitations inherent to telemedicine may jeopardize patient privacy, depersonalize therapeutic experiences, and heighten physician burnout (Kelly et al., 2022; Lougheed, 2019). Hence, proper educational support is paramount for physicians to be competent with practicing medicine in virtual healthcare settings.

In Canada, Canadian Medical Education Directives for Specialists (CanMEDS) or CanMEDS-Family Medicine (CanMEDS-FM) are competency-based education frameworks for clinical specialty development in medicine (Frank et al., 2015; Shaw et al., 2017). Physicians are medical experts who must demonstrate clinical competencies of six intrinsic roles: professional, scholar, health advocate, leader, collaborator, and communicator (Frank et al., 2015). Educational leaders curate medical residency programs in alignment with these frameworks to deliver for competency-based medical education (CBME) (Lockyer et al., 2017; Shaw et al., 2017). During the course of residency, clinical preceptors play an integral role in the advancement of trainees' skills for safe, ethical practices (Biagioli & Chappelle, 2010; Ramani & Leinster, 2008). Clinical preceptors are experienced practitioners who are expected to supervise trainees' work performance, function as role models of best practices, and facilitate learning opportunities for theory-to-practical applications (Billay & Myrick, 2008; Giroto et al., 2019). However, adopting virtual practice as part of the new standard for patient-centered care poses unique challenges on how clinical teaching occurs. National recommendations recognize the need to train a medical workforce for providing equitable healthcare virtually (CMA, 2020b), and that such educational efforts to define and develop virtual care competency remain inadequate.

To address this issue, my thesis aimed to examine the experiences of clinical precepting in virtual care settings. By understanding how the preceptor roles are shaped in virtually-based contexts, my research provides new insights on educational opportunities for creating a normalized learning culture in such clinical environments.

Literature Review

To lay the foundations in which my thesis is grounded on, this section presents key concepts about clinical preceptorship and virtual care. The latter part explores their implications on recent medical education developments in response to a global movement for adopting virtual care practices.

Preceptorship in Health Professions Education

Clinical preceptorship is a longstanding tradition within medical training programs. Since its induction, educators sought for deepened understandings about the concept of preceptorship in clinical training (Dusmohamed & Guscott, 1998). Extending Kramer's theory of reality shock (1974) for entrance into a new health profession, nursing educators first used the term 'preceptorship' to describe the process of how clinical trainees are being taught (Billay & Yonge, 2004). More recently, Giroto et al. (2019) defined preceptorship as "a simultaneous teaching-learning method used by the practice professions of nursing, medicine, pharmacy, and dentistry in teaching students in clinical settings, focusing on their clinical and ethical development" (p. 1). Clinical preceptorships happen as short-term teaching and learning relationships, which carry out with the intention to integrate and support new practitioners to perform independently and proficiently (Tan et al., 2011; Yonge et al., 2007). In essence, the fundamentals of preceptorship provide clinical preceptors a teaching method within their work environments and during work routines.

Early conceptualizations of the clinical preceptor describe this individual as a person who teaches, counsels, inspires, role models and supports the growth and development of a novice for a fixed amount of time with the specific social purpose into a new role (Morrow, 1984). Terms used interchangeably in the literature to refer to the preceptor include 'clinical teacher', 'clinical educator', 'clinical supervisor', or 'mentor' (Rose & Best, 2005). In the context of family medicine, College of Family Physicians of Canada (CFPC) broadly defines the clinical preceptor role as "[a] teacher working with learners in the clinical setting when patient care is being

provided” (Walsh et al., 2015). For the purposes of this thesis, I adhered to this working definition for the ‘clinical preceptor’ role as outlined by CFPC.

Preceptors support CBME initiatives by fostering the professional growth of trainees to attain clinical competence. Academic programs in Canada and other countries abroad adhere to the CanMEDS and CanMEDS-FM frameworks acknowledging that a physician, at its core, is the medical expert within one’s scope of practice (Lockyer et al., 2017). As an outcomes-based approach, the goal of CBME is to foster an educational progression so that a learner can develop the clinical knowledge, skills, and attitudes for independent practice in medicine (Frank et al., 2010). The value of precepting in CBME should be twofold – to demonstrate a clinical activity and offer insights about the responsibilities of a physician.

Preceptor Functions. The nature of preceptorship demands that clinical preceptors can function in several capacities. According to the CFPC’s Fundamental Teaching Activities Framework for Family Medicine, the clinical preceptor domain captures day-to-day teaching tasks of a ‘clinical coach’ (e.g., demonstrate clinical skills, complete learner assessments, provide in-the-moment feedback) and a ‘competency coach’ (e.g., long-term advisory tasks fostering learner ownership, co-develop learning plans, advise on career planning, review performance portfolios) (Walsh et al., 2015). Hence, educators recognize the need for formative and summative precepting opportunities for professional development.

Preceptors strategize their educational approach so that their trainees can receive a meaningful learning experience in real-life, clinical environments. In the process of teaching, preceptors demonstrate non-clinical skills (e.g., communication, collaboration, professionalism) that are difficult to acquire through role-modelling (Cote & Bordage, 2012; Marisette et al., 2020). Based on the learning needs of a medical resident, clinical preceptors also plan hands-on activities that enable clinical skill development. Ultimately, a proficient preceptor uses these encounters to observe clinical performance and provide individualized feedback based on judgements about competence (Buck et al., 2014). The facilitation of feedback (verbal or written) allows residents to formulate guided self-assessments about their current standing and foster reflective learning (Laughlin et al., 2012). In addition to supervisory roles, residents rely on their preceptors as an educational resource for advising differential diagnoses, interpreting clinical findings, and suggestions for practice improvement (Allan et al., 2012; Cote & Bordage, 2012).

Altogether, these studies suggest residents tend to emulate how their preceptors practice medicine and they value the learning relationships established within the clinical workplace.

Clinical preceptors contribute to residents' advancement through cycles of assessment and feedback activities before they transition into independent practice. Preceptors serve as assessors who "collect [and document] data about the trainee's performance in the workplace, and make judgements of their competence for a range of summative and/or formative purposes" (Prentice et al., 2020, p. 2). By compiling assessment data from various sources (e.g., in-training examinations, workplace-based assessments), educators can extrapolate interpretations about a resident's ability to practice medicine over time (Fok-Han et al., 2016; Lockyer, 2013). In addition to measuring performance, educators design assessment programmes or systems of assessments with an intent to provide residents with meaningful feedback from their preceptors (Soemantri et al., 2018). While assessment stresses the judgement and decision-making of one's performance, feedback is the catalyst for transforming assessment data into learning (Burgess & Mellis, 2015). That is, the way in which feedback is conveyed matters – it requires a careful process of 'knowing and applying' feedback (Ramani & Leinster, 2008). Researchers continue to devote much attention to develop academic coaching strategies for clinical teachers to deliver individualized feedback timely and efficiently (Ekpenyong et al., 2021; Lockyer et al., 2020; Sargeant et al., 2017). For the aforementioned reasons, there are shared precepting functions across clinical training contexts. Nonetheless, it should not be understated that the experiences of a preceptorship are unique to the trainee and assigned preceptor.

Challenges to Clinical Precepting. Several challenges are known to limit effective precepting in hospital- or clinic-based learning environments. Studies suggested that weak learning relationships challenge how residents engage and respond to preceptor feedback (Ramani et al., 2020). If perceived as low credibility, then residents tend to dismiss or reject their preceptors' feedback (Sargeant et al., 2010; Watling et al., 2012). To this end, researchers speculate cognitive processes (e.g., discrepancies in self-appraisal, emotion management) and dispositions (e.g., feedback seeking and appreciation) may influence learners' ability to make sense of information and use it to enhance discipline-specific performance (Carless & Boud, 2018; Molloy et al., 2020; Winstone et al., 2022). In addition to feedback literacy, clinical preceptors are often juggling competing demands due to their professional identities as educators, health providers, and leaders of the healthcare team (Meeuwissen et al., 2019). In

managing these tensions among clinical and educational duties, preceptors miss teachable moments or opportunities to directly observe a resident in the workplace. These practical aspects may result in compromised content and quality of feedback from clinical preceptors (Cote & Bordage, 2012). A third challenge to preceptorship is the sensitive balance between preceptor and resident visibility in the clinical workplace. The degree of supervision mainly depends on personal preference among clinical preceptors (Wallenburg et al., 2013). Within the literature related to transfer of learning, Govaerts and Dochy (2014) and Govaerts et al. (2017) argue that different types of supervisor support (e.g., openness, favourable attitude, coaching and feedback) can influence the outcomes of workplace training. While allowing residents to manage patients independently signifies a level of trust, preceptors rely on their own expertise to know when the timing to intervene is appropriate (before the clinical situation progresses to a point of irreparability). Greater attention is also paid to examine the effects of shame-based education on medical trainees and ways to create psychologically safe environments handling clinical errors or mistreatment (Bynum IV & Goodie, 2014; Grailey et al., 2021). Hence, the provision of autonomy when residents are not ready can have consequences on preceptorships, as well as therapeutic relationships with their patients.

Past research suggested that certain preceptor and workplace factors may influence the experiences of clinical preceptorship. In Schultz et al. (2004), medical residents reported that aspects related to the matched ambulatory care site compromise the learning relationship if missing: availability of effective teachers, opportunities to see patients independently, and exposure to serve an adequate and diverse patient pool. These residents also noted preceptor behaviors that supported positive learning experiences (e.g., openness to resident questions, ability to give constructive feedback, teaching attitude and approach). However, the impacts of different precepting styles, preceptor's years of clinical experience, and staffing models on preceptor-resident interactions remain debatable (Cote & Bordage, 2012; Sobel et al., 2017). Perhaps, dedicated preceptor training initiatives to support trainees in the virtual care workplace can offer successes in clinical teaching. A systematic review showed that faculty development programs can be effective in raising awareness for effective teaching practices; however, their implications on promoting workplace learning remain unclear (Steinert et al., 2016). Thus, future research should examine the effects of preceptor training initiatives on the quality and safety of virtual care.

The notion of virtual care precepting remains largely understudied. Resident engagement has historically been a focus in clinical education; however, the paradox of being reluctant to involve learners in virtual care – a practice also deemed clinically valuable among faculty preceptors – suggests that preceptorship remains an unfamiliar or disruptive phenomenon in certain clinical contexts (Lee & Kron, 2022). With patient interactions occurring remotely, preceptors resort to virtual supervision when making real-time decisions about treatment plans (Croome et al., 2011). Researchers are exploring the preceptors' use of other proxy measures to monitor clinical performance, such as analytics from electronic medical records (EMRs) and health system technologies (Ellaway et al., 2014; Martin et al., 2017). Given the educational novelty of technology-facilitated patient care, designated rotations to engage residents in virtual care practices were limited prior to the emergence of COVID-19 (Nham et al., 2020). Thus, researchers need to explore strategies that can promote educational continuity in virtual healthcare settings, specifically when preceptor-resident dyads are not working in a shared physical space.

Virtual Care

Defining Virtual Care. Coined in the 1970s, 'telemedicine' (often referred as 'virtual care') means "healing at a distance" (Strehle & Shabde, 2006). Telemedicine is broadly described by the World Health Organization (WHO) as such:

The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. (WHO, 1998, p. 10)

As the field continues to grow, the philosophical contentions between 'telemedicine' and 'virtual care' become apparent. According to Olayiwola et al. (2020), any form of healthcare delivered without the patient and clinician being present in the same physical location can be considered virtual care. This research group, along with others, argue that telemedicine should be an umbrella term for the digital communication modalities that empower care irrespective of space and time (Serper & Volk, 2018). That is, in addition to virtual care, telemedicine can also include

asynchronous forms of remote monitoring, store-and-forward technology, and mobile health applications. Despite these conceptual distinctions, any form of telemedicine must fulfill four germane principles: 1) purposeful uses to provide clinical support, 2) intended to overcome geographical barriers, 3) employs various types of information and communication technologies, and 4) carried out with the goal to improve health outcomes (WHO, 2010). For the purposes of my dissertation, this research supports the following definition mandated by our nation's virtual care task force because it provides a relevant description for the virtual care landscape in the context of Canada's current healthcare system.

[Virtual care is] any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies, with the aim of facilitating or maximizing the quality and effectiveness of patient care. (J. Shaw et al., 2018, p. 609)

A New Landscape of Healthcare. The implementation of virtual care, a synchronous form of telemedicine, predates back to 1960s in the military and space industries (Serper & Volk, 2018). With advances in wireless technology, access to virtual care perpetuated for chronic disease management with underserved populations (Bashshur et al., 2016; Greenhalgh et al., 2017; Langarizadeh et al., 2017; Serper & Volk, 2018). Clinical tasks relevant to virtual care include conducting real-time, telehealth visits with patients via telephone or videoconferencing. In the process of virtual care delivery, physicians can also engage in asynchronous telehealth tasks, such as interpretations of diagnostic images or lab tests (Bhati et al., 2010; Mammas et al., 2013) and consulting other clinical specialists (Furlan et al., 2019; Leung et al., 2019; Tande et al., 2020). By 2019, the Ontario Telemedicine Network (2019) reported that over one-million clinical video events occurred within the past year. With this rising interest towards telemedicine, healthcare stakeholders acknowledge the need to scale up virtual care capacity in efforts to combat health inequities (Moroz et al., 2020; Vogel, 2020). The Canadian Medical Association (CMA, 2020b), in collaboration with CFPC and Royal College of Physicians and Surgeons of Canada, put forth recommendations to address gaps in clinical standards, licensure, cost and quality of care, and medical education.

In light of the COVID-19 pandemic, accelerated transitions in clinical practices enabled physicians and medical trainees to participate in virtual care tasks. Public health safety regulations urged the rapid adoption of virtual care as a necessary approach to continue patient care delivery. This included implementing practice changes to triage and scheduling protocols for facilitating patient-provider interactions virtually (O'Gorman et al., 2016; Owens, 2018; Uscher-Pines & Mehrotra, 2014). Under time-sensitive pressures, patient care shifted from in-person consultations in clinical rooms to virtual care encounters from physicians' homes or offices. These adaptations allowed medical professionals to conduct virtual care programs for at-home patient monitoring, preliminary health assessments, medication review, and patient education (Baumgart, 2020).

Strengths to Virtual Care. The use of virtual care carries several advantages. Patients noted reduced wait times and financial burdens associated with in-person clinic or hospital visits as apparent strengths to virtual care (Vogel, 2020). Secondly, physicians felt that being able to conduct patient-related team meetings virtually enhanced interprofessional communications (Li et al., 2020). Thirdly, during pandemic times, virtual care contributed to emergency case management in ways that permitted the sharing of clinical data in real-time and efficient allocation of healthcare resources (Baumgart, 2020). Fourthly, clinical outcomes improved with certain outpatient populations that had access to virtual care (e.g., elderly, immunosuppressed, pregnant women) (Bokolo, 2020). Physicians may opt to manage patients remotely as avoiding hospital-acquired infection exposures is a clinical priority. These strengths provide end-users with justifiable reasons to provide virtual care in situations where patients will benefit from it.

Challenges to virtual care. Despite heightened uptake, there are inherent limitations to accessing virtual care. Absence of in-person meetings forfeits a physician's ability to conduct a full physical examination and gather necessary patient information through a virtual encounter (COVID-19 Scientific Advisory Group, 2020). Additionally, the removal of a shared physical space may instigate unease when difficult clinical conversations or decisions need to be made. Successful telehealth interactions require effective interpersonal communication between physicians and their patients. Communication barriers, including functional impairments, that hamper users' ability to understand verbal and non-verbal cues over a virtual interface need to be noted (Annaswamy et al., 2020). While the nature of some medical visits can be substituted by virtual meetings, this decision should not compromise the care patients ultimately receive or

hinder the development of therapeutic relationships with their healthcare team. Infrastructure and legal restrictions can also challenge the efficacy of virtual care. Barriers to utility include the need for dedicated practice funds and management, patient engagement, and training to operate virtual care platforms (Bokolo, 2020). Ways to harness patient confidentiality and health information security are ongoing problems for implementation (Hale & Kvedar, 2014; Lee et al., 2020). The lack of policy regulations for practicing virtual care between provincial and national jurisdictions not only impedes physician reimbursement or malpractice coverage but also carries risks to unwarranted breaches with releasing health data (Golinelli et al., 2020; Neubeck et al., 2020). Lastly, the impacts of virtual care tools on physician workload have been noted as a challenge, in addition to the above, in a recent international study (Li et al., 2022).

Virtual Care Education

The resurgence of virtual care demands a repository of educational resources for its end-users (e.g., physicians, patients, clinic staff). Publications of practice guides for scaling up virtual care services were made accessible across North America (American Medical Association, 2020; CMA, 2020a). Instructions on setting up a virtual care workflow consists of steps for physicians to join the virtual care visit from start to end, complete the necessary documentations, and develop a patient management plan. Efforts for physician education development emphasize on the tools and skills to structure a telehealth call, from technology requirements to scope of virtual care practice. As novice physicians entering the circle of a healthcare team, establishing a commitment to educate them on the new workflow, clinical protocols, and operation of virtual care is crucial. These guidelines recommend that a “superuser” or preceptor provides the training opportunities to acquire knowledge of potential misuses, demonstrate professional conduct, and develop digital health literacy for telemedicine.

The availability of online resources for virtual care is improving; however, formal instruction tailored to clinical trainees is historically deprived. A decade ago, Canadian medical schools had no consistent approach to integrate e-health learning in the undergraduate medical curricula (The Association of Faculties of Medicine of Canada & Canada Health Infoway, 2012). At a conceptual level, the establishment of CanMEDS 2015 e-health working group identified key areas of competency for health technology practice (Ho, 2014). More recently due to COVID-19, family medicine academic leaders proposed a set of pandemic-specific competencies for carrying out virtual care (Wooltorton et al., 2020). In this forthcoming era of telemedicine,

assurance in the quality of training opportunities for residents to learn and practice those clinical skills has become a priority in medical education and licensure. To address the need for effective teaching about virtual care competency, the objectives of my research aimed to 1) understand what the current gaps are in postgraduate medical education, and 2) examine the experiences to precept in virtual healthcare settings.

Research Design and Methodology

Study Design

Under guided supervision of my PhD supervisors and assistance of research volunteers I pursued a three-phase, mixed methods study. The completion of this study consists of conducting a scoping review, obtaining research ethics approval for data collection and analysis, administering a survey, interviewing key informants, and disseminating study findings. Within one research programme, I studied the issue of clinical preceptorship in virtual care contexts quantitatively and then qualitatively. Once survey and key informant interview data were gathered and summarized, I drew meta-inferences from key findings. Thus, this mixed methods study is sequential and exploratory in nature (Nastasi et al., 2010).

The intended target audiences of my dissertation encompass a diverse community of postgraduate medical educators and medical education researchers involved with the planning, development, and delivery of virtual care training. This can include, however not limited to, family medicine education leaders, residency program directors, and clinical supervisors of resident learners.

Study Setting

I conducted this study in collaboration with postgraduate medical education programs in family medicine and its affiliated clinical faculty members. The primary research site, University of Ottawa, is a state-of-the-art bilingual post-secondary institution that consists of 12 distinct clinical departments pursuing teaching and research priorities in medicine. In the area of family medicine education, the Faculty of Medicine offers a collection of residency program streams (community, urban, rural, francophone) and 11 enhanced skills programs that lead to certification from CFPC. Family medicine residents can complete training in various Ottawa area health sciences training center(s), including The Ottawa Hospital, Children's Hospital of Eastern

Ontario, Hôpital Montfort, and The Royal and Bruyère Continuing Care. At these teaching hospitals or affiliated community clinics, clinical faculty members from various clinical backgrounds function as preceptors for family medicine residents who undergo training in their scope of practice. Residents and their clinical preceptors can serve patient populations from the Ottawa, as well as North and East Ontario regions in Canada.

Research Questions (RQ)

These overarching questions guided each phase of a mixed methods study:

Study phase I

- RQ1. How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education?
- RQ2. What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?

Study phases II and III

- RQ3. To what extent do preceptors involve, prepare, and assess family medicine residents in virtual healthcare settings?
- RQ4. How do preceptors assess and provide feedback to family medicine residents in virtual healthcare settings?

These research questions summoned an exploration of the current literature and experiences of clinical educators to understand the practice of preceptorship in virtual healthcare settings.

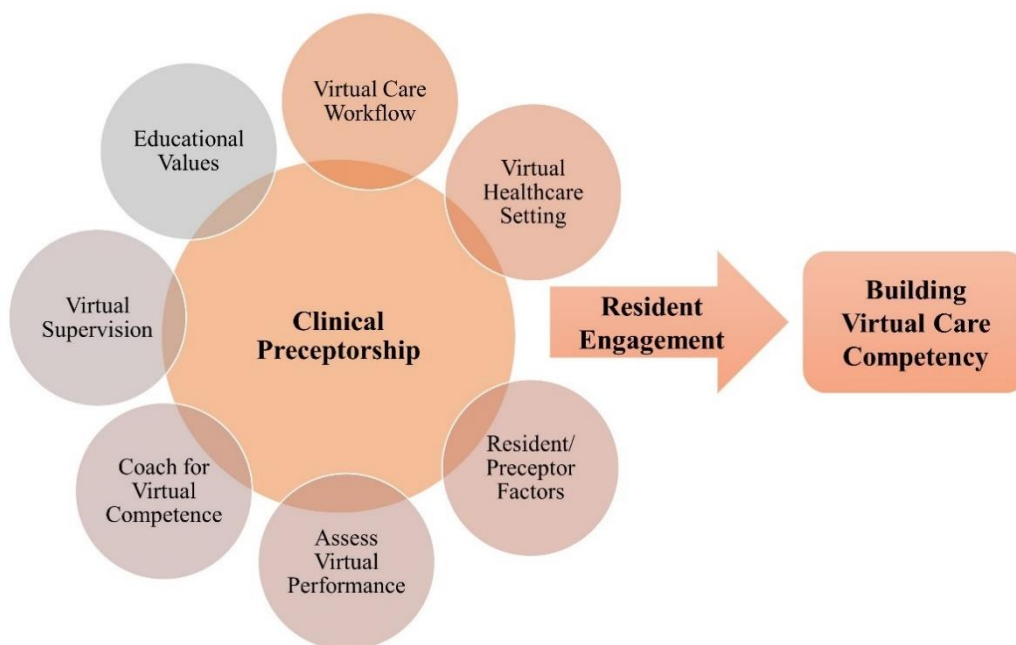
Conceptual Framework

I developed a conceptual framework to illustrate the role of clinical preceptorship in developing virtual care competency (Figure 1). Derived from the current literature on clinical preceptorship and virtual care, my framework consists of three main components: aspects that shape clinical preceptorship (Cote & Bordage, 2012; Schultz et al., 2004), opportunity for resident engagement (Ramani et al., 2020), and building virtual care competency as an outcome of precepting (CMA, 2020b; Nham et al., 2020; Woollorton et al., 2020). As depicted, I speculate that an assemblage of individual (i.e., preceptor, resident) and contextual (i.e., workflow, setting) factors related to virtual care may impact the experiences of precepting relationships. I also propose that alignment or familiarity of CBME supports clinical precepting activities (e.g., supervise, coach, assess residents). It is also implied that regular preceptorships

with trained physicians can harness opportunities for residents to develop the necessary knowledge, skills, and attitudes with practicing virtual care.

Figure 1

Conceptual Framework for Preceptorships in Virtual Care Competency



With the progression of empirical investigations, I focused on the “clinical preceptorship” components to validate its fit of this conceptual framework and made modifications based on the study findings. The resulting diagram will be presented as a thematic framework later in Section Three of this thesis.

Philosophical Assumptions

Throughout this thesis, I applied theories in a *theory-informed inductive data analysis* approach to make sense of the complexity behind the collected data on virtual care preceptorships (Varpio et al., 2020). Specifically, two epistemologies guided my inquire and understanding of clinical preceptorship.

The first is Pragmatism. It offered methodological flexibility for me to interact with physician preceptors in ways that they could relate to this aspect of their professional identity. In conducting a mixed methods study, I embraced principles of pragmatism when marrying

quantitative and qualitative methods at key research stages - from study design, data collection and analysis, to the synthesis of findings. Pragmatism offers an approach to design a mixed methods study for investigating socially complex issues in medical education (Maudsley, 2011; Schifferdecker & Reed, 2009). This philosophical school of thinking views human actions as continuous routines that can be affected by contextual conditions. Supporters of pragmatism acknowledge the situational influences that lead them to mentally review the available options and to select one among several choices in hopes to achieve the desired outcome (Morgan, 2017). As a mixed methods researcher specializing in health professions education, the pragmatist approach guided my interactions with study participants and ensured reflexivity as each study phase unfolded.

The second epistemology is social constructivism. Ideologies rooted in this paradigm influenced the interpretations about teaching and learning as socially-situated activities in virtual clinical spaces. I acknowledge that medical residents are situated adult learners, and their learning takes place through interactions within communities of practice (Wenger et al., 2002). The social constructivist approach acknowledges that workplace learning happens during clinical encounters with patients, preceptors, and members of the healthcare team. Being theoretically aware of the contentions that drove this research forward helped me understand how the virtual care context impacts the dynamics and processes of preceptorships.

Methods

Phase I. To understand the current state of literature on clinical preceptorship in virtual healthcare settings, phase I consisted of a scoping review on this topic. Specifically, this review addressed the first two research questions (RQ1, RQ2). The scoping review, described in detail in Section Two, adhered to the methodological framework proposed by Arksey and O'Malley (2005) and the PRISMA-ScR protocol for reporting scoping reviews (Tricco et al., 2018). This review included research articles related to preceptor interactions with postgraduate medical trainees in virtual healthcare settings. Trainees of Canadian family medicine residency programs are required to receive training from an eclectic group of physician preceptors in various scopes of practice. While this dissertation is geared towards preceptorship with trainees pursuing the family medicine specialty, I opted to examine literature related to this teaching practice across all clinical disciplines offering postgraduate medical education. Thus, the complexity of preceptorship will be undermined if preceptor expectations from clinical specialties outside of

family medicine are not considered. Synthesis of the literature provided rich descriptions about current conceptualizations of clinical preceptorship in the virtual workplace. Detailed breakdown for article inclusion and the search strategies are noted in Appendix A as supplementary material.

Phase II. Informed by the findings from phase I, the second study phase examined the extent in which preceptors engage residents in virtual care tasks (RQ3). To do so, I conducted a survey of clinical faculty on their precepting experiences with family medicine residents within virtual healthcare settings. This phase yielded preliminary evidence about the type and extent of precepting activities for virtual care training.

Phase III. To further understand the process of clinical precepting in virtual healthcare environments (RQ3, RQ4), the final study phase comprised of interviews with clinical preceptors on their experiences of precepting family medicine residents. Specifically, I explored the dynamics of how preceptors made judgements on virtual care performance and communicated their observations in virtual healthcare settings.

Study Population and Recruitment

At the time of enrolment, all clinical preceptors participating in this study are certified physicians to practice at a teaching hospital site or affiliated community clinic in Canada. In liaison with family medicine residency programs, program administrators assisted in recruiting a convenience sample of clinical preceptors by distributing a study invitation with survey information to eligible participants. Eligibility was determined based on the following inclusion criteria: attending physicians who are 1) clinical faculty members affiliated with a Faculty of Medicine in Canada; 2) providers of virtual healthcare services for their patients within the last 12 months; and 3) clinical preceptors for family medicine residents training within their scope of practice. This research did not consider preceptors who have 1) provided only telemedicine services without real-time patient interactions (e.g., tele-interpretation of laboratory or diagnostic tests); or 2) not observed or supervised residents in a clinic offering virtual care services. Phase II included a total of 45 clinical preceptors.

Following the same eligibility criteria for Phase III, I first approached recruited preceptors from the preceding study phase, those who indicated interest on their survey for completing a telephone interview. A second email invitation was then formally sent to arrange an interview time. Interview recruitment continued with another call for participation until richness in data was reached. A total of 13 clinical preceptors were enrolled and completed Phase III.

Data Collection Methods

Online Survey (Phase II). To ensure that the construct definitions align with prior research and identify existing survey scales or items, I used results from Phase I to refine the development of a survey instrument (Artino et al., 2014). Offered in the English language, Appendix B encloses a survey instrument that consists of 35 closed- and 1 open-ended items. Prior to distribution, survey items were designed by a panel of research team members (R.L-K., D.A., K.M.) with expertise in the areas of family medicine education, health professions education and/or mixed methods methodology. A ‘not applicable’ option was also added, when appropriate, to minimize missing responses (Dillman et al., 2014). I completed pilot testing with three clinical preceptor volunteers from Pediatrics and Psychiatry subspecialties and an Infectious Diseases clinical fellow trainee. Input from physicians outside of primary care was sought after to determine appropriateness and feasibility of the survey with clinical preceptors who can supervise Family Medicine residents from various clinical settings (Litwin, 2002). I collated written feedback from pilot participants to refine the survey, and changes were implemented with the intention to improve the clarity of question stems and response options. Formatting suggestions were also made to optimize the experience of survey completion. Final version of the online survey was administered using Qualtrics®.

The anonymous, electronic link to a five-minute online survey was embedded within an email invitation. Upon accessing the hyperlink or QR code, participants were first introduced to details about informed consent (provided in English and French languages) and could only complete the survey once consent was granted. Contact details were only gathered at the end of survey for the purposes of Phase III participation and sharing of research findings.

Interviews (Phase III). Results from preceding phases informed the development of a guide used to complete semi-structured interviews in English, which was piloted with two colleagues to ensure clarity and feasibility (Seidman, 2019). At the beginning of each interview, an interviewer (R.L-K.) introduced the study’s purpose and thanked participants for their involvement. The interviewer then obtained verbal consent prior to starting the interview (n.b., electronic copies of the consent form in English and French were emailed to participants at least one day in advance). After participants verified their academic affiliations as clinical faculty, the interviewer asked a series of probing questions to understand their perceptions and experiences with clinical preceptorship in virtual healthcare settings (see Appendix C). When necessary, the

interviewer prompted participants to elaborate how contextual factors enabled or challenged their ability to assess clinical competence, deliver feedback to residents, or use feedback to coach residents in virtual healthcare settings. The interviewer audio-recorded all telephone interviews and anonymized the transcripts prior to further analysis.

Data Analyses

Phase II. Using IBM Statistical Package for the Social Sciences (SPSS®) v.26, I completed quantitative analyses with descriptive statistics for means, frequencies, and percentages. For free-text responses, I collated and tabulated these data following content analysis (Hsieh & Shannon, 2005).

Phase III. As described by Braun and Clarke (2022), I followed a stepwise approach for thematic analysis to identify, analyze, and report patterns in qualitative data. Two researchers (R.L-K. and a trained research volunteer completing doctorate studies in the Health Professions Education concentration) coded transcripts using the NVivo software. Researchers generated initial codes to organize the data at a granular level and then used them to search for major themes. Next, researchers reviewed the codebook to resolve any discrepancies and ensured that patterns presented in the data were adequately captured. A narrative description was constructed for each theme, along with supporting quotes and justifications for why they are relevant to addressing the corresponding research questions.

Ethical Considerations

This thesis received ethics approval from the University of Ottawa Research Ethics Board (lead research site) at Ottawa, Ontario, Canada on April 20, 2021 (ID: S03-21-6707) and Hôpital Montfort Research Ethics Board (ID: 21-22-04-001). Research ethics boards from other hospital sites affiliated with the University of Ottawa granted exemptions for additional ethics: Children's Hospital of Eastern Ontario Research Institute, Bruyère Research Institute, and Ottawa Hospital Research Institute. For pan-Canadian recruitment outside of the Ottawa region, I pursued administrative reviews of this research ethics application as an external study at local universities. For research ethics boards at academic institutions that could not conduct an administrative review, I approached eligible participants through personal research networks and publicly identifiable resources (e.g., university websites). Appendices D to F consist of ethic

review certificates and documentations, as well as English and French versions of the informed consent forms built for this study.

Research Validity and Trustworthiness

Mixed methods research is an evolving paradigm. As Johnson et al. (2007) clarified, “Although mixed methods research is not new, it is a new movement, or discourse, or research paradigm that has risen in response to the currents of quantitative and qualitative research.” (p. 113). Mixed methods designs are appealing to medical education researchers because it can incorporate both meaning and quantity into the same project. It is a methodology that allows both quantitative and qualitative research to mutually coexist. With no set protocol for evaluating the methodological trustworthiness though, evaluating the robustness of a mixed methods study can be challenging. Herein, I followed three guiding principles raised by Morse (2010) to maintain control, strive for rigor, and acknowledge complexity in my own research.

Establishing trustworthiness begins early in its design. As the primary investigator, I maintained control by engaging in a stepwise approach to develop each study phase. For quantitative approaches to inquiry, up-front planning of what evidence to collect is a crucial first step to constructing a validity argument (Cook, 2021). Survey-based research may seem straightforward; however, researchers make assumptions when determining what evidence needs to be collected. To improve the accuracy of what I intended to measure, I challenged these assumptions through a careful process of generating, pilot testing, and revising of survey items (Artino et al., 2014). In addition to content evidence, I considered various constructs for clinical preceptorship in the context of other variables pertaining to preceptor demographics, teaching experience, and the virtual workplace. While the main purpose of Phase II is to report the patterns of survey responses, close attention on the validation process for a survey instrument created *de novo* contributes to the research decisions made thereafter. Contextual information collected about participants’ scope of practice provides supporting data about the reliability of survey findings to specific subgroups of clinical preceptors (i.e., mainly preceptors with over 10 years of teaching and clinical experience in Family Medicine, offering virtual care on a daily basis during COVID-19). However, the concern of low survey response rate is a methodological weakness to why robust conclusions could not be drawn from inferential statistic tests (Field, 2018, p. 136). Thus, when interpreting the findings altogether, I tread cautiously to avoid overgeneralizations beyond the constraints of the study sample.

In terms of maintaining rigor, the fidelity of qualitative research inquiry should be determined based on the findings' credibility, originality, resonance, and usefulness (Charmaz, 2014; Watling & Lingard, 2012). Several strategies can enhance the trustworthiness of its interpretations. Firstly, I exploited the nature of semi-structured interviews to ensure the quality and richness of transcripts. By documenting the key decisions reached among research members, creating an audit trail improved the credibility of identified themes. Member checking was another strategy to confirm the accuracy of data and ensure reflexivity is practiced throughout the research process.

Up to this point, I individually discussed the validity and reliability of quantitative results, as well as the trustworthiness of qualitative research findings. Now, I want to focus on the synthesis of evidence from both. For socially complex phenomena such as clinical preceptorship, not all aspects can be quantized. Maintaining complexity, the last principle, is a unique aspect of mixed methods designs because the "splicing of reality to convert phenomena into researchable chunks is minimized" (Morse, 2010, p. 350). Although Phase II and III are two components conducted separately, I considered both components at an analytic point of interface. I did so by attending to data and methodological forms of triangulation when corroborating evidence from different sources (Creswell & Poth, 2016). For instance, researchers can achieve methodological triangulation by gathering data sources congruent with the main questions and philosophical assumptions (Chun Tie et al., 2019). By drawing these meta-inferences, I hope to address the limitations that mono-paradigmatic approaches of inquiry cannot withstand. Ultimately, making sense of evidence from qualitative and quantitative research strategies to better illuminate the contemporary issues of residency training, particularly on the learning culture in virtual healthcare settings.

In the art of reflexivity, a recorded reflection of the personal, methodological, and contextual subjectivities allows me to acknowledge their influence in the research process (Kolb, 2012; Olmos-Vega et al., 2022). I led this research in part of my PhD studies in the Health Professions Education concentration, and my supervisors, research colleagues, and study participants were aware of this aspect of the study context. Being an outsider researcher, many of my research ideas stemmed from experiences as an Educationalist in the academic realm and a professional consultant in continuing medical education. Through informal conversations with research colleagues and clinical faculty, I noticed shared frustrations in transitioning to remote

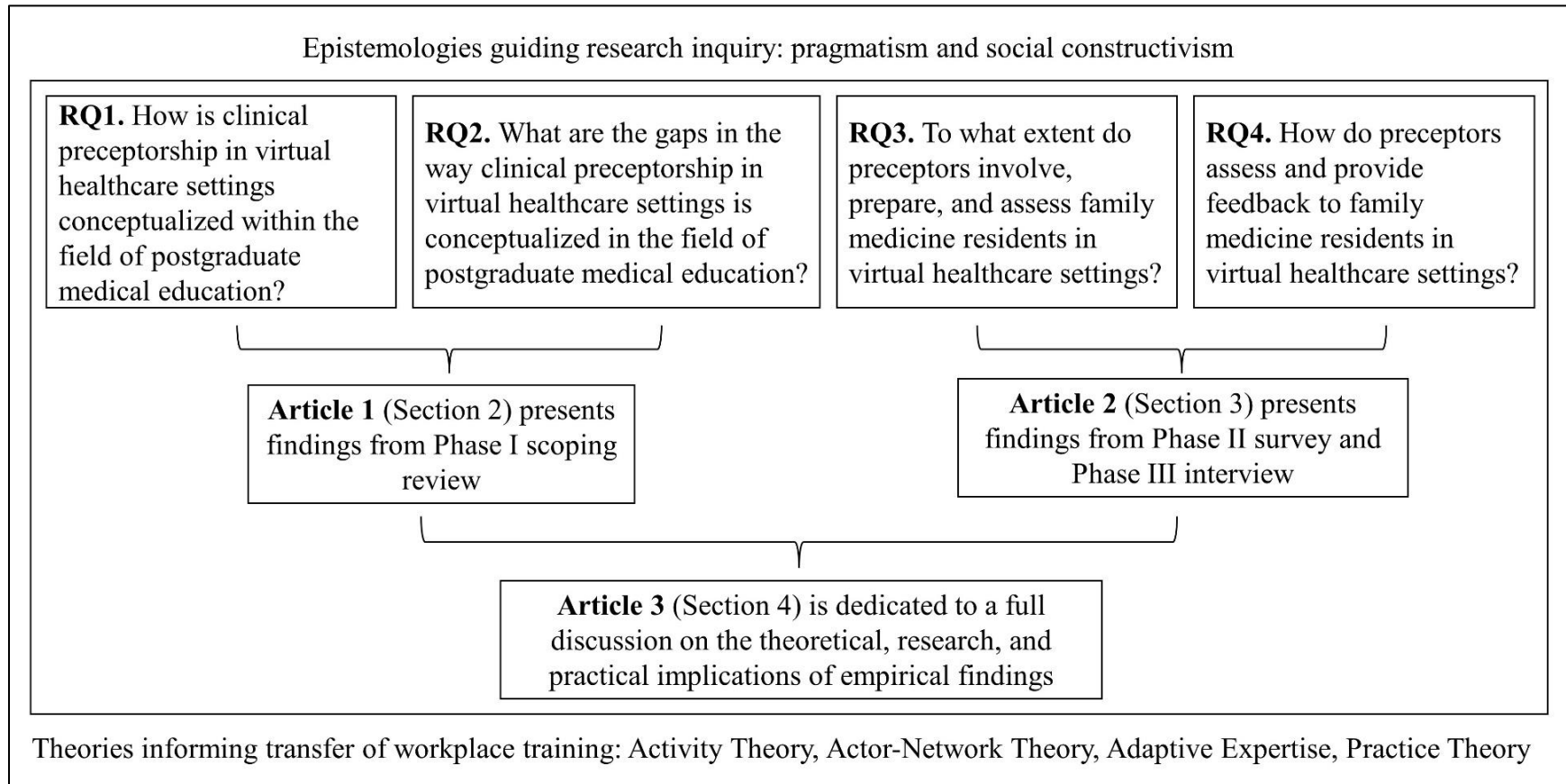
learning and work configurations early in the COVID-19 pandemic, especially in the field of family medicine. These personal insights shaped my PhD work to focus on virtual care training through the perspectives of family medicine teachers. During data generation and analyses, I started to uncover nuances involved with clinical supervision in virtual healthcare settings. Coming from a non-clinical background, I saw myself as a privileged member of the medical education community gathering different insights and strategies of how family physicians positioned themselves as clinical teachers in remote care situations. In leading this mixed methods study, being methodologically reflexive entailed understanding the possibilities and shortcomings of making deliberate decisions in data collection (e.g., timing to advance to the next study phase) and analysis (e.g., type of thematic analysis align to philosophical and methodological frameworks, reconciling new perspectives expressed by co-researchers). Methodological implications from such decisions are made explicit in the respective manuscripts presented in the following Sections. Given the breadth of family medicine education, contextual reflexivity is also pertinent to this work. Preceptors are often introduced to family medicine residents at different points of their residency training journey, in clinical workplace structures and cultures unfamiliar to learners, or in contexts when the focus of supervision is not distributed in a 1:1 ratio. Therefore, it was necessary for me to reflect upon and report the unique contexts study participants practiced in may have guided their interactions with family medicine residents. Throughout the interviewing process, participants repeatedly doubted or questioned their decisions or actions to precept family medicine residents during the COVID-19 pandemic. It became apparent that this research instigated reflection among family medicine teachers as they recounted their own supervisory choices. By taking into account my personal agendas and hidden assumptions as the primary investigator, these judgements contribute to the rigor and transferability of findings in research reporting (Varpio et al., 2020).

Structure of Dissertation

This dissertation consists of five sections. Section One serves as an introductory section on the review of the current literature, study objectives, and research design and methods for conducting a mixed-methods study. Developed as stand-alone publishable articles, Sections Two to Four can be read independently. Each of these sections open with a designated title page and individual abstract. When considered collectively, the three articles tie to a train of thought weaving the dissertation (Figure 2).

Figure 2

Logical Flow Diagram Mapping Research Questions, Theoretical Principles, and Article Manuscripts



The first manuscript is a Review article specifically addressing two broad research questions (RQ1, 2) in the Phase I of a mixed methods study. Guided by the lenses of social constructivism and pragmatism, this article details the conceptualization and implementation of a scoping review. Through a systematic approach of literature searching, I mapped types of evidence to key concepts and gaps in the literature about virtual preceptorship. Synthesized findings from this review offer readers a shared understanding of a defined area of virtual care training. Uncovering key concepts of clinical precepting and the existing gaps to this teaching approach helped narrow and focus my line of inquiry to study specific dimensions of preceptorship in virtual healthcare settings:

- Preceptor trust in resident involvement
- Degree and breadth of resident exposure to virtual care activities
- Dynamics to build clinical learning relationships in virtual healthcare setting
- Ability and approaches to assess virtual care performance
- Experiences to provide resident feedback in the virtual care workplace

The second manuscript is an Original Research article addressing the latter two research questions (RQ3, 4). I articulate the methodological processes and results from Phases II and III to build a thematic framework on the experiences of clinical preceptorship in virtual healthcare settings. Grounding on the empirical studies for answering my four research questions, the third manuscript is written in the form of a Scholarly Perspectives article, namely suitable to expand on contemporary issue(s) in academic medicine. In considering the current climate of family medicine education, this scholarly space serves three purposes: 1) holistically revisit key concepts and results yielded from a multi-stage project, 2) theorize new evidence-based arguments about postgraduate medical education, and 3) present research and education practice directions for preceptor support in virtual care settings.

Lastly, Section Five concludes with a Coda chapter for medical educators and researchers who wish to advance this landscape of CBME. It summarizes the deliverables and key messages from this dissertation, as well as insights that scholars can draw on to generate knowledge on virtual workplace training across clinical specialties.

Contribution to the Field of Medical Education

During thesis conceptualization, virtual care evolved from a growing practice to the new norm for patient care delivery. I was alarmed to discover that robust investigations on preceptorships under such environments remain lacking despite the prioritization of medical education efforts to address relevant learning needs. Thus, I commenced this study in hopes that it will be one of the first to define the current roles and experiences of clinical preceptorship in virtual healthcare settings. Each manuscript article documents how the process yielded theoretical, methodological, and practical contributions to the field of medical education.

Theoretical Contributions

Novelty in this research ultimately broadens our knowledge of preceptorships in medicine, along with yielding foundational evidence on how clinical teaching evolved with the introduction of a new clinical learning environment. Firstly, this work reinforces our knowledge about precepting relationships as the backbone to building positive learning cultures for postgraduate medical trainees. This body of research pushes current conversations in CBME to consider applying social learning and practice theories in telemedicine training. Article 1 conceptualizes the preceptor beliefs, interactions, and workplace artifacts that facilitate training in virtual healthcare environments. A cross-examination of the literature also revealed the scarcity of theory-grounded research in this area of medical education. A critical output from Article 2 is a framework describing the elements to facilitate a meaningful virtual preceptorship. Drawing on survey and interview data from preceptors of family medicine residents, this thematic framework illustrates the prudent connections to support experience-based training in virtual healthcare settings. Within Article 3, I articulate in a fuller discussion on the theoretical implications that extend from literature synthesis, interpretations informed by this mixed-methods study, and review of policy documents. Focusing on educational continuity as an organizing principle, I explore the theoretical relevance of actor-network, adaptive expertise, and practice theories behind the scholarship of teaching and learning in virtual care.

Methodological Contributions

Virtual care has become a priority topic across all levels of medical education, encouraging researchers to examine the scholarship of clinical teaching with different methodological approaches. Using this mixed-methods study as a working example, Articles 1

and 2 detail the rigorous research processes undertaken to study the practice of clinical precepting in virtual care contexts. Specifically, I applied a generalized model of Disciplined Inquiry to design and execute each research stage, focusing on the logic justifying how a research method addresses the pre-defined set of research objectives and questions. Each of these articles conclude by outlining the key limitations from this body of research.

In Article 3 I share my reflections on conducting a multi-phase, pan-Canadian research project during the COVID-19 pandemic. These lessons speak to the unexpected research dilemmas I faced during its planning and implementation. I then extend the research conversation by suggesting research strategies to unpack contemporary issues on workplace training for virtual care. For researchers who also intend on advancing this area, I hope to shed light on this path of inquiry and offer strategies addressing contemplations of alike nature.

Contributions to Educational Practice

Readers of this thesis will find inspiration on enriching the professional identity and practice of a clinical preceptor in family medicine education. With decades of history as a clinical practice, Article 1 describes a scoping review on the scholarship of clinical teaching in virtual healthcare settings leading up to the period of COVID-19 pandemic. Building on this general understanding and recent shifts in recognizing virtual care as a key clinical domain in the Family Medicine profession, I present new evidence on the impacts of virtual care setup on clinical teaching and supervision. For educationalists abroad, this work was nurtured at a time of human history when virtual care has never before been as highly sought after. Thus, Article 2 archives a critical time when medical educators reflected and improvised their own clinical teaching practices before and in response to a global health crisis. Stories of the setbacks and successes on how clinical teachers pivoted to virtual healthcare contexts can inform the ongoing development and implementation of CBME initiatives. Article 3 extrapolates meta-interpretations from this body of research and considers them in the broader context of postgraduate medical education and by extension faculty development.

Section Two: Article 1

Precepting Postgraduate Medical Trainees in Virtual Healthcare Settings: A Scoping Review

Running head: Clinical Preceptorship in Virtual Care

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This manuscript is developed for submission to a journal such as the *Medical Teacher*, a peer-reviewed, international academic journal that publishes research on the developments of teaching approaches and methods in medical education.

Article type: Original Article

Number of supplementary figures: 1

Number of supplementary tables: 3 (attached separately in Appendix A)

Word count: 3555 (excluding in-text references)

Poster Presentations at Meridith Marks Day (March 2022) and International Congress for Academic Medicine (April 2023, submission accepted).

Abstract

Background: Physicians are required to deliver high-quality virtual care. As the demand for virtual care increases, educators require effective methods for training physicians to handle these clinical encounters. Literature was examined to understand the current conceptualizations of clinical preceptorship in virtual healthcare settings.

Methods: To identify peer-reviewed articles describing the interactions of preceptors with postgraduate medical trainees, a scoping review following the Arksey and O'Malley methodological framework was performed. Details about article demographics, research methods, targeted populations, training contexts, precepting experiences, and study limitations were examined.

Results: Twenty-four articles addressed preceptorships at the postgraduate medical training level across various medical specialties. Preceptorships were described by the virtual care workplace, preceptor characteristics and functions, precepting attitude and interactions, trainee involvement, and perceived training outcomes. Potential areas of research should explore solutions to strengthen preceptor-trainee relationships, evaluating the impacts of clinical preceptorships, and delineating preceptor roles in virtual healthcare settings.

Discussion: This review informs the current conceptualizations of preceptorship for supporting postgraduate medical trainees through telehealth training. Adaptative strategies and gaps to sustain clinical preceptorships in virtual healthcare settings were recognized. Efforts to reinforce goal-oriented preceptorships for developing virtual care competency are highly advised.

Abstract word count: 192

Keywords: scoping review, virtual care, preceptorship, postgraduate medical education

Introduction

Virtual care is a modality of patient care delivery used across medical specialties (Flodgren et al., 2015; Greenhalgh et al., 2017). Defined by Shaw et al. (2018, p. 609), virtual care considers “any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies, with the aim of facilitating or maximizing the quality and effectiveness of patient care”. The COVID-19 pandemic led to accelerated implementations of telemedicine in primary care clinical, allowing up to 90% of patient visits to be conducted virtually via phone or videoconferencing (Olayiwola et al., 2020). Recent systematic reviews support the feasibility of telehealth technologies in dermatology, mental health, and chronic disease management (Armfield et al., 2015; Bashshur et al., 2016). In relation to in-person care, virtual care can be a safe alternative for managing acute, non-urgent conditions (Gordon et al., 2017). Despite the abundance of evidence supporting its use, patients continue to report mixed experiences with virtual care services. In Donelan et al. (2019), over 80% of patients who completed a virtual follow-up visit with their clinical subspecialists rated the encounter with high satisfaction. When complex chronic patients finished a six-month telephone coaching programme delivered by family physicians, they reported higher quality of life compared to those who did not receive additional care remotely (i.e., improved scores on physical component of 12-Item Short Health Survey; mean difference of 4.71, 95% CI [-9.03, -0.41], $p = 0.03$) (González-Ortega et al., 2017). Contrarily, medical regulatory bodies have received medico-legal complaints pertaining to the quality of virtual care; for instance, failing to listen to patient needs, inappropriate or irresponsible prescribing, breach of confidentiality, and unthorough clinical assessments or investigations (Canadian Medical Protective Association, 2021; General Medical Council, 2021). Thus, virtual care cannot substitute in-person clinical assessments and treatments or when patients need urgent medical care.

A goal of medical education is to graduate physicians who demonstrate readiness to practice medicine and be stewards of healthcare. Virtual care is no exception. Competent providers of virtual care, including postgraduate medical trainees, need to be aware of its limitations. Absence of in-person meetings forfeits a physician’s ability to conduct a full physical examination, gather all the necessary patient information, or perform clinical procedures in a virtual encounter (COVID-19 Scientific Advisory Group, 2020). A successful telehealth

interaction also relies on trusting relationships and effective interpersonal communication skills (Henry et al., 2021). Absence of a shared physical space may also instigate unease when difficult clinical decisions need to be made. Thus, physicians should respond accordingly if communication barriers or functional impairments hamper a patient's ability to engage over the virtual interface (Annaswamy et al., 2020).

To help physicians meet the required competencies for providing remote care in clinically appropriate situations, medical licensure bodies recognize the imminent need for more education (Association of American Medical Colleges, 2021; CMA, 2020b; WHO, 2021). In addition to formal telemedicine curricula, trainees need guided opportunities to practice virtual care skills in real-life situations (Stovel et al., 2020). Aligned with the current competency-based medical education (CBME) movement, preceptors are uniquely positioned in postgraduate medical trainees' learning trajectory, guiding them to become professionals fit for clinical practice (Bartlett et al., 2020). While some studies have examined the concept of virtual supervision (Martin et al., 2017; Wearne, Dornan, et al., 2015; Wearne, Teunissen, et al., 2015), there is scant literature directly addressing the practice of preceptorship in virtual healthcare settings. This scoping review was, therefore, designed to understand the clinical precepting experiences that occur in such work environments. Specifically, this review intended to address two research questions:

1. How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education?
2. What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?

Methods

Given virtual care is an emerging field in medical education and the lack of a shared understanding of preceptorship in these contexts, an overview of the existing teaching practices in virtual healthcare settings is needed. For the purpose of this review, the operational definition of 'virtual healthcare setting' is defined as a setting where physicians provide medical services and synchronously interact with their patients without being in a shared physical space. In this context, the precepting interactions between clinical supervisors and postgraduate medical trainees (i.e., also referred to as "interns", "house officers", "residents", "registrars", or "fellows" continuing their training upon the completion of medical school) were of particular interest.

Engeström's model of Activity Theory (2001) provided a theorizing concept to draw interpretations about virtual preceptorship described in the postgraduate medical education literature: Who are precepting? Why do they precept? What do they precept? And, how do they precept in virtual healthcare settings?. Adhering to the methodological framework proposed by Arksey and O'Malley (2005) and PRISMA-ScR guideline for reporting scoping reviews (Tricco et al., 2018), a final protocol was pursued and registered under Open Science Framework registries (osf.io/htsd3).

Identification of Relevant Studies

To ensure the adequate inclusion of articles, literature searches were conducted with four databases: Embase via Ovid, MEDLINE via Ovid, Education Source via EBSCO, and Scopus. In collaboration with a university librarian (L.S.), search strategies were developed for each database (Table S1). Limits were not imposed to permit the comprehensiveness of data collection. To check the appropriateness of keywords and databases, search strategies were piloted prior to finalizing; and thereafter, a final search using all identified keywords and index terms was done on February 25, 2021. All 8424 references were imported, and duplicates were removed using the screening software Covidence.

Article Eligibility

We selected original articles describing the precepting interactions with postgraduate medical trainees in virtual healthcare settings. Given the novelty of the studied topic, conceptual papers that discussed the potential roles of clinical preceptors in postgraduate medical education were also included. Only articles with full-text available in English were considered. Articles excluded were reviews, commentaries, conference proceedings or abstracts, articles describing education in asynchronous telehealth settings (i.e., no direct patient care), articles describing only virtual patient education interventions, and studies including populations of medical students or learners from other health disciplines.

Data Extraction

To determine article eligibility, two researchers (R.L-K., C.K.) independently screened article titles and abstracts for 5947 entries. They then reviewed the full text of 113 articles to confirm eligibility and discussed any discrepancies before proceeding with data extraction for the

included studies. Using a standardized data extraction form, researchers (R.L-K., C.K., M-H.H.) then independently extracted information about the authors, study type, study participants (i.e., preceptor, postgraduate medical trainee characteristics), objects (i.e., precepting goals), tools (i.e., technologies mediating preceptor-trainee interaction), rules (i.e., timing or context of virtual precepting), community (e.g., interactions with patients, medical students, healthcare team members), division of labor (i.e., preceptor, trainee responsibilities), and any study limitations mentioned. Researchers charted the data using an electronic form to capture the details about included articles, characteristics of data sources, and reported findings. R.L-K. reviewed all charted data and resolved any discrepancies until consensus was reached.

Data Analysis

One author (R.L-K.) calculated frequencies on the country of origin, clinical specialties studied, and research methods employed. Individual preceptor functions were also coded and tabulated. The charted evidence on clinical preceptorship and relevant research gaps were thematically analyzed and elaborated as topic summaries.

Results

This scoping review included 24 peer-reviewed articles that explored preceptorship in virtual healthcare settings with postgraduate medical trainees (see PRISMA flow diagram in Figure S1). Published between 2009 and 2021, most studies originated from the United States (n=20) with only two set in Canada and one in the United Kingdom. One article was multi-national based in Singapore, the Netherlands and Australia. Researchers examined aspects of preceptorship in virtual healthcare contexts across various medical specialties (3 articles were unspecified): anesthesiology (n=1), dermatology (n=1), emergency medicine (n=1), medical genetics (n=1), surgery (n=1), family medicine (n=2), internal medicine (n=2), pediatrics (n=2), neurology (n=3), and psychiatry (n=7). With an overarching goal of integrating telemedicine into the medical education curricula, non-empirical literature sources took the form of practical guides (n=4) for developing postgraduate medical education programs. For original research sources, 20 studies examined the logistics and short-term impacts of engaging postgraduate medical trainees in virtual care. Table S2 presents a full breakdown of the demographics, research methods and settings, and participant details for each article.

Conceptualizations of Clinical Preceptorship

Most studies defined the nature of virtual care services provided by trainees and preceptors; however, the theoretical grounds to examine clinical training in virtual workplaces were rarely described. Only three studies noted the alignment of precepting interactions to experiential learning (e.g., Kolb's experiential learning cycle) (Crawford et al., 2016; Huffman et al., 2020; Papanagnou et al., 2018). Findings revealed that preceptorship in virtual healthcare settings can be conceptualized around seven aspects: the virtual care workplace, individual preceptor characteristics, preceptor functions, preceptor-resident interactions, degree of trainee involvement, attitudes for training, and perceived training outcomes. Table S3 presents the charted data for each of these topics in detail.

Virtual Care Workplace. Postgraduate trainees and their preceptors often provided virtual care under the following circumstances: 1) real-time video visits with patients during outpatient clinics, 2) telephone visits from clinicians' home offices or on-site at the hospital, and/or 3) patient encounters where a complete physical examination is deemed unnecessary.

Preceptor Characteristics. Some studies emphasized the need for preceptor experience or qualifications to supervise trainees in virtual healthcare environments (Crawford et al., 2016; Hilty et al., 2019; Papanagnou et al., 2018). Additional on-the-job training to help attending physicians prepare for virtual care included practice tip guides and education grand rounds (Crawford et al., 2016; Papanagnou et al., 2018; Stephenson et al., 2020; Suarez-Cedeno et al., 2020).

Preceptor Functions. Fifteen studies highlighted virtual supervision as the predominant preceptor function. Other preceptor functions mentioned were guidance in patient management (Casas et al., 2020; Chick et al., 2020; Kowalski et al., 2020; Lau et al., 2020; Suarez-Cedeno et al., 2020; Teshima et al., 2016), provision of resident feedback (Huffman et al., 2020; Kohan et al., 2020; Papanagnou et al., 2018; Shore et al., 2011; Stephenson et al., 2020), clinical teaching (DeGaetano et al., 2015; Govindarajan et al., 2017; Hilty et al., 2019; Shore et al., 2011), formative assessment of performance (Hilty et al., 2019; Kohan et al., 2020; Lum et al., 2020; Papanagnou et al., 2018), role modeling (Afshari et al., 2019; DeGaetano et al., 2015; Teshima et al., 2016), and mentoring (Fleming et al., 2009; Govindarajan et al., 2017; Keswani et al., 2020).

Trainee Involvement. Clinical preceptors supported (or were advised to) trainee engagement in the virtual care workflow in a graduated fashion (Crawford et al., 2016; Huffman

et al., 2020; Keswani et al., 2020; Teshima et al., 2016). After observing a few telehealth visits, residents could complete virtual care tasks under the supervision of an assigned preceptor (e.g., history taking, formulating treatment plans, medication reviews, patient counselling, documentation) (Casas et al., 2020; Chick et al., 2020; DeGaetano et al., 2015; Kowalski et al., 2020; Lau et al., 2020; Papanagnou et al., 2018; Suarez-Cedeno et al., 2020). Adequate staffing, access to virtual care technology, and dedicated workplace setup were identified as enablers of trainee engagement (Afshari et al., 2019; Dzara et al., 2013; Keswani et al., 2020; Shore et al., 2011; Stephenson et al., 2020). Upscaling virtual care due to mandatory public health regulations also encouraged postgraduate medical education programs to invite trainees to provide patient care remotely (Huffman et al., 2020; Kohan et al., 2020; Mallon et al., 2020; Pritchard et al., 2021; Suarez-Cedeno et al., 2020).

Precepting Interactions. Preceptors supported their trainees' participation in the virtual care workflow through backstage oversight, indirect supervision, or direct supervision (Afshari et al., 2019; DeGaetano et al., 2015; Dzara et al., 2013; Huffman et al., 2020; Lum et al., 2020; Mallon et al., 2020; Shore et al., 2011; Stephenson et al., 2020; Suarez-Cedeno et al., 2020; Teshima et al., 2016). In operationalizing telehealth visits, preceptors believed that the virtual context favored trainee observation and feedback provision to happen more readily (compared to in-person care) (Stephenson et al., 2020). Preceptors also encouraged communication with trainees during and/or after a patient encounter (e.g., using virtual platform's messaging function) (Fleming et al., 2009; Govindarajan et al., 2017; Huffman et al., 2020; Keswani et al., 2020; Kohan et al., 2020; Papanagnou et al., 2018; Shore et al., 2011). Preceptors needed to make new arrangements so that time to build a learning relationship with residents was possible (Chick et al., 2020; Govindarajan et al., 2017; Huffman et al., 2020). For instance, Pritchard et al. (2021) described a pre-clinic staffing model that enabled preceptors to review cases with trainees prior to meeting the patient. In another study, researchers emphasized the deliberate need for residents seeing patients independently to 'pause' the virtual care encounter for the attending physician on duty to review their preliminary evaluations and make readjustments to care plans (Afshari et al., 2019). Reinforcing help-seeking behaviors and identifying critical moments when preceptors should intervene were strategies for collaborative patient management in virtual care (Afshari et al., 2019; Chick et al., 2020; Lau et al., 2020; Mallon et al., 2020; Suarez-Cedeno et al., 2020). Outside of the virtual encounter, few studies noted that preceptors

prepared their trainees with additional teaching pertaining to virtual care (e.g., proper documentation, physical examination, history taking, professional etiquette, building therapeutic alliance, practice-based learning) (Govindarajan et al., 2017; Keswani et al., 2020; Shore et al., 2011).

Precepting Attitudes. Trainees and preceptors expressed positive remarks, concerns, and barriers to preceptorships maintained in virtual healthcare settings. In four studies, trainees viewed training with a telehealth component as valuable in preparing them for future practices with diverse patient groups (Dzara et al., 2013; Kowalski et al., 2020; Papanagnou et al., 2018; Pritchard et al., 2021). Clinical faculty also considered that hosting virtual “bedside” rounds to be appropriate for resident learning (Keswani et al., 2020). With the implementation of new virtual care services, trainees reported moderate levels of satisfaction with their clinical experience during the COVID-19 pandemic (Beran & Sowa, 2020; Pritchard et al., 2021). Despite the evolving nature of supervision during COVID-19 pandemic times, preceptors navigated virtual care technologies in order to directly observe trainees as a “silent spectator” (DeGaetano et al., 2015; Huffman et al., 2020; Lau et al., 2020; Suarez-Cedeno et al., 2020).

Contrarily, preceptors and trainees also voiced concerns with the quality of preceptorship in virtual healthcare settings. The physical isolation that trainees and preceptors experienced when working in virtual settings brought critical changes to how postgraduate medical education programs operated (Mallon et al., 2020). In programs that made rapid transitions to virtual care amidst the COVID-19 pandemic, preceptors perceived a loss of opportunities for their residents to develop procedural and physical examination skills (Fleming et al., 2009). Although trainees did not seem to be affected in the Beran and Sowa study, preceptors also rated their satisfaction on the quality of supervision provided lower than before the implementation of virtual care ($p = 0.04$). Learning tensions that were apparent when they practiced in virtual healthcare settings, including lost autonomy, heightened scrutiny, and decreased collegiality (Fleming et al., 2009; Huffman et al., 2020). Barriers to or reasons for ineffective precepting may be a result of preceptor’s discomfort to work and/or supervise trainees virtually (Beran & Sowa, 2020; Crawford et al., 2016), lack of faculty development support (Crawford et al., 2016; Keswani et al., 2020), assessment fatigue (Keswani et al., 2020), limited resources to support pre-staffing models (Pritchard et al., 2021), or time spent on troubleshooting issues with telehealth technologies (Suarez-Cedeno et al., 2020).

Training Outcomes. Preceptors positioned in the virtual workplace are conducive to assessing virtual care performance. Preceptors judged their trainees' performance by directly observing them in the virtual healthcare settings – specifically on history-taking and some examination skills (Govindarajan et al., 2017), interpersonal communication skills (Lau et al., 2020), and clinical reasoning skills in integrating practice guidelines (Casas et al., 2020). Recent developments to building competency-based frameworks for telemedicine have identified opportunities for standardized workplace assessments in virtual healthcare settings (Hilty et al., 2019; Keswani et al., 2020; Kohan et al., 2020; Lum et al., 2020; Stephenson et al., 2020). Researchers suggested strategies to adopt telemedicine-specific mini-clinical evaluation exercises, competency checklists, structured observation tools, or medical chart reviews for determining and tracking performance.

Research Gaps

Of the included articles, existing research gaps pertinent to the practice of preceptorship in virtual healthcare are summarized as three categories. First, there is a lack of original research on solutions that effectively strengthen training relationships in the virtual work environments. Early exposure to telehealth patient services can enrich trainees' learning experience; however, past studies yielded limited knowledge about the areas trainees tend to struggle with and how they can be coached in virtual healthcare settings (Dzara et al., 2013; Keswani et al., 2020; Mallon et al., 2020). In terms of identifying educational needs, researchers recognized that preceptors could benefit from a repository of faculty development resources for teaching residents in their rotations involving telemedicine (Crawford et al., 2016; Lum et al., 2020).

Second, this synthesis indicates a paucity of research on the continuity of clinical preceptorship in virtual healthcare settings. Several studies emphasized the need for longitudinal data to support preceptorship as an effective method in developing virtual care competency (Hilty et al., 2019; Huffman et al., 2020; Kohan et al., 2020; Suarez-Cedeno et al., 2020; Teshima et al., 2016). Furthermore, the underlying reasons for low trainee confidence in carrying out virtual care tasks remain unclear (Afshari et al., 2019; Beran & Sowa, 2020; DeGaetano et al., 2015; Dzara et al., 2013; Lowe et al., 2020). Researchers also noted the lack of robust assessment approaches to measure virtual care provider competencies (e.g., assessment purpose, frequency of assessments, tools used) (DeGaetano et al., 2015; Dzara et al., 2013; Hilty et al., 2019; Lau et al., 2020; Pritchard et al., 2021). When evaluating the effectiveness of telehealth

training, past studies acknowledged that further examinations on the impacts of preceptorship to the healthcare experience are warranted (Kowalski et al., 2020; Lau et al., 2020). For instance, considering patient-reported outcomes or clinical analytics may determine whether trainee engagement in telemedicine negatively impacts the quality of care (Afshari et al., 2019; Casas et al., 2020; DeGaetano et al., 2015; Lum et al., 2020; Papanagnou et al., 2018; Pritchard et al., 2021).

Last, our conceptualizations of preceptorship in virtual healthcare settings are limited to postgraduate medical education programs with the capacity to provide telemedicine training. As most studies described the telehealth training experiences of those completing a US-based or psychiatric training program, few focused on virtual preceptorship beyond these geographical or clinical speciality contexts. With more clinical practices operationalizing a hybrid of virtual and in-person healthcare settings, novel strategies to sustain meaningful relationships and navigate the dynamics between both learning contexts are strongly advised (DeGaetano et al., 2015; Shore et al., 2011).

Discussion

This scoping review identified 24 peer-reviewed articles addressing preceptorships with postgraduate medical trainees in various virtual healthcare settings. Specifically, faculty experience with telemedicine, clear educational roles, and well-equipped workplaces can facilitate precepting. In situations where trainee involvement is permitted, they became familiar with the logistics of a novel workflow and gained clinical experience working as virtual care providers. Preceptors provided support through planned observations in the virtual workplace, role-modeling professional behaviors, and offering guidance when needed. While clinical learning experience is deemed generally positive, trainees and preceptors noted unique challenges to complete virtual care rotations. The capacity of preceptors to assess trainees' performance in virtual healthcare settings remains unknown. The self-reported nature of most outcome data (i.e., ability to supervise, degree of confidence or interest to work in virtual care) further limited our interpretations on the effectiveness of telehealth training.

Despite evidence supporting co-constructed learning relationships in virtual healthcare settings, specific areas remain unaddressed in the way clinical preceptorship is currently conceptualized. Evidence-based strategies to strengthen preceptorships in these clinical contexts need to be better studied (e.g., staffing model, feedback delivery). To this effect, researchers

require an understanding of the beliefs and judgements that govern preceptor-trainee interactions in virtual healthcare settings. An examination of the literature revealed different assessment approaches for virtual care but requires further investigation (e.g., implementing structured tools to assess milestones for virtual care competency). Moving beyond the logistics of integrating trainees into this novel workflow, evaluations on the longitudinal impacts of training residents in this clinical learning environment will require a thorough look. Lastly, information on how preceptors maintain the quality of postgraduate medical education in virtual settings is underrepresented in specific geographic contexts and clinical specialities that offer patient care virtually.

Practical Implications

Recent demands and developments for virtual care pushed clinical teachers to precept in a setting in which they may not have received training or are themselves adopting practice changes for telemedicine. In a recent Best Evidence Medical Education guide update, the authors concluded that “[educational] research on telehealth...and faculty development to teach in remote environments was lacking and urgently needed” (Daniel et al., 2021). Without a clear understanding of what constitutes best practices for telehealth, clinical educators will continue to carry blind spots on their precepting approaches to teaching and assessing trainees. Thus, this scoping review provides an overview of the current precepting approaches and educational gaps that postgraduate medical trainees faced when situated in virtual healthcare settings.

Virtual care can improve accessibility to medical services; however, the physical isolation or interpersonal divides may compromise the supportive environment needed for building educational alliance (Telio et al., 2015). As healthcare team leaders, clinical teachers are accountable for the quality of learning that medical trainees receive in various healthcare environments. Similar to previous clinical supervision research (Hauer et al., 2014; Ten Cate et al., 2020), there is evidence of preceptors making *ad hoc* entrustment decisions on when learners can perform tasks with a given level of remote supervision. Clinical faculty remain concerned about their ability to support trainees to the same extent as in traditional, face-to-face workplaces. Although virtual healthcare settings enable trainees and preceptors to remotely interact with a diverse pool of patients, these interactions may occur at the expense of informal yet high yield learning opportunities (e.g., “hallway” conversations about the pearls of a clinical case). To prepare postgraduate trainee for clinical tasks in new clinical settings, they need to

acquire contextual competence to navigate effectively and contribute to safe practice (Teunissen et al., 2021). Perhaps, deliberate facilitations of structured coaching have a unique place for supporting development in the virtual workspace (Gatewood & De Gagne, 2019; Lockyer et al., 2020; Ramani & Leinster, 2008).

The findings should be interpreted in light of their limitations. It is possible that a relevant study was inadvertently missed. With the global movement to implement telemedicine, a bevy of new literature describing virtual preceptorships with medical trainees may have accrued by the time of publication. Thus, a re-examination of how our conceptualization of virtual preceptorship has evolved over time will likely be necessary (e.g., liability concerns to involve medical trainees). Supplementary search strategies (e.g., citation chasing, trial register, web searching) were not performed due to time and resource restrictions. It was also assumed that peer-reviewed, published articles would offer richer data on the practice of clinical precepting, compared to abstracts (n=16), commentaries (n=12), short reports (n=3), or expert opinion articles (n=1). The ability to evaluate the quality of evidence is another limitation as information was gathered from a range of study designs and methodologies. Hence, an appraisal of the risk for bias was not possible. Despite best efforts to include multiple reviewers in the data gathering processes and to report findings transparently (Khalil et al., 2016), selection bias may still have occurred.

Conclusion

Preceptorship is a tradition of medical education (Gjerde & Coble, 1982; Stuart et al., 1980) – a teaching practice for introducing novice learners to the art of clinical medicine. Over the last decade, preceptorship has evolved - it no longer is confined to the physical boundaries of hospital or clinic spaces. This scoping review gathered insights on how preceptors are supporting trainees in the era for telemedicine, serving the foundation for future efforts to improve clinical training in virtual healthcare settings.

Practice Points

- Rapid developments in virtual care demand clinical teachers to precept postgraduate medical trainees in remotely-based healthcare settings.

- Preceptorship experiences in virtual healthcare settings can be characterized by the workplace, preceptor characteristics and functions, precepting interactions, degree of trainee involvement, attitudes towards precepting, and training outcomes.
- Concerns about clinical preceptors' ability to continually support trainees in virtual healthcare settings persist.
- Novel teaching and assessment approaches should support postgraduate medical trainees to provide safe patient care in virtual healthcare settings.

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Declaration of Interests

No conflicts of interest to declare.

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None to disclose.

Section Three: Article 2

Title: Treading in the Virtual Care Classroom: An Exploratory Sequential Mixed Methods Study on Precepting Family Medicine Trainees in Virtual Care

Running head: Preceptorship in Virtual Care Settings

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Number of figures: 2

Number of tables: 6

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Abstract

Background: Healthcare systems worldwide embraced virtual care during the COVID-19 pandemic. As the pioneer of telemedicine, Canada has laid the foundations for a remote healthcare revolution on Earth and in Space. Despite this historic connection, the practice of clinical precepting in virtual healthcare contexts remains understudied.

Objective: This study aimed to explore the experiences of precepting family medicine residents in virtual healthcare settings.

Methods: A three-phase, sequential, exploratory mixed methods study was conducted. Phase I comprised of a scoping literature review on the conceptualization of preceptorship in virtual healthcare settings. Review findings guided the administration of a one-time online survey to clinical preceptors of family medicine residents (n=45). To elucidate their experiences, perspectives from interviewing 13 preceptors led to a thematic framework for precepting in virtual care contexts (Phase III). Survey data were analyzed using SPSS® and interview data were coded following reflexive thematic analysis.

Results: Clinical preceptors reported the nature of their interactions with residents in virtual healthcare settings (e.g., clinical tasks engaged, impacts of the virtual workplace). The dynamics of clinical precepting in virtual care contexts were described as six key themes: precepting as patchwork, steering away from transactional care, configurations discourage direct supervision, setting residents up for success, struggling to gauge progress, and centering feedback around clinical story.

Discussion: This article discusses the perceived roles and challenges with precepting family medicine residents in virtual healthcare settings, as well as summarizing the limitations and implications of this research on postgraduate family medicine education.

Word Count: 245

Keywords: Mixed Methods, Virtual Care, Postgraduate Medical Education, Clinical Preceptorship

Introduction

Best educational practices in telemedicine activities continue to be lacking (Daniel et al., 2021; Vaona et al., 2017). In acclimatizing to the competency-based medical education (CBME) movement, medical residency programs are committed to offer training opportunities for trainees to manage diverse clinical situations, including virtual care. The wide implementation of virtual care into clinical practices demanded that relevant training is effective and accessible for new physicians to offer them safely. During the COVID-19 pandemic, educators prioritized and integrated virtual care topics in formal curricula across the medical education continuum (Helou et al., 2020; Knight et al., 2016; Poncette et al., 2020). At the undergraduate level, there is a shift in culture for medical students to gain the foundational knowledge to support patient needs both in-person and remotely (Anawati, 2022). Progressing to more advanced stages of medical training as postgraduate trainees, they should be introduced to the practical applications of virtual care –highlighting its value and limitations to providing safe patient care.

Clinical preceptorship is an instructional method heavily employed in postgraduate medical education. Focusing on clinical and ethical development, preceptorships are short-term learning relationships maintained with the intention to integrate and support new clinicians into practice (Giroto et al., 2019; Tan et al., 2011; Yonge et al., 2007). The educational practice of clinical precepting, therefore, comprise of the acts and behaviors to establish and maintain these relationships. The results of a scoping review conducted by Lee-Krueger, Archibald, et al. (n.d.), indicate clinical educators and postgraduate medical trainees conceptualized virtual preceptorships in relation to 1) the workplace, 2) functions of the preceptor role, 3) type of preceptor-resident interactions, 4) degree of trainee involvement in virtual care workflow, 5) attitudes towards virtual precepting, and 6) perceived outcomes to virtual care training. Despite the growing body of literature on virtual care education, researchers have yet to unpack the dynamics of clinical preceptorships in this educational frame.

To examine the precepting experiences in virtual healthcare setting, this study objective specifically explored two research questions: To what extent do preceptors involve, prepare, and assess family medicine residents in these contexts? How do preceptors assess and provide feedback to family medicine residents?

Methods

Figure 3 illustrates the design and implementation of a three-phase mixed methods study. The methodological process adheres to the model of Disciplined Inquiry a five-stage generalized approach presented by Shaw et al. (2018) for conducting mixed design research. Emphasis is placed on justifying the use of multiple research strategies due to the nature of research objectives and questions, rather than the categories of data collection methods.

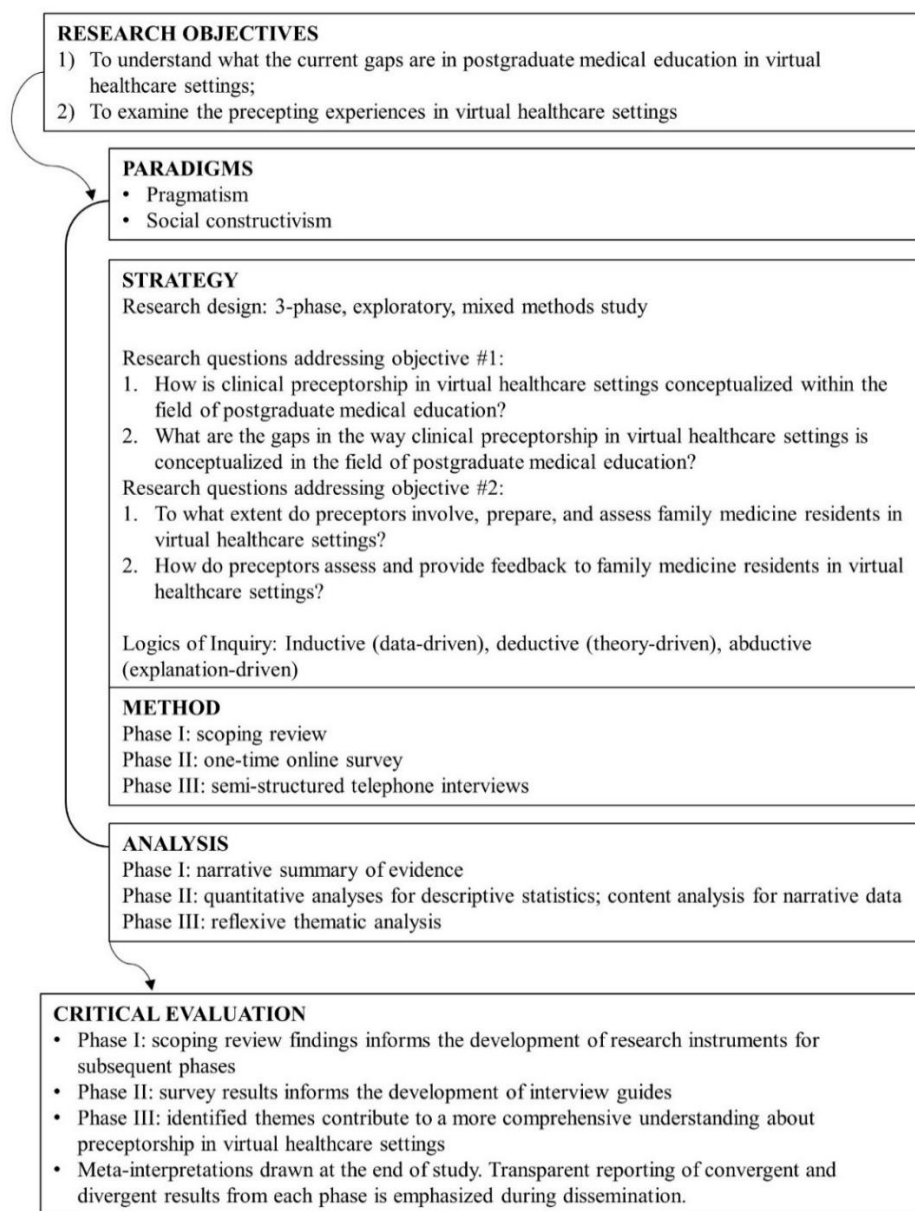
This group embraced epistemological lenses of pragmatism and social constructivism to delineate the scope of an exploratory study. Pragmatism views human actions as continuous routines that can be affected by contextual conditions (Morgan, 2017). As the study unfolds, situational influences urged us to mentally review the available options and select one appropriate for studying clinical preceptorships in virtual healthcare environments during peak years of the COVID-19 pandemic. The worldview of social constructivism is also relevant to how we conceptualized the evolving complexities of clinical preceptorship. Precepting are socially bound by interactions with patients, trainees, and healthcare team members. As pointed by Wenger et al. (2002), the value of communities of practice is that "...these people don't necessarily work together on a day-to-day basis, but they get together because they find value in their interactions... Over time, they develop a unique perspective on their topic as well as a body of common knowledge, practices, and approaches" (pp. 4-5). Compatible with this philosophical plurality, we sensitized our interpretations of precepting in the virtual workplace with theoretical principles from actor network theory (Fenwick & Edwards, 2010) and adaptive expertise (Hatano & Inagaki, 1986)

To gather a deepened understanding of how clinical teachers viewed virtually-based preceptorships as meaningful learning interactions, the inquiry process was driven by a spectrum of deductive, inductive, and abductive thinking. This pragmatic intent shifts the focus away from a burgeoning classification for mixed methods studies, and instead prioritizes understanding the logics behind research strategies employed to study the phenomena of virtual care preceptorships. Each phase contributed to the entirety of this mixed methods study. By considering findings from prior study phase(s), abductive inquiry guided the design of research instruments and meta-interpretations drawn in line with the current landscapes of virtual care and medical education. The concept of preceptorship is not foreign to medical educators; thus, being mindful of new theoretical constructs generated while staying open-minded of how well existing

theories fit with newly collected data was critical. At times, planned interactions with research participants were deductively driven by pre-existing concepts of CBME. This intrinsic plurality in different yet compatible methodological and reasoning approaches enabled a more wholesome understanding of the interconnected tensions to precepting relationships in virtual healthcare settings.

Figure 3

Process Diagram on Studying Precepting Experiences in Virtual Healthcare Settings



Phase I

In collaboration with a university librarian, R.L-K., K.M., and D.A. conducted a scoping review to understand how clinical preceptorship in virtual healthcare settings is conceptualized and which existing gaps require focused investigation. A total of 24 peer-reviewed articles described virtual preceptorships between clinical educators and postgraduate medical trainees. From Phase I, research gaps identified the ambiguities of precepting roles and relationships in virtual care settings, which ultimately shaped the design of subsequent study phases. The curation of research instruments was also informed by shared aspects of virtual preceptorship described in the literature (i.e., nature of virtual care workplace, perceived functions to precepting, interactions and attitudes toward precepting, resident involvement, training outcomes). Details about the full protocol and summary of findings can be found in preceding section by Lee-Krueger, Archibald, et al. (n.d.).

Phase II

Participants Eligibility and Identification. A residency program administrator identified and contacted all clinical preceptors affiliated with the University of Ottawa Department of Family Medicine. Following a similar approach, snowball sampling of preceptors from other Canadian family medicine residency programs was attempted. Study eligibility was based on the following criteria: attending physicians who are 1) clinical faculty members affiliated with the Faculty of Medicine; 2) virtual care providers for their patients within the last 12 months; and 3) clinical preceptors of family medicine residents training within their scope of practice.

Data Collection and Analysis. To determine the degree in which clinical preceptors engage with family medicine residents in virtual healthcare settings, a one-time online survey questionnaire was developed *de novo* by R.L-K, in consultation with K.M and D.A. Prior to distribution, permission from developers was obtained to use the O-SCORE anchors (Gofton et al., 2012). The survey was then piloted with 4 physician volunteers familiar with virtual care (3 specialist physicians working at an academic hospital centre, 1 clinical fellow trainee) to ensure its appropriateness, comprehensibility, and feasibility. Survey piloting was completed by June 4, 2021 and the final version was administered via Qualtrics in English.

A finalized survey of 36 items gathered information about estimated proportion of virtual care visits seen by a family medicine resident, preceptors' level of trust to allow residents

complete virtual care tasks (5-point Likert scale with O-SCORE anchors), perceived impact the virtual context has on preceptors' ability to support residents (5-point Likert scale; 0 = negatively impact, 1 = some degree negative, 2 = neutral, 3 = some degree positive, 4 = positively), preceptors' ability to assess intrinsic CanMEDS-FM roles (4-point Likert scale; 0 = not possible, 1 = to some extent, 2 = to most extent, 3 = completely), and frequency of documenting resident involvement in virtual care (4-point Likert scale; 0 = never, 1 = rarely, 2 = often, 3 = always). Preceptors were also asked to list any educational resources accessed to help them prepare residents for virtual care and precept in virtual care settings (see Appendix B for survey questionnaire).

To maximize participation, Dillman et al. (2014) tailored design method was considered for the timing and frequency of survey distribution. Following the initial distribution (November 19, 2021), program administrators sent two email reminders for survey completion (November 27 and December 10, 2021). Possible participants were reminded about the ongoing survey through an email newsletter distributed by the University of Ottawa Department of Family Medicine (DFM) and Department of Innovations in Medical Education (August 16 to October 1, 2021), as well as in-person faculty development events (i.e., DFM Assembly on November 5, 2021). Recruitment also extended to clinical preceptors from other Canadian Departments in Family Medicine via program administrators, publicly accessible resources, or by referral. Survey data collection officially closed on January 18, 2022. R.L-K. analyzed all closed-ended survey responses in IBM SPSS® v.26 using descriptive statistics (i.e., frequencies, percentages for dichotomous rating items) and analyzed text-based responses following qualitative content analysis (Hsieh & Shannon, 2005).

Phase III

Participants. Convenience sampling was first attempted to identify clinical preceptors to complete a semi-structured interview. Email invitations were first sent by R.L-K. to eligible participants who on their survey expressed interest to participate in this phase. R.L.K. and D.A. then attempted snowball sampling to extend invitations to clinical preceptors who may not have been interested earlier in study participation.

Data Collection and Analysis. The first author (R.L-K.) developed an interview guide to elucidate preceptor experiences and perspectives of clinical precepting in virtual healthcare settings (see Appendix C). The final version includes 9 open-ended questions about preceptor interactions and perspectives with family medicine residents in these contexts. Between January

26 and March 9, 2022, R.L-K. obtained verbal informed consent to conduct interviews in English with clinical preceptors. The length of interviews ranged from 24 to 44 minutes, with a median of 32 minutes. All interviews were audio-recorded, professionally transcribed verbatim, and anonymized prior to analyses. Using NVivo, R.L-K. coded interview transcripts following a process informed by reflexive thematic analysis (Braun & Clarke, 2022). M-H.H. independently reviewed a subset of interviews to ensure key themes were not force-fitted into a pre-existing framework.

Integration of Study Phases

The notion of “multiple validities legitimization” challenges researchers to design and carry out a study based on the standards of a mixed methods research paradigm (Onwuegbuzie & Johnson, 2006). These authors stress the importance of questioning the legitimization of quantitative and qualitative results, and how relevant validities can be achieved while deriving defensible meta-interpretations. By actively engaging in a process of incremental reflexivity, this group achieved consensus to determine how subsequent research counterparts could extend inquiry (Song et al., 2010). The integration of different data sources, data collection approaches, and analytical strategies occurred at three stages of the research lifecycle. As data analyses for Phase II concluded, survey findings offered a guiding direction in determining which key aspects of preceptorship required a deeper exploration through interviewing. A thematic framework was developed to illustrate the facilitators or challenges to clinical precepting in virtual healthcare contexts. Lastly, to account for possible violations in the trustworthiness and confirmability of meta-inferences, a “merging” technique helped link key findings from both phases on a side-by-side joint display (Younas et al., 2020).

Ethical Considerations

The primary research institution University of Ottawa [ID: S-03-21-6707] and affiliated hospital research ethics boards approved all ethical components for this mixed methods study. In addition to using personal networks, Western University, University of Saskatchewan, and Dalhousie University reviewed this research ethics application for local recruitment in collaboration with their Department of Family Medicine. The GRAMMS guidelines were adhered to for reporting findings of a mixed methods study (O’Cathain et al., 2008).

The interdisciplinary research team consisted of 2 Educationalists (K.M., D.A.) and 2 graduate students pursuing a PhD degree in the Health Professions Education concentration (R.L-K., M-H.H.). Team members also have a combined expertise in family medicine education (D.A.), patient and family engagement (K.M.), and program evaluation (K.M., R.L-K., D.A.). The principal investigator (R.L-K.) was a PhD candidate pursuing this study and concurrently worked as an Education Consultant for a university in the development and accreditation of continuing medical education for family physicians and specialist physicians. Acting as an outsider during data collection and analysis, R.L-K. had no existing work relationships with study participants prior to recruitment. One educationalist held academic appointments within the Family Medicine department, and when needed, provided insider perspectives about the research context. In efforts to mitigate sampling bias towards a pre-identified group of preceptors, the primary investigator and educationalists overseeing this project made a consensus decision to not include family physicians in the pilot of research instruments.

Results

Demographics

Specific demographics about the surveyed participants and their virtual care practice are presented in Table 1. A total of 45 survey responses were gathered (18% overall response rate), which does not account for a duplicate entry. Seven responses were removed prior to analysis (3 did not grant informed consent, 4 granted informed consent yet did not proceed to complete the survey questionnaire). The final dataset comprised of survey responses from 38 participants. Most physician preceptors held a clinical faculty appointment in Family Medicine and pivoted to offer virtual care on a daily basis from their clinical and/or home offices.

Table 1*Survey Demographics*

Characteristics	<i>N</i>	<i>n</i>	%	Mean	SD	Median	Mode	Min	Max
Academic affiliation	38								
Family Medicine		33	86.8	-	-	-	-	-	-
Pediatrics		1	2.6	-	-	-	-	-	-
Missing		4	10.5	-	-	-	-	-	-
Years of clinical practice		34	89.5	18.9	13.3	15.0	11.0	2.0	44.0
Years of clinical precepting		34	89.5	12.1	10.4	11.0	2.0	0.0	37.0
Years of precepting in virtual care settings		33	86.8	3.3	5.5	2.0	2.0	1.0	30.0
Frequency of practicing virtual care	38								
Daily		28	73.7	-	-	-	-	-	-
Weekly		6	15.8	-	-	-	-	-	-
Bi-weekly		0	0.0	-	-	-	-	-	-
Monthly		0	0.0	-	-	-	-	-	-
Missing		4	10.5	-	-	-	-	-	-
Location of virtual care practice	38								
At home (1)		4	10.5	-	-	-	-	-	-
Clinic or hospital office (2)		15	39.5	-	-	-	-	-	-
Academic/Research office (3)		0	0.0	-	-	-	-	-	-
(2) + (3)		1	2.6	-	-	-	-	-	-
(1) + (2)		13	34.2	-	-	-	-	-	-
(1) + (2) + (3)		1	2.6	-	-	-	-	-	-
Missing		4	10.5	-	-	-	-	-	-
Estimated portion (%) of residents with virtual care experience	38	28	73.7	71.1	32.2	85.0	90.0	10.0	100.0
Estimated portion (%) of virtual care visits seen by/with a resident	38	36	94.7	49.4	19.8	50.0	50.0	10.0	90.0
Residents facilitate visit		35	92.1	34.3	27.5	30.0	50.0	0.0	100.0
Resident observes preceptor		35	92.1	2.7	5.3	0.0	0.0	0.0	25.0
Co-facilitated with preceptor		35	92.1	7.7	11.7	0.0	0.0	0.0	50.0
Consulted preceptor when needed		35	92.1	55.3	31.1	50.0	50.0, 80.0	0.0	100.0

For phase III, 13 clinical preceptors (12 family physicians and 1 community pediatrician) consented and completed a semi-structured interview. Their clinical practices served rural and urban populations that represented geographic regions from Alberta, Ontario, Quebec, and the Northwest Territories. Clinical experience ranged from less than 1 to over 30 years in independent practice. Ten preceptors integrated virtual care into their clinical practice during the COVID-19 pandemic period, and the other two started practicing telemedicine earlier in the pre-pandemic era.

Survey Findings

At the time of survey, preceptors reported that most of their family medicine residents had prior exposure to work in virtual healthcare settings and estimated nearly half of scheduled virtual care visits were seen with or by a resident. Preceptors “always” ($n = 19$) or “often” ($n = 10$) met with their residents prior to the start of a virtual care clinic. In preparation for precepting residents in virtual care settings, half of surveyed preceptors sought faculty development resources to enhance their own teaching practices. However, only one-third of preceptors recalled needing to provide their residents additional virtual care resources. Table 2 details the specific types of educational resources accessed or recommended by preceptors.

Table 2*Virtual Care Education Resources Accessed*

Resources	<i>N</i>	<i>n</i>	%
Resources recommended to residents	38		
No		24	63.2
Yes		11	28.9
Missing		3	7.9
Types of resources recommended to residents	11		
Clinic/Site champions (1)		1	9.1
Online documents (2)		1	9.1
Video demonstrations (3)		0	0.0
Virtual care tool support (4)		0	0.0
(2) + (3)		2	18.2
(2) + (4)		5	45.5
(2) + (3) + (4)		1	9.1
(1) + (2) + (3) + (4)		1	9.1
Accessed faculty development resources to train residents in virtual care	26		
No		10	38.5
Aware of education opportunities but did not participate		1	2.6
Yes		16	61.5
Types of faculty development resources accessed*	16		
Academic journals		1	6.3
Podcasts		1	6.3
Telemedicine webinars		2	12.6
Departmental curriculum development for virtual visits		1	6.3
Attended CME Courses on virtual care teaching		1	6.3
Virtual care resources through academic department or faculty		5	31.3
Peer learning		5	31.3
Virtual care resources from regulatory bodies		6	37.5
Virtual care assessment tools		1	6.3

[*] denotes participants can access more than one type of faculty development resources

In terms of resident involvement, Table 3 presents self-reported ratings of preceptors' entrustment for family medicine residents to perform virtual care tasks. Most preceptors agree in having their residents conduct parts of the virtual visit independently or consult them for further guidance when necessary. Triaging for in-person care and finalizing clinical management with their patients are areas where preceptors felt closer supervision is needed. Despite the active engagement of residents in virtual care activities, 40% of preceptors ($n = 15$) recalled they rarely documented their residents' virtual care performance on assessment forms.

Table 3*Self-Reported Level of Trust to Engage Residents in Virtual Care Tasks*

Virtual Care Tasks	<i>N</i>	<i>n</i>	%
Obtain patient consent	34		
“I had to do”		0	0.0
“I had to talk them through”		2	5.9
“I had to prompt them from time to time”		2	5.9
“I needed to be in the room just in case”		2	5.9
“I did not need to be there”		28	82.4
Complete medical history	34		
“I had to do”		0	0.0
“I had to talk them through”		0	0.0
“I had to prompt them from time to time”		6	17.6
“I needed to be in the room just in case”		10	29.4
“I did not need to be there”		18	52.9
Relay information about possible diagnosis(es)	34		
“I had to do”		0	0.0
“I had to talk them through”		1	2.9
“I had to prompt them from time to time”		12	35.3
“I needed to be in the room just in case”		11	32.4
“I did not need to be there”		10	29.4
Communicate next steps about a treatment plan	34		
“I had to do”		1	2.9
“I had to talk them through”		1	2.9
“I had to prompt them from time to time”		13	38.2
“I needed to be in the room just in case”		11	32.4
“I did not need to be there”		8	23.5
Arrange for appropriate follow-up	34		
“I had to do”		0	0.0
“I had to talk them through”		2	5.9
“I had to prompt them from time to time”		11	32.4
“I needed to be in the room just in case”		9	26.5
“I did not need to be there”		12	35.3
Triaging the need for in-person medical visit	34		
“I had to do”		0	0.0
“I had to talk them through”		2	5.9
“I had to prompt them from time to time”		11	32.4
“I needed to be in the room just in case”		12	35.3
“I did not need to be there”		9	26.5
Provide patient education or support	34		
“I had to do”		0	0.0
“I had to talk them through”		1	2.9
“I had to prompt them from time to time”		14	41.2
“I needed to be in the room just in case”		7	20.6
“I did not need to be there”		12	35.3

When asked to what extent does virtual environments impact participants' overall ability to perform their precepting roles, survey respondents expressed varying degrees of impact. Over half of preceptors felt "neutral" or "to some degree negatively impacted" in their ability to plan, supervise, teach, or coach for resident engagement (see Table 4).

Table 4

Self-Reported Impact of Virtual Healthcare Setting on Clinical Precepting

Precepting Roles	<i>N</i>	<i>n</i>	%
To what extent does virtual environments impact your overall ability to supervise family medicine residents during a patient encounter?	38		
"Negatively impact"		5	13.2
"Some degree negative"		16	42.1
"Neutral"		10	26.3
"Some degree positive"		3	7.9
"Positively impact"		1	2.6
Missing		3	7.9
To what extent does virtual environments impact your overall ability to teach family medicine residents after a patient encounter?	38		
"Negatively impact"		5	13.2
"Some degree negative"		14	36.8
"Neutral"		10	26.3
"Some degree positive"		4	10.5
"Positively impact"		2	5.3
Missing		3	7.9
To what extent does virtual environments impact your overall ability to coach family medicine residents to improve their clinical skills?	38		
"Negatively impact"		6	15.8
"Some degree negative"		10	26.3
"Neutral"		10	26.3
"Some degree positive"		7	18.4
"Positively impact"		2	5.3
Missing		3	7.9
To what extent does virtual environments impact your overall ability to develop a plan for family medicine residents' involvement in virtual care?	38		
"Negatively impact"		2	5.3
"Some degree negative"		12	31.6
"Neutral"		13	34.2
"Some degree positive"		6	15.8
"Positively impact"		2	5.3
Missing		3	7.9

When asked to what extent they can assess family medicine-specific competencies in virtual healthcare settings, preceptors expressed moderate confidence. A greater proportion of preceptors rated they are “to most extent” able to assess the Professional, Scholar, Health Advocate, and Communicator roles of the CanMEDS-FM competency framework (Table 5). However, a few preceptors believed that the Scholar and Leader roles could not be assessed at all.

Table 5

Self-Reported Ability to Assess CanMEDS-FM Roles in Virtual Healthcare Settings

CanMEDS-FM Role	N	Item response							
		Not possible		To some extent		To most extent		Completely	
		n	%	n	%	n	%	n	%
Professional	38	0	0.0	9	23.7	21	55.3	5	13.2
Scholar	38	2	5.3	7	18.4	21	55.3	5	13.2
Health advocate	38	0	0.0	8	21.1	23	60.5	4	10.5
Leader	38	4	10.5	19	50.0	9	23.7	3	7.9
Collaborator	38	0	0.0	18	47.4	13	34.2	4	10.5
Communicator	38	0	0.0	12	31.6	17	44.7	6	15.8

Interview Findings

To unpack how judgements about trainee engagement in virtual healthcare settings are shaped, clinical preceptors rationalized the process of teaching family medicine residents in these contexts to be challenging. During this process, preceptors alluded to pertinent skills of a virtual care provider, their values to using virtual care responsibly, and logistical considerations to optimize the patient experience. Their perspectives are captured into six key themes:

Theme 1: Precepting in virtual healthcare settings described as patchwork.

Preceptors recognized that limits of virtual care created blind spots to precepting, leaving residents with an awkward or incomplete training experience in family medicine. When virtual care was mandated during the COVID-19 pandemic, several preceptors detailed how changes in clinical pathologies seen at their clinics have impacted resident learning. They struggled to find balanced approaches that could offer diverse clinical training opportunities despite the skewed demand for virtual care.

My worry is that they [residents] haven't seen some stuff that you normally would see. Like I remember seeing a resident who's had never seen an ear infection because they don't come in the office...it's only a short program of two years and if you don't see any acute kids in the office, then you may not know what an ear infection looks like. (Preceptor 10)

Preceptors also expressed ownership in the quality of clinical training their residents receive in virtual healthcare settings; however, without a wholesome understanding of the clinical story, precepting can seem fragmented. Preceptors emphasized the need to gather corroborating evidence (e.g., additional patient follow-up) for the clinical histories and management plans presented by their residents.

When you look at virtual encounters, it's kind of a skeleton... you've got just really a history, and you highlight the fact that you're basing your diagnosis on only a history and that you don't have a physical exam... To evaluate that, like you're looking at only part of the whole diagnostic approach. (Preceptor 11)

Managing the uncertainty with precepting family medicine residents in virtual healthcare settings demanded preceptors to be innovative. Entering the COVID-19 pandemic, preceptors carried an ingrained predisposition from their prior clinical experiences on how to support their residents in virtual healthcare settings. Preceptors' confidence and uptake to offer virtual care also contributed to their openness with involving residents. For instance, those who practiced virtual care regularly prior to the COVID-19 era were seemingly more adjusted and prepared to work with residents in these contexts.

Theme 2: Improvise precepting to steer residents away from transactional care.

Preserving relationships is central to how preceptors plan to introduce family medicine residents into the virtual care workflow. It was assumed that their residents enter residency with the foundational knowledge required to facilitate virtual care visits. Preceptors also took into consideration their impressions of resident's prior education, clinical experience with in-person and virtual care, and their learning needs for the rotation. A notable worry with precepting in virtual healthcare settings is the lack of learning opportunities for residents to develop the

humanistic connections crucial in compassionate medical practice (e.g., a gentle touch, empathetic ear):

It's the non-verbal in terms of eye contact, silence, interpreting pauses, body language, but it's also that medicine is fundamentally – it's a reciprocal thing and so when I physically see a patient and they smile at me I get something back from that. My residents are not getting that. They're getting a business of medicine... I usually will give them two or three hard patients that I know will challenge them... they are the patients that they remember from their residency. They're the ones where this feeling of success is so much sweeter. But that ability to do that just logistically because the patients aren't coming in and because they're doing one thing on the phone, one thing in-person, following up on the phone, it's just a little bit harder to give them that opportunity. (Preceptor 7)

Preceptors held conflicting opinions on whether the virtual medium can foster and challenge relational continuity between residents and their patients. As articulated below, preceptors paid particular attention to setting professional boundaries so that both receiving and providing parties of virtual care understand the importance of these therapeutic encounters.

Telemedicine shouldn't be any less of an in-person visit, right? Like some of our residents are like, "Well, can't I just do my telemedicine from home?", for example. Like during the pandemic when much of their visits telemedicine they're like, "Do I really have to come into the clinic?" We're like, "No, no you need to come into the clinic." I think much like we don't want patients taking it lightly (i.e., be on the highway when they get called), we also want the residents to take telemedicine seriously as a medical act. (Preceptor 9)

Because the patient's having to, uh, give more detailed information or more specific information or, in fact, examine themselves, or take pictures... It may enhance the patient, um, doctor-patient conversation because the patient may feel like they're more a part of the team. (Preceptor 12)

Theme 3: Selected virtual care configurations encourage role modelling or observing patient encounter. Certain virtual care configurations enable preceptor-resident

interactions. Videoconferencing offers both audiovisual capabilities for preceptors to observe and advise residents in the virtual care encounter; however, phone-based visits are logistically easier to arrange with patients. Preceptors recognized that the decision to pursue a resident-run virtual visit by phone rather than videoconferencing may compromise a teachable moment.

The other thing that we did that was helpful in terms of supervision and direct observation in particular is we do have audio/video access in all of our patient exam rooms and to allow residents to physically distance themselves from each other. We have like a big common team room, so nobody has independent offices... we asked the residents to do their virtual care visits from the exam room they were assigned and to have the phone on speaker phone. So that way, when we were plugged into their room we could hear both sides of the conversation. (Preceptor 6)

Clinical teaching strategies, such as role modelling, occurred sparingly. Despite the availability of triadic communication with patients and other healthcare team members, only one preceptor described an alternative to role play and practice clinical skills prior to or after the patient encounter. Other workplace factors such as defining a shared location or optimizing clinic schedules enable case reviewing or feedback dialogues. Some preceptors also favored the live-chat function in EMR systems or virtual care platforms to give their residents timely advice.

Theme 4: Setting residents up for success to maximize learning in virtual settings.

Many preceptors found that intercepting a virtual care encounter to be socially awkward or disruptive. Rather, they prefer to choreograph their interactions around the virtual visit and plan ahead with their residents:

I usually will go through the reason for the visit and some details about the patient before the encounter with the resident to help prepare them for what it is that they're going to be discussing potentially and maybe start the process of thinking about sort of differential diagnoses or even what you would want to ask on history. (Preceptor 8)

Preceptors framed their guidance to be open-ended. These pre-visit conversations also serve as a checkpoint to affirm residents' confidence or readiness to conduct the visit. When possible,

preceptors help their residents strategize in managing patient expectations or meeting their goals for virtual care. It is also important for preceptors to offer their availability when residents needed support and notify them when to review virtual care visits.

Theme 5: Struggling to gauge resident progress accurately. Preceptors confirmed having documented resident performance in virtual healthcare settings. They captured observations of the CanMEDS-FM roles in the form of field notes. Observing a video visit, listening to the phone conversation, and assessing the quality of history taken by residents were approaches to gauge resident performance. When asked about their experiences with assessing residents' performance, preceptors again described feeling risky or blind-sighted by the limits of virtual care:

I don't always know about their judgment because they haven't had the experience to be able to know when they're right or when they're wrong. It's sort of scary... it's kind of like gambling. I think for the most part we're going to be OK but I'm concerned that a resident who's not as competent as they think. They may not get the history right. And I'll be relying on flawed data that I can't verify the person by going into the room and looking at the patient myself. (Preceptor 2)

Preceptors considered their assessment of clinical skills to be suboptimal if clinical performance was inferred from second-handed information (i.e., seek patient feedback, role-playing).

How are you going to give them feedback on their physical examination when they haven't actually done it? Uh, that gets in the way. But I change that. Then I have the resident examine me, "OK, examine my shoulder. Examine my hip. Examine my knee..." I've not necessarily confirmed those skills... (Preceptor 12)

Relating to in-person care, detecting signs of underperformance in virtual care workplaces is harder for preceptors. If a family medicine resident began residency training during the COVID-19 pandemic, preceptors assumed the individual to perform at a lower starting point than one would in non-pandemic times. For such reasons, some preceptors cautioned that a hands-off approach to precept in virtual healthcare settings may perpetuate a failure-to-fail culture.

Theme 6: Centering feedback around history-taking skills and credibility of the clinical story. The process in which preceptors organized feedback time is similar to how they would arrange for reviewing in-person visits. Without patients waiting on-site, finding a suitable time to give their residents feedback became a more tangible task for preceptors. Verbal feedback is typically given after the virtual visit or end of the clinic day, remotely or in-person. One preceptor preferred reviewing cases in group huddles as a way to promote peer learning.

The vast majority of feedback you're giving relates to their thought processes, and their synthesis and their integration and their history-taking and, you know, their interaction with the patient. (Preceptor 1)

Feedback content centred around the completeness of a clinical history, patient safety, or concerns that residents had. Preceptors recalled coaching their residents to develop advanced history-taking skills, focusing on approaches to gather a social history during a virtual care visit and synthesize this information into a management plan. One preceptor also indicated, at this time, she ensures safety netting options were adequately discussed with patients and confirm that their condition is stable. Below are examples of feedback topics covered:

A subtle thing might be, you know, often it's the conversation with an elderly patient, for example, who has your UTI [urinary tract infection] symptoms. And then suddenly the subtle thing, "Is this person on the other end of the phone actually safe at home?", you know? What are their supports? You don't want to overstep the line either, you know?" (Preceptor 3)

Safety netting I think is an important thing to address with residents for virtual things and documentation of that because it is different when assessing pain obviously. You're going by what they're saying and hopefully by the tone of their voice, but you can see if someone's in pain when they're in the clinic. You can actually see it. (Preceptor 7)

Discussion

The present study includes a deep exploration and detangling of precepting experiences in virtual healthcare settings. As shown in Table 6, the logic behind triangulating data sources and the meta-interpretations are mapped in a side-by-side joint display. In response to public

health restrictions for combating the COVID-19 pandemic, transition periods to offer patient care in fully virtual and hybrid capacities enabled preceptors to experiment ways of building learning relationships with family medicine residents. Clinical preceptors pivoted their approach to involve, prepare, and supervise residents in virtual care contexts. To be adept, even experienced preceptors needed to learn new “tricks of the trade”. Preceptors needed to use existing knowledge and adapt to make sense of how to navigate the virtual care workplace in fostering clinical competence. In the terms of adaptive expertise, integrated competence requires a process of internalization and construction of new knowledge (Hatano & Inagaki, 1986; Mylopoulos et al., 2018). After cycles of routine and non-routine experiences in virtual care, clinical preceptors derive the skills and solutions to better act as educators in diverse and complex environments. Research findings led us to conclude that preceptors now expect the current and future cohorts of family medicine residents to enter residency with the foundational knowledge and ethos to care for patients in virtual healthcare settings. In considering the intersecting therapeutic and educational frames that shape virtual care learning, preceptors weigh the gains and affordances to carry out various precepting activities (i.e., direct observation, documenting performance, planning for feedback). They may opt to leverage communication tools built into e-health technologies to convey more immediate, written recommendations. Whereas some preceptors preferred giving in-the-moment feedback after the patient encounter. For reasons of patient preference and logistical convenience, telephone-based consultations or follow-ups remain the dominant form of virtual care offered. Hence, despite the promises of videoconferencing platforms to support triadic communications (patient–resident–preceptor), preceptors conceded that supervisory or feedback activities do not necessarily occur within this therapeutic frame.

Table 6*Side-By-Side Joint Display of Data Sources and Interpretations*

Question	Interview Themes	Key Survey Findings	Meta-Interpretations
To what extent do preceptors involve, prepare, and assess family medicine residents?	Precepting in virtual healthcare settings described as patchwork	Most preceptors perceived that the virtual setting impacted their ability to supervise, teach, or coach family medicine residents.	Preceptors assume readiness and expect family medicine resident to carry out virtual care activities.
	Improvise precepting to steer residents away from transactional care	Over half of preceptors strategized to determine resident engagement in the virtual care workflow.	While some aspects are similar with in-person care, preceptors needed to develop new “tricks of the trade” to supervise residents in virtual healthcare settings.
	Selected virtual care configurations encourage role modelling or observing patient encounter	Most preceptors pivoted their practice to provide virtual care in clinical and/or non-clinical offices.	
	Setting residents up for success to maximize learning in virtual settings	Preceptors rarely invited their residents to observe a virtual care visit. 1 out of 3 preceptors recommended virtual care resources to residents. Half of preceptors accessed additional faculty development resources.	Preceptors weigh the educational gains and affordances to observe residents in virtual healthcare settings.
How do preceptors assess and provide feedback to family medicine residents?	Struggling to gauge resident progress accurately	Preceptors reported some or limited capacity to assess specific CanMEDS-FM roles (i.e., Scholar, Leader).	Underperformance in virtual healthcare settings is challenging to identify using current assessment practices.
	Centering feedback around history-taking skills and credibility of the clinical story.	Most preceptors trust their residents to initiate a virtual care visit (e.g., obtain patient consent, complete medical history). Preceptor guidance is required with more complex virtual care tasks: relaying information about diagnoses or treatment plans, arranging for follow-up, triaging need for in-person care, and providing patient education or support.	In-the-moment feedback can be given synchronous or asynchronous from the patient encounters. Preceptors may leverage communication tools built in e-health systems to provide immediate written feedback.

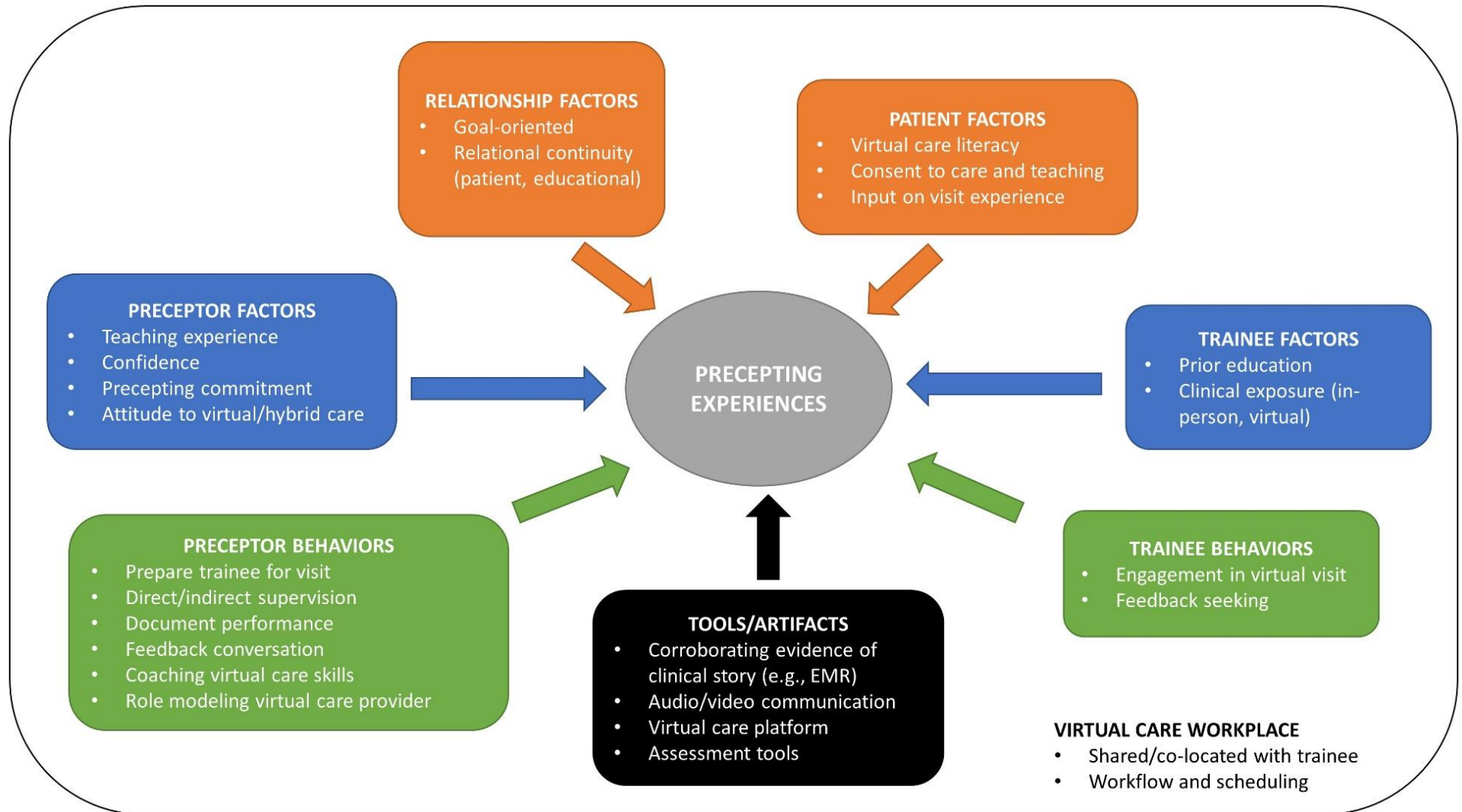
The practice of clinical precepting in the virtual healthcare setting is similar to Grenny et al. (2022) who remark on the teaching of fly-fishing:

Your guide [The preceptor] keeps telling you to cast your fly six feet upstream from that brown trout “just out there.” Only you can’t see a brown trout “just out there”. She can. That’s because she knows what to look for. You think you do. In reality, you need to look for the distorted image of a brown trout that’s underwater while the sun is reflecting in your eyes. You have to look for elements other than the thing that your parents have stuffed and mounted over the fireplace. (p. 110)

Assumed to be “the experienced angler” with both knowledge and practice of what competency should look like, the virtual healthcare context is a medium that challenged almost all aspects of precepting. While preceptors know what signs of competent performance to look for, opportunities for their residents to observe and demonstrate competency in virtual healthcare settings are transient. Perhaps, we can draw upon sociomaterial ideas to rethink the connections that mediate or deter precepting within virtual therapeutic frames. Tenants of actor-network theory view educational practices as a gathering of natural, technological, human, and non-human actors (Fenwick & Edwards, 2010). In distributed medical education, MacLeod, Cameron, Kits, et al. (2019) showed that the agency of videoconferencing in curriculum can introduce unsolicited uncertainty to the educational experience due to auditory or visual exposures not typically present with in-person learning. In attempt to capture this layer of complexity with clinical preceptorship, we propose in Figure 4 a thematic framework of the interdependency of human and non-human (i.e., technological tools, educational artefacts) actors relevant to training family medicine residents in virtual healthcare settings. The manifestation and trial of new tactics demonstrate preceptors’ commitment to extend family medicine education into this dimension of patient care. For instance, establishing learning expectations for virtual care, assigning a diverse yet manageable patient load, exploring ways to appraise clinical performance, and navigating virtual care tools to offer guidance are strategies to individualize the learning experience. The presence of patient collaboration is also assumed in this framework. That is, the undertakings to re-socialize and re-learn how to “be” a patient within this therapeutic frame should not be taken for granted. While training experiences are inherently unique and spatially situated, precepting within this virtual therapeutic frame is an activity created by knowledgeable actors who draw on a set of pre-determined rules and available resources.

Figure 4

Thematic Framework for Precepting in Virtual Healthcare Settings



Relevance to Current Literature

Educational challenges with precepting are not novel to clinical teachers. However, the recent upscaling of virtual care has become a pharmakon to medical education. Results from this study substantiate the theoretical foundations and best practices for clinical preceptorship in virtual healthcare settings.

In a virtual care visit, every clinical concept associated with the frame, structure, and dynamic of a therapeutic encounter is challenged. Despite the added values to this modality of patient care, Shepherd and colleagues (2022) highlighted that clinical teachers avoid involving medical learners for logistical and educational reasons (e.g., disrupt clinical workflows with in-person care, perceived as inferior learning opportunities). Study results further pointed to reasons why clinical educators may resist virtual care training more than others, which may in part stem from preceptors' individual values or own experiences as telehealth providers (Zeavin, 2021). According to Weizenbaum and McCarthy (1977) critique against computer technology, if the practice of medicine is viewed as structured activities or activities governed by human choice, then one is inclined to believe that breaking down the barrier between humans and virtual care technology will happen at the expense of societal progression (e.g., fear of losing the art of medicine, promoting a culture of transactional care). Whereas physicians, more inline with Kenneth Colby's futuristic perspective for computer-mediated care (Nadelson, 1987), are permissive to let novel technologies augment what humans can do in the service of treatment. While physical structures of the clinic room are dissolved, clinical preceptors who embrace this mindset believe that physicians can continue to simulate room-based conventions that patients may recognize in a virtual care encounter (e.g., taking clinical histories in a ZOOM virtual room, guiding patients to demonstrate a physical exam maneuver). In the broader organizational learning literature, Govaerts et al. (2018) demonstrated that supervisor inclinations, specifically their accountability and involvement to support trainees, positively influences the retention of workplace training. Thus, family medicine residents supervised by preceptors, who are aware of the learning objectives with virtual care training and committed to teaching in these contexts, may apply the attained knowledge and skills in their future clinical professions.

This study adds to the medical education literature a deeper understanding of the possibilities to supervise family medicine residents and engage them in virtual healthcare settings. Leading up to the clinical encounter, preceptors recognize the need to establish a

learning relationship and help their residents see how virtual care fits in the bigger picture of a patient's care journey. Similarly, Golub et al. (2021) and Pham et al. (2021) suggested maintaining time for huddle conversations and designated workspaces as strategies for monitoring the performance of pediatric residents and fellows in telehealth activities. Findings from the present study echo with Brunner et al. (2018) argument for calling educational leadership to sustain a workforce for virtual care delivery. Preceptors oversee and lead the learning processes for digital literacy, creation of digital health data, and an integrated practice with digital health technology systems. They also are accountable for reporting poor performance across the physician training continuum (Daly et al., 2022).

To further explore approaches to assess and provide feedback on virtual care performance, our study gathered preceptors' experiences to assess their trainees based on the CanMEDS-FM roles and existing options to document their observations. However, we found limited evidence on the use of context-specific instruments to assess residents' knowledge and skills in virtual care practice (Henry et al., 2021; Lum et al., 2020). Hesitancy to assess residents mainly stems from preceptors' unease to making educational judgements solely based on disembodied voices of their learners or patients. Faced with a problematic progression of trainees enduring learning difficulties in medical education, the struggles for supervisors or institutions to flag those they deem unsatisfactory and respond with effective remedial support have long been documented (Dudek et al., 2005; Gingerich et al., 2020). The layer of anonymity inherent to virtual healthcare settings may reinforce this "failure-to-fail" culture in family medicine education.

Strengths and Limitations

Through this investigation, insights were gained on how clinical preceptors trained family medicine residents in a multitude of virtual healthcare settings. Major strengths of the study include: 1) transferability of findings are supported by the input of family medicine preceptors with virtual care practices representing different geographic regions in Canada, 2) rich reflections on the changing dynamics to precepting during a time when virtual care is widely implemented, and 3) triangulation of multiple data sources to identify and explain patterns about clinical precepting.

These findings should be interpreted in light of these methodological limitations: 1) low response rate for the Phase II survey, 2) minimal understanding of the precepting experience

with family medicine residents on their elective or core rotations in other clinical specialties, and 3) data is dependent on the integrity of self-reported responses. Survey recruitment was particularly challenging as it occurred during the peaks of COVID-19 pandemic. Although research studies consistently report low survey response rates among physician populations (Cunningham et al., 2015; Taylor & Scott, 2019), generalizability of survey findings is largely confined to family physician preceptors. To improve the reliability of survey patterns, we deliberately planned and conducted interviews to seek explanations for possible consistencies or discrepancies from other data sources. It is also worth noting that we identified a subgroup of primary care providers did not successfully pivot to offer virtual care (e.g., deemed unsuitable for caring vulnerable populations). Their views and expectations as clinical preceptors were not well-captured.

Further Directions

Several areas related to precepting family medicine residents in virtual healthcare settings require further investigation. Although there is some guidance from the literature about the process and implementation of telehealth training activities into residency program curricula, more studies are needed to understand how virtual care competence can be developed in the clinical workplace. Future ethnographic studies should aim to observe the dynamics and participation of preceptor-resident dyads before, during, and after virtual care encounters. This study revealed that scant attention is paid to the impacts of resident engagement on patient care experiences and clinical outcomes. Preceptors demonstrated creative and resilient efforts to uphold the quality of training; however, varied precepting approaches may have intended and unintended consequences on the implementation of CBME. With the movement to adopt programmatic assessment into family medicine training (Ross et al., 2022), this work identified a potential gap in current assessment practices to adequately capture residents' performance in diverse clinical contexts. Hence, an exploration of the quality of assessment and feedback data describing virtual care competency is warranted. Lastly, future research can focus on the ripple effects of legitimizing virtual care training in the system structures that support CBME (e.g., accommodations granted by academic standing committees, changes to the accreditation process of residency programs).

Conclusion

Virtual care became an integral component of family medicine residency during the COVID-19 pandemic era. The research presented here shows that clinical preceptors engaged their residents in virtual care learning environments despite having minimal faculty development guidance. Precepting in these contexts 1) involves but not limited to remote supervision, 2) remains unstandardized when it comes to assessing resident performance, and 3) generally tolerated by preceptors. With a commitment to offer high-quality training for family medicine trainees, this study unpacked the experiences to precept trainees in the virtual therapeutic frame and provide evidence that link to educational practices of this time.

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Section Four: Article 3

Title: Closing Voids of Educational Continuity in Virtual Healthcare Settings

Running Head: Education Continuity in Virtual Care

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Abstract

Telemedicine is becoming a norm in family medicine. Reforms to medical training programs aim to graduate physician learners with a comprehensive profile of skills to manage patients, in-person and virtually. Assuring residents receive exposure to virtual care activities is an educational priority for clinical teachers abroad. In rolling out competency-based medical education programs, clinical teachers bear the responsibilities to 1) prepare residents for independent practice in virtual healthcare settings; 2) implement the virtual care components of curricula; and 3) supervise, assess, and role model virtual care practice. Inadequate program guidance and resources for clinical teachers to meet these expectations, however, can threaten the continuity of competency-based education. This perspective first explores the theoretical considerations relevant to the pedagogy of virtual care education. Authors aim to unpack current challenges with implementing competency-based family medicine education in clinical learning contexts, focusing on matters of learning continuities in virtual care situations. Prevailing issues to integrate virtual care into clinical education are explicitly addressed in relation to “continuity of curriculum” and “continuity of supervision” as the organizing principles of this scholarly discussion. Focusing on the importance of aligning curriculum updates, workplace assessments, and precepting activities, this article enlightens and reminds readers with education strategies that may strengthen their linkages when preparing residents for virtual care practice. This piece concludes with a research agenda for professional development in virtual healthcare settings.

Word count: 200 words (unstructured format)

Keywords

Virtual Care, Clinical Teaching, Educational Continuity, Accreditation

Introduction

If the ultimate purpose of virtual care – to offer society a more accessible primary care system – is to be attainable, medical education should be able to train physicians who are skilled in the core and community-adaptive competencies in telemedicine. The ultimatum is to meet this goal in highly dynamic clinical environments fragmented by interruptions and confined by a competing culture to return to in-person practice.

With respect to healthcare reforms that occurred during the COVID-19 pandemic (Canadian Institute for Health Information, 2022), clinical education in Canadian family medicine programs have changed little to produce a skilled physician workforce that can keep up with patient demands and expectations. Family medicine residents are still assigned with clinical teachers for brief and minimally supervised preceptorships in virtual healthcare settings; and the core clinical training experience, specifically in family medicine rotations, continues to be informed by face-to-face care models. Although it is irrefutable that medical regulatory bodies acknowledge the need for virtual care training (CMA, 2022; FMRAC, 2022; Medical Council of Canada, 2022), there is a growing sense that newly defined competencies are misaligned with current teaching and assessment practices. This realization has led many educators to call for changes in curriculum – one that would address the essential skills to provide virtual care. Thus, with a focus on learning continuities in virtual clinical settings, authors of this Perspective aim to unpack the challenges educators face with implementing competency-based family medical education in such patient encounters.

This article aims to first dissect the problem of disrupted continuity in medicine education and then examine the education gaps for preceptors to support competency-based medical education (CBME) in virtual healthcare settings. Following, a set of practical and research strategies for building the learning connections necessary for family medicine residents to succeed in such clinical situations is offered.

Theoretical Underpinnings to Virtual Care Education

No two virtual care encounters are alike. Some can be done without much thought or reflection, while others are not as routine and demand higher levels of competence. To understand how learning is nurtured in virtual healthcare settings, it is worth applying relevant theoretical considerations to the effect of changing clinical teaching behaviors. As educationalists, we lean on the propositions from adaptive expertise and sociomaterial

approaches (i.e., activity theory, actor-network theory, and practice theory) to explain the complexities of clinical precepting. This overview, thus, presents an argument for readers to view virtual care beyond a unified entity, debunking assumptions about clinical precepting as indifferent between virtual and in-person care settings.

Delivering virtual care safely and appropriately requires a physician to demonstrate cognitive flexibility and adaptivity. Through experience-based opportunities, physicians in-training (i.e., residents) develop abilities in managing ambiguous problems, tolerating uncertainty, and making decisions with limited information at the end of consultations (Crichton et al., 2020). Clinical preceptors who engage their residents in the repeated facilitation of clinical tasks and foster an understanding-oriented learning culture may favor adaptive practice (Hatano & Inagaki, 1986; Mylopoulos et al., 2018). Researchers asserted that adaptive clinical experts can creatively respond to novel situations more effectively and innovatively, while routine experts continue honing on ways to improve task efficiency (Gube & Lajoie, 2020). In an age where medical information and technologies grow at exponential rates, the outlook of virtual care may look vastly different by the time of graduation for medical learners. Thus, educators are faced with addressing a critical question: How can we prepare family medicine trainees to be self-regulated, life-long learners for the future of healthcare? Perhaps, as Lajoie and Gube (2018) suggest, framing clinical training to be the foreground of cognitive apprenticeships –keeping attune to learning spaces and moments for residents to safely and deliberately practice towards adaptive expertise – is worth exploring.

The articulation work of virtual care precepting, however, does not take place in a vacuum. Predecessors of this field encourage researchers to attend and appreciate the sociocultural connections that environmental matters have on daily education practices (Mann, 2011). Rather than minimizing ‘context’ as an abstract concept, sociomaterial approaches shift the view of clinical and education practices away from human-centric acts to heterogeneous performances inseparable to objects and matter (Fenwick, 2014). One perspective is actor-network theory, a radical constructivist view that gained prominence in reaction to the downplay of human and non-human agencies in social-scientific inquiries about medical education (MacLeod, Cameron, Ajjawi, et al., 2019; MacLeod et al., 2017). Central claims of actor-network theory reorient the phenomenon under study to analyze the effect or assemblage of established relations between natural forces, technological elements, objects, and human actors

involved with an activity (Muniesa, 2015). To gain a fuller understanding of the contextual mediators involved with the delivery of virtual care training, educators can view precepting as a teaching practice enmeshed with human and non-human actors. For instance, when residents are not working in a shared physical location, preceptors require access to a virtual care system for establishing the connections to observe or supervise remotely. A fully telepresence system further enables preceptors and residents to interact with minimal disruptions to the patient encounter (e.g., private messaging, virtual waiting rooms). Providing adequate oversight of residents' indirect patient care activities on other e-health technologies, such as electronic medical record (EMR) applications, are inseparable actions that complement coaching for improved performance.

To become a regulated activity in medical education, precepting in virtual healthcare setting needs to be a socially established practice (Nicolini, 2012). Practice theorists hold a core belief that the dependence of activity is built on shared skills and understanding. In other words, practices can be conceived as “embodied, materially mediated arrays of human activity centrally organized around shared practical understanding” (Schatzki, 2001, p. 11). With the upscale of virtual care during the COVID-19 pandemic, nexuses of education practice have emerged and mediated by a constellation of artifacts or disagreements reigning about its nature. For instance, a bevy of virtual care playbooks, updated medical curricula, clinical teaching tips, and new billing codes are obvious signs of praxeology in action. By granting clinical preceptors and trainees cultural, social, and symbolic capital to expand their practice into telemedicine, new expectations for clinical excellence are being systemically extended and contested.

In attempt to give a detailed look on the practice of virtual care preceptorship in postgraduate medical education, Lee-Krueger, Archibald, et al. (n.d.) discerned seven elements specific to the individual and contextual factors, behaviors, and outputs of such training relationships. In this scoping review, a closer examination of the literature provided examples of clinical precepting in virtual care situations. A listing of the shared aspects to describe virtual preceptorship can be found in Figure 5.

Figure 5*Features of Virtual Care Preceptorship in Postgraduate Medical Education*

Virtual care workplace	• Preceptors and trainee situated in configurations that allow safe medical care to be delivered remotely
Preceptor characteristics	• The qualifications, professional development, or experience to supervise trainees in virtual care.
Preceptor functions	• Preceptors support trainees in virtual healthcare settings through multiple clinical and teaching capacities
Trainee involvement	• Trainees gain hands-on clinical experience to the virtual care workflow under supervision.
Precepting interactions	• The exchange of preceptor-trainee behaviors facilitating a virtual care learning experience.
Precepting attitudes	• The aptitude to engage and support trainees in the virtual care workflow.
Training outcomes	• Perceived outputs, gains, and strategies to determine competence from virtual care training.

Educational Continuity in Virtual Care – A Critical Problem

The reach of virtual therapeutic frames offered a learning environment for family medicine residents to care for patients while clinical care was disrupted by impending COVID-19 pandemic waves; however, this modernization in telemedicine was already underway. Pre-pandemic statistics from the UK National Health Service indicated that, by 2008, 12% of total primary care consultations were conducted via telephone (Hippisley-Cox & Vinogradova, 2009). Fast forwarding to the year of 2021, Canada Health Infoway (2021) reported 38% of all healthcare encounters were virtually conducted in the past 12 months (over half of which completed with family physicians or patients' regular place of care). With respect to virtual care access, 45% survey respondents ($n = 12,052$) received a phone visit with a healthcare professional, compared to only 17% for video visits. In Canada, family physicians ($n = 819$) reported that about one third of their clinical time is spent providing virtual care (CFPC, 2022). A consensus survey also found similar utilization rates in terms of telehealth use in the United

States (Karimi et al., 2022). The goal of this article is not to debate the evidence behind outcomes or benefits of virtual care; rather, a critical problem when family medicine residents are positioned in virtual healthcare settings needs to be elucidated. Despite ongoing efforts on faculty development and preceptor training, it remains a void where educational continuity cannot be unguaranteed.

At a systems level, the upscale of virtual care urged medical and health agencies to take actions for maintaining continuity in patient care and in education. However, shifting the culture of medical education to formalize learning in virtual care is happening slowly. To nurture generations of physicians who can deliver patient care with health information and communication systems (Kannry et al., 2020; Lehmann et al., 2015; Silverman et al., 2016), Accreditation Council for Graduate Medical Education approved its inaugural Clinical Informatics subspecialty program in 2014. In Canada, efforts to standardize virtual care training are newer. Family medicine educators released residency training requirements and a set of pandemic-related competencies for virtual care (Table S5 lists related learning outcomes). However, to implement CBME as a solution for educational continuity, Englander and Carraccio (2018) asserts that the “delineation of requisite competencies of a doctor in the 21st century” is merely the first step. They further warned educators that ignoring gaps in educational continuity across and within phases of medical training poses direct harms to learners and patients (i.e., absence of sustainable relationships, decline in empathy, increased mortality). Educational continuity is also contingent to the quality of virtual supervision (Hirsh et al., 2007; Wearne, Dornan, et al., 2015). Although remote care technologies existed since the time of radio inventions, “[the] important and delicate professional skills are left to individual clinicians’ own intuition and judgement to cultivate and improve” (Vaona et al., 2017, p. 2). Findings from this Cochrane review highlighted the importance of educational continuity, particularly the need for clinical supervision and guidance to identify practice changes. Lee and Ross (2020) defined the concept “continuity of supervision” as “uninterrupted connection, succession, or union of monitoring, guidance, and feedback between a learner and a supervisor” (p. 449). Whether its longitudinal or episodic learning relationships, supervision should drive learning, guide assessment, or protect patient safety. When seen as a routine activity or less “information rich” than face-to-face consultations, the investments of time and effort to directly observe or role-model virtual care are not appealing to clinical preceptors (Lee-Krueger, Moreau, et al., n.d.;

Shepherd et al., 2022). The educational gains from video or phone consultations vary in terms of the skills applied for information gathering, clinical reasoning, and patient interaction (Car et al., 2020). There are also distinctions in what visual and audio information can be retrieved from phone- versus video-based consultations (van Galen et al., 2019). Preceptors unphased of the type of virtual care visits their residents engage in may not recognize these teaching pearls. Finding solutions to the erosion of educational continuity, especially in virtual healthcare settings, should be an issue concerning medicine educators and leaders.

Closing Educational Gaps in Virtual Care

Virtual care is a low hanging fruit for medical trainees to exercise the core skills in patient communication, professionalism, and clinical reasoning (Touchie & Pugh, 2022). To help clinical teachers carry out the promises of competency-based medicine education in this learning environment, this latter part elaborates on education practice and research strategies to address educational continuity. As a guiding example the current implementation of CBME in Canadian family medicine training programs will be referenced. Committed to prepare resident learners with a comprehensive training profile for professional careers in family medicine, the College of Family Physicians of Canada endorses specific accreditation standards (Table S4) and a faculty development model (Walsh et al., 2015) for fulfilling the duties of a clinical preceptor. While variability in these requirements is likely across postgraduate training programs, the foundational principle of ensuring clinical teachers can provide to the scope and breadth of training across clinical contexts should resonate with educators abroad.

Educational Solutions

Establishing continuity in the virtual care training is a shared responsibility between family medicine residency program leaders and clinical teachers. To see the linkage between assessment and curriculum changes, preceptors lean on the guidance of postgraduate medical education program personnel. Alongside, in the process of re-structuring curriculum and determining performance levels, it is also crucial to engage preceptors as stakeholders for implementing a suitable framework for assessing virtual care competencies. Having open discussions for program leaders and clinical teachers to reflect on matters of educational continuity in virtual care contexts can set more realistic expectations for 1) required length of

training, 2) appropriate level of supervision, 2) informed assessments to use, and 3) ways to develop learning relationships that transcend in limits of virtual healthcare settings.

Faced with mounting pressures from physician workforce shortages (IHS Markit Ltd., 2021; Larocque & Perez, 2022; Taylor, 2020), ‘assessing assessments’ is important groundwork to ensure that preceptors complete workplace assessments that are fit-for-purpose. Checks-and-balances to optimize the use of multiple assessors and assessment types should justify how each component contributes to decisions made about a learner progress to practice virtual care (Lockyer et al., 2017; Norcini et al., 2018). An abundance of literature supports the use of workplace assessment tools in family medicine: field notes, multisource feedback, and structured checklists. Field notes have been introduced as a way to document preceptors’ judgements and feedback pertaining to how family medicine residents demonstrate specific CanMEDS roles (Kazevman et al., 2021; Zaki et al., 2021). Given its wide application in Canadian family medicine training programs, generating field notes for residents’ performance in virtual care encounters is also becoming a part of precepting practices (Lee-Krueger, Moreau, et al., n.d.). Repeatedly shown to providing physician learners feedback in the communicator, professional, and collaborator roles (Lockyer, 2013; Lockyer & Sargeant, 2022; Roy et al., 2022), efforts to refine an effective system of assessments can leverage multisource feedback to track residents’ performance in virtual and in-person care encounters. Educators may also wish to consider assessment options designed for telehealth activities. A research group from UK developed the *Audio-Consultation Observation Tool* (Audio-COT), a workplace-based assessment for telephone consultation skills (Chaudhry et al., 2020; Sales et al., 2015). Another instrument shown to yield scores of strong interrater and test-retest reliability is the *Teaching Interpersonal Skills for Telehealth Checklist* (TIPS-TC), which assesses 12 critical communication behaviors during video-based consultations (Henry et al., 2021). This body of research, thus, suggests a plethora of encounter-based strategies for preceptors to assess the developmental progression of virtual care performance.

Maintaining educational continuity requires individualized academic coaching, in-the-moment and longitudinally. Arising from the virtual care of patients, the tasks of role modeling, teaching, assessments, and feedback are grounded on trusting relationships with a clinical coach. During this learning process, preceptors play a critical role in identifying phases of the virtual consultation that challenge residents. Clinical preceptors can guide their residents to self-reflect,

set learning goals, and develop an actionable plan for improving virtual care skills (Armson et al., 2019; Reynolds, 2020). Such feedback conversations can be facilitated following the R2C2 coaching approach, an evidence-based reflective model designed to help residents process assessment feedback in a meaningful way (resources available at <https://medicine.dal.ca/departments/core-units/cpd/faculty-development/R2C2.html>). When logistically feasible to observe the telehealth encounter, opportunities to virtually coach residents should be harnessed (Sasnal et al., 2021). Regardless of the intensity of observation or oversight devoted to virtual care training, Sagasser et al. (2017) and Sturman et al. (2021) remind us that clinical supervision is a means of granting residents with task-based entrustment and autonomy – not an representation of entrusting the learner holistically. The developmental path to virtual care competence requires deliberate planning on how to gather and interpret virtual care performance data for the purpose of skill improvement.

Research Solutions

To continue this cultural shift in postgraduate medical education, researchers must push the boundaries of family medicine education to acknowledge and accept this clinical learning environment. Scholars studying the educational complexities or effects of virtual healthcare settings will be challenged with dilemmas and constraints of the current medical education system (Ho et al., 2004; McKimm & O'Sullivan, 2015). Grasping the evolving educational practices to include telemedicine has been, and still is, a multi-institutional or jurisdictional endeavor. Yet, minimal guidance and policies to ethically manage national data across medical education institutions ultimately discourages researchers to carry out such investigations (Grierson et al., 2022). Researchers may also face other barriers to gaining access to technology-enhanced assessment systems for virtual care performance data. Local information-technology challenges limit assessors' capabilities to relate to specific clinical tasks (Fuller et al., 2022). For instance, Lee-Krueger, Moreau, et al. (n.d.) further found that structures of an assessment system predetermines how family medicine preceptors document their observations (e.g., option to indicate the virtual care context on assessment forms). The risks of technology inequity not only exist at the assessment level. The learning context for virtual care, in turn the capacity for preceptors to supervise, also depends on the workplace configurations and infrastructures admissible to providing telehealth visits.

Despite the resistance that education researchers could encounter, these hurdles are not insurmountable. Lessons from prior research point to opportunities for investigating the educational links to virtual care competence (Lee-Krueger, Archibald, et al., n.d.). Findings from this scoping review highlights the lack of research on the transfer of virtual care workplace training into future medical careers. The under-representation of evidence speaking to the virtual care education experiences from various clinical specialties also raises duly questions about the implementation of CBME. In the latter stages of this mixed methods study, Lee-Krueger, Moreau, et al. (n.d.) explores the practice of virtual care precepting to train new family physicians in Canada. This group found that physician preceptors now expect family medicine residents to engage in virtual care and are open to adapt their precepting approaches to remotely supervise them. Furthermore, while logistical strategies may enhance the precepting experience (e.g., ability to observe non-clinical skills, access to communicate with residents, demonstrate accountability), challenges with assessing performance in virtual healthcare settings fairly remain unaddressed.

Large attainment gaps between assessment systems are unlikely to be resolved alone. As Fuller et al. emphasized, “it is vital that those who are able to trial different technological solutions share their results... even more importantly, when it goes less well, to help programmes avoid making costly mistakes” (2022, p. 4). To further explain the standardization of workplace assessments, different methodological approaches offer new angles to study the intersections between virtual care context and clinical competence. For example, realist and multiple case study methodologies can examine how assessment outcomes are generated differently in virtual workplaces across various institutions (Bates et al., 2019). Researchers also need to be creative when examining best educational practices in virtual healthcare settings. In addition to self-reported measures, audits of performance indicators from clinical analytics (e.g., patient charting, prescribing behaviors, billing codes) may offer evidence of resident engagement and precepting quality. Emerging studies continue to show that precepting relationships around and during telehealth encounters are more fragile when residents are remotely distant from their preceptors (Lee-Krueger, Moreau, et al., n.d.; Shepherd et al., 2022). Perhaps, gathering ethnographic observations better captures the players and artefacts that motivate professional growth in virtual healthcare settings.

To extend education continuity into the world of virtual care, we propose a research agenda that addresses the ongoing issues that prevent this alliance from happening. Firstly, evidence is needed for connecting the relationship between precepting and task-specific entrustment in virtual healthcare settings. Many validity arguments on the assessment of virtual care competency still rest upon the preceptor and their capacity to make judgements fit for a learner. The scoring of clinical performance assumes that clinical preceptors can be credible observers to generate authentic, rich, and fair learner assessments (Cook et al., 2015). Yet, education researchers know little about the role supervision has on preserving (or disrupting) the quality of care residents deliver in the virtual workplace. A deeper investigation is also needed on whether preceptor judgements correlate to other indicators of clinical competence (e.g., length of training, clinical analytics, licensure scores). Secondly, the qualities of psychologically safe feedback that inspire practice changes in virtual healthcare settings remain unknown. A comprehensive review of the medical education literature may offer educators a better understanding of which interventions work for family medicine residents and under what circumstances. Thirdly, the economic burdens to engage and retain preceptors in virtual care training have not been well-studied. To attain entrustment in telehealth consultations, Lum et al. (2020) recommended preceptors to observe each postgraduate medical trainee do 10 consecutive virtual encounters and have two or more attending physicians complete a summative evaluation. However, with an educational culture where preceptors often supervise multiple learners at a given time, such decisions lack evidence for feasibility and validity. Lastly, as clinical care evolves to hybrid-based models, a rigorous comparison of precepting dynamics between virtual and in-person settings is warranted.

Conclusion

After a decade long of research, virtual care is internationally recognized as a core topic in family medicine education. Medical educators are tasked to foster educational accountability and distribute pedagogical strategies for teaching safe virtual care. To achieve this goal, this Scholarly Perspectives article presents theoretical arguments about the voids of educational continuity and investigate why they persist in this clinical context. Specifically, the importance to effectively link the chains for curriculum and assessments in virtual healthcare settings were emphasized. The authors conclude by offering educational strategies along with a call for future research to help clinical teachers support effective competency-based education in virtual care.

Section Five: Coda

To my knowledge, this is the first study to explore clinical preceptorship practices in virtual healthcare settings for family medicine residents. Building upon 40 years of research identified in clinical teaching, computer technology, and teletherapy literature, the three articles presented in this dissertation are integrated to demonstrate a cohesive and logical progression of conceptualizing clinical preceptorship in virtual healthcare environments. Specifically, I explored the phenomenon of virtual care precepting by addressing four key research questions:

- How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education?
- What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?
- To what extent do preceptors involve, prepare, and assess family medicine residents in these contexts?
- How do preceptors assess and provide feedback to family medicine residents?

This Coda, therefore, is intended to critique the findings from a multi-phase study and expand our knowing with new perspectives about the roles and experiences of physician educators in virtual care preceptorships.

Research Summary

Section Two provides a scoping review of literature to understand how virtual preceptorship is conceptualized in postgraduate medical education. A call is made for a new research programme to examine critical questions about clinical preceptorship in virtual healthcare settings.

Section Three articulates the experiences and challenges to precept family medicine residents in virtual healthcare settings. Results from surveying and interviewing clinical preceptors shed light on shifts and nuances in clinical preceptorship with training family medicine residents. This research collaboration yielded a thematic framework that illustrates the complexity of virtual care precepting as a pedagogical activity.

Section Four then extends scholarly conversation to critically discuss the expectations, affordances, and gains to precept resident learners in virtual care contexts. Drawing on existing literature, new empirical findings, and a collection of policy documents, the authors identify

virtual care situations where educational continuity may not be guaranteed for medical resident learners. New theoretical perspectives, research directions, and education solutions are put forth as recommendations to amend voids of safe medical care learning.

To summarize, Table 7 recaps the research objectives or questions, evidence sources, and key messages reported in Sections Two to Four. A discussion follows which addresses the connection between each research question and findings from this body of research.

Table 7.*Summary of Sections Two to Four*

Research Objectives/Questions	Evidence Sources	Findings/Deliverables
Section 2: Scoping review (Article #1) - How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education? - What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?	24 peer-reviewed articles	Identification of key features for preceptorship in virtual care settings: workplace, preceptor characteristics and functions, precepting attitude and interactions, trainee involvement, and training outcomes; How to strengthen learning relationships, understanding situations when educational continuity is jeopardized, and implications of contextualization in virtual care training are critical questions for future research.
Section 3: Survey and interviews with clinical preceptors (Article #2) - To what extent do preceptors involve, prepare, and assess family medicine residents in these contexts? - How do preceptors assess and provide feedback to family medicine residents?	45 online survey responses, 13 key informant interviews with physician preceptors	Survey findings indicated the nature of and aspects impacting preceptor interactions with family medicine residents in virtual care. Interview themes described the dynamics, adaptive behaviors, strategies, and limitations to precept residents. Integration of results lead to building a thematic framework for individual and relational factors, behaviors, tools to precept in the virtual care workplace.
Section 4: Critical perspectives on virtual care preceptorship (Article #3) - To identify education gaps for preceptors to support CBME in virtual healthcare settings - To offer practical and research strategies for building the learning continuity necessary for virtual care competency.	Empirical literature, policy documents (frameworks for accreditation standards, core competencies and activities, assessment, faculty development)	Present theoretical arguments to explain the evolving practice of clinical preceptorship in virtual care contexts; Understand the contemporary issues with formalizing virtual care in clinical education; Discuss existing education interventions to amend the voids of education continuity; Recommend a research agenda to systematically study the linkage between curricular, instructional, and assessment approaches in virtual care education.

Bringing It All Together

Integration of Deliverables

I conducted this thesis with the overarching purpose to address a need for effective virtual care training in the clinical workplace. In triangulating various evidence sources, methods, and findings, I developed a holistic understanding of the current gaps in precepting practices and how preceptor experiences guided or altered their educational judgements in virtual healthcare settings. Table 8 compares and contrasts the research deliverables from each article manuscript in relation to the research questions.

Table 8.

Overarching Research Questions and Key Deliverables by Article

Research Question	Integration of Deliverables
How is clinical preceptorship in virtual healthcare settings conceptualized within the field of postgraduate medical education?	<i>Article 1:</i> Physician educators and trainees characterized preceptorship by the virtual workplace, preceptor characteristics and functions, trainee engagement, preceptor-trainee interactions, precepting attitudes, and learning outcomes. <i>Article 2:</i> A thematic framework expands on the interplay of individual factors and behaviors, technological artifacts, and virtual workplace setting on precepting. Continuity and goal-oriented relationships are found to be motivators of precepting in virtual care. <i>Article 3:</i> Adaptive expertise and sociomaterial approaches offer theoretical explanations for the nexuses of clinical precepting in virtual healthcare settings.
What are the gaps in the way clinical preceptorship in virtual healthcare settings is conceptualized in the field of postgraduate medical education?	<i>Article 1:</i> Researchers have yet to fully examine the impacts of preceptorship on patient care, which teaching strategies effectively support trainees, and reasons for underperformance in virtual healthcare settings. Few studies described the phenomenon of virtual preceptorship in the context of Canadian-based programs. <i>Article 2:</i> Lack of survey and interview findings indicating standardized ways for physician preceptors to assess virtual care skills and changes in patient outcomes. Quality of assessment and feedback data, and how they inform education decisions remain inconclusive. <i>Article 3:</i> While recognized as a core professional activity in family medicine, the erosion of educational continuity remains a growing concern for safe virtual care learning.

To what extent do preceptors involve, prepare, and assess family medicine residents in these contexts?	<i>Article 1:</i> Virtual supervision is recognized as the predominant preceptor role. Few studies described strategies to engage prepare and assess family medicine residents. <i>Article 2:</i> Physician preceptors assume residents are prepared to carry out virtual care activities. Preceptors seek for adaptive and feasible approaches to supervise and support their residents' training. <i>Article 3:</i> Successful restructuring of family medicine education to include virtual care involves the collaboration of clinical preceptors.
How do preceptors assess and provide feedback to family medicine residents?	<i>Article 1:</i> Assessment and feedback mechanisms for virtual care performance in family medicine education are not well described. <i>Article 2:</i> Physician preceptors report limited capacity to assess the CanMEDS-FM roles, struggling to assess for underperformance in virtual healthcare settings. Opportunities to give residents in-the-moment feedback about the virtual visit are logistically possible. <i>Article 3:</i> Claims on how current and novel assessment strategies may translate into effective and reflective clinical learning are explored.

Theoretical Implications

Despite the emerging research to suggest that clinical preceptors play an important role in virtual care training, the interplay between context and precepting may not be as straightforward as medical education research would lead to believe. Reflection in medical practice and education involves multifaceted and complex processes that challenge one's firmly held beliefs and assumptions (Sargeant et al., 2009; Tsingos et al., 2014). If our goal as educators is to help residents develop a safe virtual care practice, then this thesis project is the start of a journey to test the assumptions and biases to fostering virtual care competency (see Figure 1). Concordant and discordant findings from the presented mixed methods study further expands our knowledge around what reflective virtual care teaching and learning are, which led to the creation of a thematic framework (Figure 4).

Firstly, I reoriented the concept of virtual care preceptorship to address its micro-dynamics in terms of individual (preceptor-, trainee-, patient-), social (behaviors, relationship), and contextual (workplace, tools) factors. Past literature and new empirical results consistently confirmed supervision, role-modeling, coaching, assessment, and feedback provision to be key

educational activities in virtual healthcare settings. However, a deeper exploration of preceptor experiences revealed that varied engagement in these behaviors is mediated by structural elements (or the lack of) from the workplace. The interconnectivities between human and non-human actors involved with virtual care precepting are now better acknowledged in this new framework.

Secondly, the emphasis on relational continuities in virtual care preceptorship is another divergence from my conceptual framework. After a two-year longitudinal study in primary care, Etz et al. (2022) found that most physicians agreed an established patient relationship is foundational to doing virtual care well; however, it cannot replace the need for physician touch in medicine. Similarly, the present study suggested that coaching residents to communicate with empathy, deliver care compassionately, and recognize challenges to build therapeutic alliance remotely is becoming a shared teaching practice in virtual care. During the COVID-19 pandemic, preceptors reflect on the rarity of opportunities to maintain longitudinal learning relationships with residents, which may have impacted their ability to support them in a goal-oriented way. Thirdly, this thematic framework underscores the importance of training outcomes and assessment practices to meet those expectations. Earlier in Section Two, findings from a scoping review indicated training outcomes and approaches to monitor them as a critical component of virtual care precepting. Yet, when physician preceptors are asked how they determined virtual care competence, the perceived outputs or gains to assess resident performance in these contexts are surprisingly not well-noted.

Lastly, it is worth mentioning the theoretical constraints of this thematic framework. Fundamentally, clinical preceptorship is a co-constructed learning experience shaped by the novice trainee and an experienced practitioner. Building on this existing gap in assessment practices, Section Four is a thought-provoking piece that urges researchers to (re-)consider how preceptorship can foster learning, and adaptively translate those experiences to safe virtual care practice. My theorizations may also be blind sighted by minimal insights representing trainees' perspectives on virtual care engagement in this regard. Thus, to fully understand the phenomenon of reflective learning and teaching, the bi-directional influences to build educational alliances in virtual healthcare settings should be investigated.

Implications on Postgraduate Medical Education

Changing patient expectations towards virtual care have led to its integration within the training of family physicians and physician specialists. In Canada, the Federation of Medical Regulatory Authorities of Canada (FMRAC) identified virtual care as an organizational priority, recommending medical regulatory authorities to liaise with the Association of Faculties of Medicine of Canada and national certifying bodies “to promote better understanding of the ethical and legal aspects of virtual care by medical students, residents and practising physicians, and to enhance digital professionalism and literacy” (2022, p. 6). Likewise, the Australian Government put forth a 10-year strategic plan to focus on supporting safe telehealth as a pillar of future focused primary care (Department of Health and Aged Care, 2022). To ensure the quality and safety of patient care do not fall by the wayside, medical education programs must be carried out to graduate physicians that can meet this societal need.

In the process of revisiting our conceptualization of clinical preceptorship, a teaching-learning method foundational to postgraduate medical education, educators can plan and design a balanced curriculum for residents to gain exposure in practicing both in-person and remote care. The introduction of a new framework (Figure 4) will help educators understand the individual factors, actions, relationships, and technology aids that preface meaningful preceptorships in virtual care workplaces. To support health practitioners working in rural and remote practices through situational tele-mentorship, Bui et al. (2022) proposed a conceptual framework leveraging synchronous telecommunication technologies and a problem-solving process to help mentees at a remote location deal with challenge clinical situations. Altogether, such sociomaterial expositions suggest that medical educators are invested in creating safe clinical learning environments unrestricted by the physical boundaries of a patient room.

In determining preceptors’ comfort to engage residents in virtual healthcare activities, this research unpacked the underlying beliefs that govern their decisions to grant residents with greater autonomy to practice telemedicine. Physician preceptors now expect medical residents can carry out virtual care activities as early as the start of their specialty training. They also actively seek, adapt, and trial strategies to supervise residents in ways that avoid compromising the quality of patient care. Taking it one step further, I argue that preceptor accountability and cooperation are pivotal in the restructuring of family medicine education to address new learning needs. Perhaps, we can draw on lessons from other residency training programs to streamline the

day-to-day precepting tasks in virtual care. For instance, to become an accredited postgraduate medical program, Longhurst et al. (2016) commented on the enduring process to define rotations and longitudinal experiences that can provide trainees with sufficient exposure in telemedicine and clinical informatics. In designing a national pediatric telepsychiatry curriculum, Khan et al. (2021) advocates a set of education principles that focuses on preceptorship as the bridge for residents to develop core clinical responsibilities. Recent transitions in neurology and internal medicine residency programs have encouraged physician preceptors to document teaching in telehealth encounters and provide virtual academic coaching on communication and non-technical skills (Sasnal et al., 2021; Savage et al., 2022). While there may not be a single recipe to teach virtual care correctly, the early and recent experiences of postgraduate medical educators have sketched blueprints to extend CBME into telemedicine.

With a surge of telehealth care programs entering the public's eye, health organizations are promising Canadians a convenient way for vulnerable and underserved populations to get medical advice (Alberta Health Services, 2018; The Hospital for Sick Children, 2022; University of Ottawa Heart Institute, 2017). This new horizon of remote medicine calls for a critical reflection and reconsideration of how practice readiness is determined, in relation to the rising expectations for physicians to navigate complex health technology and information systems. In addressing the research question "How do preceptors assess and provide feedback to family medicine residents?", we are left with uncertainties towards the pedagogical practice of assessment and feedback literacy in the virtual care workplace. From the presented study, minimal data point to effective assessment systems in place to monitor virtual care skill development. Physician preceptors also expressed limited capacity to assess competence and identify signs of underperformance in these clinical situations. Perhaps, this ambiguity stems from two root problems. For one, preceptors lack a shared sense of awareness about the virtual care competences and core professional activities that residents should be developing and evaluated over time. The second problem, as Wenghofer and Boulet (2022) warn us, is "the predictive relationships that have been established to date may become irrelevant as medicine evolves" (p. 7). Any evidence to suggest that workplace assessments can determine practice readiness for in-person care, however, cannot tell us if medical educators are focusing on the right aspects of virtual care competence within ones' scope of medical practice. From early studies on implementing telemedicine in northern Italy medical centres, we already learned that

granting health professionals more autonomy and independence can disrupt practice (Nicolini, 2012). This dualism of “everything is the same, only different” (p. 72) suggests that validity claims for current education interventions and clinical performance are incomplete. Thus, fossilization of assessment structures may impede preceptors to conduct focused observations and translate them into meaningful feedback for learner reflection and appraisal of virtual care performance.

Returning to the core research question that looked at our knowledge gaps about clinical preceptorship, this thesis recognized impacts of preceptorship on patient care, which teaching strategies supported clinical trainees, and reason for virtual care performance as key areas needing further research (see Section Two). A deeper exploration of precepting experiences confirmed the teaching strategies that preceptors relied on to support medical residents through virtual care activities (e.g., pre-huddle discussions, oversight, verbal in-the-moment feedback). Such observations align with practice tips previously suggested in the postgraduate medical education guides for virtual care supervision (Coe et al., 2022; Hovaguimian et al., 2022; Schultz et al., 2021). However, these resources offer minimal recommendations on effective assessment strategies for virtual care training. The presented study gathered preliminary evidence to suggest that weakened linkages between the curriculum, supervision, and assessment components of virtual care learning jeopardizes educational continuity. With increasing scrutiny on the adherence to accreditation standards to assure the quality of postgraduate medical education (Amaral & Norcini, 2022; Frank et al., 2020), mitigating inconsistent or contradicting expectations on trainees’ performance by extension could improve the quality and safety of telemedicine across clinical specialties.

Concluding Note

In an era when the television has yet to exist, Hugo Gernsback envisioned the Radio Teledactyl as an invention that can revolutionize medicine, allowing doctors to “feel” with a robotic arm and treat patients from a distance (Gernsback, 1925). Today, we coexist with a Zoomified life and shared frustrations with remote work including the healthcare sector. However, the quest for medical educators to find a helpful distance for clinical learning to occur in this social sphere continues.

The birth of this thesis project coincided with the start of a global health crisis – a historic event that remains deeply ingrained among physicians and left many demoralized. Faced with

personal and professional crossroads of their own, clinical teachers committed to their roles in caring for the ill and leading medical trainees through an ailing healthcare system. The task of precepting medical trainees in virtual care environments also fell upon the shoulders of clinical preceptors. Their lived experiences leave behind this thesis - a biopic on the realities of virtual care training and contemplations on the future of family medicine education.

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Appendix A: Supplementary Material

Figure S1

PRISMA Flow Diagram for a Scoping Review of the Literature on Preceptorship in Virtual Healthcare Settings

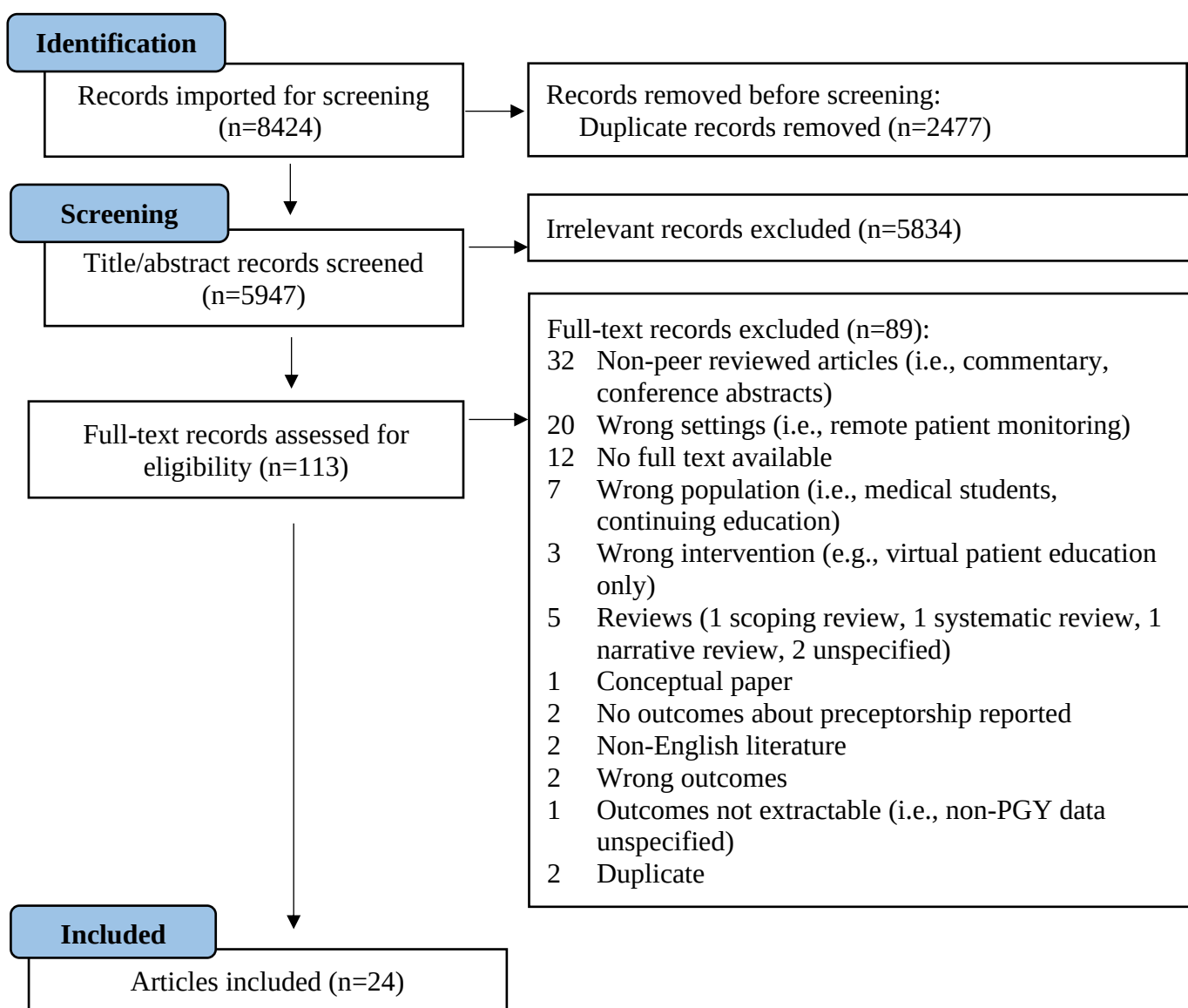


Table S1*Search Strategies for Scoping Review*

Database	Entries found	Search Strategy
Ovid MEDLINE(R) and In-Process & Other Non-Indexed Citations	3305	1. Preceptorship/ 2. precept*.ti,ab. 3. Teaching/ 4. (teach* or supervis* or assess* or feedback* or evaluat*).ti,ab. 5. 1 or 2 or 3 or 4 6. Telemedicine/ 7. ((virtual* adj1 care) or telehealth* or telemedicine or (distan* adj1 care) or (online adj1 care) or (mobile adj1 health) or mhealth or ehealth or m health or e health or (remote* adj1 care)).ti,ab. 8. 6 or 7 9. "Internship and Residency"/ 10. Education, Medical, Graduate/ 11. (residen* or fellow* or house officer* or registrar* or intern* or pgme or trainee*).ti,ab. 12. ((postgraduate or graduate) adj1 medical adj2 education).ti,ab. 13. 9 or 10 or 11 or 12 14. 5 and 8 and 13
Embase	4238	1. medical education/ 2. precept*.ti,ab. 3. teaching/ 4. (teach* or supervis* or assess* or feedback* or evaluat*).ti,ab. 5. 1 or 2 or 3 or 4 6. telemedicine/ 7. telehealth/ 8. ((virtual* adj1 care) or telehealth* or telemedicine or (distan* adj1 care) or (online adj1 care) or (mobile adj1 health) or mhealth or ehealth or m health or e health or (remote* adj1 care)).ti,ab. 9. 6 or 7 or 8 10. residency education/ 11. (residen* or fellow* or house officer* or registrar* or intern* or pgme or trainee*).ti,ab. 12. ((postgraduate or graduate) adj1 medical adj2 education).ti,ab. 13. 10 or 11 or 12 14. 5 and 9 and 13

Education Source	739	S1. (teach* or supervis* or assess* or feedback* or evaluat*) S2. Precept* S3. S1 OR S2 S4. ((virtual* N1 care) or telehealth* or telemedicine or (distan* N1 care) or (online N1 care) or (mobile N1 health) or mhealth or ehealth or m health or e health or (remote* N1 care)) S5. (residen* or fellow* or house officer* or registrar* or intern* or pgme or trainee*) S6. ((postgraduate or graduate) N1 medical N2 education) S7. S5 OR S6 S8. S3 AND S4 AND S7
Scopus/Science Direct	142	(TITLE-ABS-KEY (teach* OR supervis* OR assess* OR feedback* OR evaluat* OR precept*) AND TITLE-ABS-KEY (virtual* AND care OR telehealth* OR telemedicine OR distan* AND care OR online AND care OR mobile AND health OR mhealth OR ehealth OR m AND health OR e AND health OR remote* AND care) AND TITLE-ABS-KEY (residen* OR fellow* OR house AND officer* OR registrar* OR intern* OR pgme OR trainee* OR postgraduate AND medical AND education))

Table S2*Research Details of Included Articles for Scoping Review*

Year	Authors	Country	Aims	Design	Participants	Clinical/Research Context	Data Collection
2009	Fleming et al.	US	Examine the beliefs and attitudes of TH providers Determine barriers of utility and implementation of TH training and services in primary care resident ambulatory care clinic	Qualitative research	10 family residents, 5 preceptors	University of Missouri primary care residents, attending physicians from General Internal Medicine Division	2 separate focus groups for residents and preceptors
2011	Shore et al.	US	Present a model for resident telepsychiatry training	Cohort study	11 residents	PGY-3/4 psychiatric residents participated in an elective rotation (1 half-day per week per year) at the Denver VA Medical Center from July 1, 2003 to June 30, 2008. Resident-based telepsychiatry service for veterans at Community-Based Outreach Clinics in rural Colorado.	Data from first 4 years of clinic operations
2013	Dzara et al.	US	Understand how psychiatry trainees evaluate the telepsychiatry rotation, whether they perceive direct supervision as useful, and whether they find the training useful	Cross sectional study	8 residents, 7 medical students	Pilot telepsychiatry clinic Southern Illinois University of Medicine Only 1 resident had prior experience with telepsychiatry	27-item, post-rotation survey (78.9% response rate)
2014	DeGaetano et al.	US	Develop a 6-month telepsychiatry training program for psychiatry residents	Cohort study	15 PGY-2/3 residents, 8 telepsychiatry attending physicians	6-month telepsychiatry rotation	Population data from EMR database 10 residents, 7 attending physicians completed an online survey
2016	Crawford et al.	CAN	Understand learning needs across relevant domains for telepsychiatry Articulate core competencies in	Qualitative research	7 resident, 9 faculty members	University of Toronto leaders in Department of Psychiatry. Faculty members were identified by expert panel	Semi-structured interviews of faculty and residents following a grounded theory approach

			telepsychiatry and link them to pedagogical methods			and an environmental scan of department's services. Psychiatry residents had interests in telepsychiatry or education scholarship.	Expert panel consisted of 11 knowledge users in administration, education, and telepsychiatry
2016	Teshima et al.	CAN	Examine residents' feedback from telepsychiatry training	Cohort study	335 residents	The Hospital for Sick Children TeleLink Mental Health Program in Toronto, Canada. University of Toronto psychiatry residents participated at least 2 telehealth consults in a child psychiatry block from 2005-2012.	Residents completed a post-training evaluation (88% response rate)
2017	Govindarajan et al.	US	Develop a framework for a teleneurology curriculum for residency programs Reflect the milestones needed to train providers who can meet current healthcare needs	Conceptual paper	N/A	Developed by AAN Telemedicine Work Group	N/A
2018	Papanagnou et al.	US	Describe a 12-month training experience where residents provided a TH follow-up encounter with patients after their in-person visit at emergency department Determine feasibility of training program in graduate medical education Survey the educational value of TH training	Cross sectional study	12 Emergency Medicine PGY-3 residents	A pilot TH training program using JeffConnect platform at the Thomas Jefferson University's Department of Emergency Medicine in Philadelphia, Pennsylvania.	Survey with closed and open-ended questions completed by 10 residents (83% response rate)
2019	Afshari et al.	US	Evaluate a curriculum's effect on resident knowledge, perspectives,	Cohort study	11 residents	University of California San Francisco neurology residents completed a	Pre- and post-curriculum surveys, qualitative feedback from residents

			and perceived competence in teleneurology			teleneurology rotation across PGY-3/4 years At start of rotation, residents received a 1:1 lecture session N/A	
2019	Hilty et al.	US	Outline the competency- based medical education movement for telepsychiatry competencies Describe components, concepts, operations, processes of mobile health Organize competencies for mobile health using ACGME framework Develop an approach to teach and evaluate skills and patient outcomes	Conceptual paper	N/A		Modified Delphi process Themes organized into competencies following the ACGME Milestones and CanMEDS roles
2020	Beran & Sowa	US	Describe practice changes to implement virtual care in a psychiatry C-L service Present evidence regarding the telehealth experience of psychiatric trainees and attending physicians	Mixed methods, case study	4 attendings (80%) and 10 residents (62.5%) completed survey	Clinical teams on inpatient psychiatry consult service consists of 2 attendings, 4-5 residents, 2 fellows, 2-3 medical students	Focused interviews with inpatient C-L leaders Inpatient consult volume and charge data Online surveys of attendings, residents
2020	Casas et al.	US	Address the patient care and residents' educational needs in an internal medicine clinic during COVID-19	Case report	N/A	Residents completed a rotation in academic internal medicine practice every 2 weeks	N/A
2020	Chick et al.	US	Propose solutions in maintaining surgical resident education during COVID-19	Case report	N/A	N/A	N/A
2020	Huffman et al.	US	To maintain teaching in the telehealth environment during COVID-19	Qualitative research	7 faculty members, 4 fellows	Stanford University School of Medicine, Developmental- Behavioral Pediatrics Division	2 focus groups with faculty and fellows separately and analyzed

							with inductive content analysis.
2020	Keswani et al.	US	Discuss a framework for implementing telemedicine into an allergy-immunology curriculum Propose telemedicine competencies desired for the independent practice of telemedicine	Conceptual paper	N/A	Allergy and clinical immunology	N/A
2020	Kohan et al.	US	Provide guidance on training programs for the practice of TH Provide resources for maintaining the quality of pain fellowship education during COVID-19	Practice guide	N/A	Developed by the Association of Pain Program Directors	N/A
2020	Kowalski et al.	US	Maintain a family medicine/behavioral health co-preceptorship model via TH during COVID-19	Case report	N/A	Rowan University School of Osteopathic Medicine faculty members, family physicians, clinical psychologist, and residents	N/A
2020	Lau et al.	US	N/A	Case report	N/A	N/A	N/A
2020	Lowe et al.	UK	Ascertain what teledermatology teaching was available to dermatology registrars and their confidence in this area	Cross sectional study	26 dermatology registrars	58% of dermatology specialty registrars reported there is a teledermatology practice in their workplace.	National survey
2020	Lum et al.	SGP, NLD, AUS	Describe a piloted training program for TH consultations Propose TH consultation as an entrustable professional activity	Conceptual paper	N/A	N/A	N/A

2020	Mallon et al.	US	Understand how COVID-19 affected pediatric gastroenterology fellowship training in North America Share how programs managed changes in clinical work, research activities, and endoscopy training	Cross sectional study	51 program directors	Training Committee of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. 42 fellowship programs (82%) had 6 or fewer fellows.	One-time survey (66% response rate)
2020	Stephenson et al.	US	Propose solutions to the limited resident outpatient observation opportunities during COVID-19	Case report	N/A	N/A	N/A
2020	Suarez-Cedeno et al.	US	Describe the transitions of a movement disorders program to teach telemedicine	Cross sectional study	N/A	Johns Hopkins University neurology fellows and attending physicians. No fellows worked in telemedicine, only 3 attendings conducted telemedicine visits	Resident surveys, faculty discussions from March 18 to May 18, 2020
2021	Pritchard et al.	US	Assess impacts of COVID-19 on the education experience in pediatric genetics education	Cross sectional study	23 residents: 2 PGY-1, 10 PGY-2, 10 PGY-3, 1 PGY-4	Pediatric/combined internal medicine residents completed a pediatric genetics elective between July 2018 and June 2020	Online survey distributed June 2020 (82% response rate)

Acronyms: AAN = American Academy of Neurology, AUS = Australia, CAN = Canada, C-L = consultation-liaison, COVID-19 = Coronavirus Disease 2019, EMR = electronic medical record, NDL = The Netherlands, PGY = Postgraduate year, SGP = Singapore, TH = telehealth, UK = United Kingdom, US = United States, VA = Veteran Affairs

Table S3*Aspects of Preceptorship Examined by Included Articles*

Year	Authors	Workplace	Trainee Involvement	Learner Interactions	Attitudes to Precepting	Training Outcomes
2009	Fleming et al.	N/A	N/A	N/A	P and R concerned about strained mentoring relationships R learned clinical skills to treat patients in remote areas. P and R concerned about fewer opportunities to develop physical examination skills. P concerned that R exposure to patient encounters is reduced.	N/A
2011	Shore et al.	Provider site had 4 private offices with video-conferencing units for R and P use.	Appointment scheduling done by clinic clerks, as directed by R.	P rotated between offices, observed R and patient interactions, and provided immediate feedback on clinical skills. Each clinic day concluded with a 1-hour group supervision to discuss patient cases, along with rural issues and give career guidance. Supervision focused on interactions with patients during telepsychiatry visit, clinical skill development, and suggested readings.	N/A	5 R (63%) sought to continue with VA experiences as chief R or clinicians.

				R received oral and written feedback.		
2013	Dzara et al.	R utilized video conferencing equipment to interview/examine patients.	R attended telepsychiatry consultation sessions (median = 5.5, min = 1, max = 10).	R provided patient consultations under P supervision (on-site, side-by-side).	R "agreed"/ "strongly agreed" that direct supervision helped provide a comprehensive learning experience.	N/A
2014	DeGaetano et al.	R scheduled 3-4 patients during 3-hour addiction clinic using telepsychiatry	From January 2012 to July 2013, R saw 263 telepsychiatry patients (640 individual encounters). Services given: 57% medication review, 40% psychotherapy with medication review, 3% new patient evaluations.	Shadowed a tele-psychiatrist during a 2-month rotation in outpatient care. Mix of in-person, secure instant messaging, and telephone supervision.	Some R reported not having P sitting in the room with them during visits fostered autonomy Instant messaging allowed them to query their P about treatment decisions without interrupting a patient session.	Many R felt comfortable with providing medication management and treating most diagnoses by telepsychiatry. All P "agreed"/"strongly agreed" that R became comfortable with using telepsychiatry.
2016	Crawford et al.	N/A	Telepsychiatry should be introduced early in training and allow for gradual responsibility to treat different patient populations/clinical contexts.	P supported experiential learning approaches.	Minimal faculty development viewed as barrier to advance telepsychiatry training. Some P assume that telepsychiatry is undifferentiated from face-to-face care .	N/A
2016	Teshima et al.	Consultations involved a case manager, a parent/guardian, and child/adolescent.	Recommendation: • R observe a staff psychiatrist conduct a consult and then participate in the interview of 2 nd consult and completed documentation.	Recommendations: • Promote discussion before/after videoconference to enrich learning experience	87% "agreed"/ "strongly agreed" P provided a clear explanation for telepsychiatry as a mode of service delivery" 85% "agreed"/ "strongly agreed" that P highlighted unique	N/A

				• Offer opportunity to conduct parts of the interview	aspects to telepsychiatry work. 96% “agreed”/ “strongly agreed” they would recommend this training.	
2017	Govindarajan et al.	N/A	N/A	R taught to document teleneurology encounter. Prior to seeing patients, P conversed with R about purpose of tele-neurologic examinations, equipment needed, and performance of specific testing. P supported a dynamic teaching method by giving feedback on how to improve website manners.	N/A	Direct supervision of R’s history and examination skills identified as a way to assess proficiency in teleneurology.
2018	Papanagnou et al.	N/A	R performed 197 follow-up visits on patients seen in the ED (<i>mean</i> = 13 TH visits, <i>IQR</i> = [8, 16.5]). Prior to TH visit, R reviewed patient’s ED note from hospital visit. Documentation for TH visit captured in the EMR as addendum.	R completed 16 hours of directly supervised TH delivery over 4 weeks. P provided R feedback during/after each TH visit. Kolb’s experiential learning cycle noted as theoretical perspective for learning in TH visits.	7 R agreed there is value to having a TH rotation in EM residency. R commented “[they] liked it better than expected”, and “prepared [them] for EM” in specialized areas (e.g., remote, rural settings).	Evidence of program effectiveness evaluated by Kirkpatrick Model: Levels 1 to 3
2019	Afshari et al.	R saw patients via live, video-	On average, R saw 11 and 20 patients	First video visits led by P so R can gain	N/A	R felt more competent using telemedicine

		conference using Cisco Jabber software (clinic-to-clinic, clinic-to-home).	during a rotation (upper range: 21-30 patients).	familiarity with the technology, clinical exam structure, and ways to interact virtually. R conducted video visits and discussed their preliminary evaluation with P in private. R and P would rejoin visit to provide a final assessment and plan.		after 2 weeks of rotation.
2019	Hilty et al.	N/A	N/A	Recommendations: • Supervision approaches should align with competencies and milestones for mobile health training	N/A	Proposed assessment methods using clinical supervision in group, co-interview settings Possible types of learner assessment: chart/mobile app review, mini-clinical evaluation exercises
2020	Beran & Sowa	Clinical teams have 1 attending physician and 1 trainee on-site, remaining members worked remotely from their home/office.	R and P reported moderate-high comfort with virtual consults (1 = very uncomfortable, 10 = very comfortable): • R's comfort to perform phone visits; <i>mean</i> = 6.40, <i>SD</i> = 2.15 • R's comfort to perform video visits; <i>mean</i> = 6.13, <i>SD</i> = 1.45	N/A	P's satisfaction with their supervision during COVID-19 was rated moderate and significantly lower than pre-pandemic ($p = 0.043$). However, R's satisfaction with their supervision did not change and their satisfaction. P felt less comfortable connecting with trainees and patients during COVID-19. They worried that trainees'	Most R felt less comfortable conducting virtual care, stating it was more difficult to connect with patients, and they had less confidence in their assessments.

			• P's comfort to supervise phone visits; <i>mean</i> = 5.00, <i>SD</i> = 1.00 • P's comfort to supervise video visits; <i>mean</i> = 7.25, <i>SD</i> = 0.83		experience was reduced because of changes to supervision.	
2020	Casas et al.	Patients referred through a shared message pool within EMR system.	2 R per half-day telephoned patients to assess COVID-19 risk factors and made management recommendations	1 P available to discuss cases and review documentation.	N/A	R exercised clinical reasoning to justify their management decisions and assessed/integrated rapidly changing guidelines.
2020	Chick et al.	N/A	R made initial contact with patients, gathered a history, and formulated plan. P-R dyad conducted videoconference with patient so R could partake in final counseling and implement treatment plan.	After initial consult encounter, R and P reviewed case in private. Once patient signed off, P and R debriefed.	N/A	N/A
2020	Huffman et al.	N/A	After 1 month, 101 TH visits were led by fellows and supervised by faculty (31%). Fellows could observe and practice skills to demonstrate leadership, flexibility, timeliness during TH visits.	Educational framework rooted in experiential learning: 1) faculty and fellow paired for entire TH visit; fellow led the visit and faculty observed; 2) for each TH visit, time was dedicated for focused "pre-brief" and "de-brief" discussions; and	Faculty expressed concerns about possible disadvantages of tele-training (e.g., fellows perceive lost autonomy, heightened scrutiny, decreased collegiality).	N/A

2020	Keswani et al.	N/A	Challenges: • Trainees rely on attending's access to the TH platform. • Engagement permitted after patient consents. Recommendations: • Trainees may benefit from observing attendings conduct initial visits and lead subsequent patient encounters. • Trainees recap patient's pharmacy, review plan, discuss follow-up, and provide education. • Trainee completes documentation about TH visit (e.g., persons present, location of	3) capitalized on observation of patient visits at home. Nature of supervision changed to observe fellows without interrupting clinical interactions). Faculty gave enriched, confidential feedback during/after the visit. Recommendations: • Role model empathy and therapeutic alliance digitally. • Acknowledge P's duty to provide trainees with feedback after each visit. • Review patient feedback to strengthen practice and professionalism. • Instruction on aspects of the allergy-immunology physical examine that can be assessed by telemedicine • Recognize situations to defer/ recommend in-office evaluation	Telemedicine perceived as appropriate for conducting direct "bedside rounds". Challenges to supervision: • Ways to promote clinical reasoning virtually • Discussing trainee's care plan with patient present • Faculty report evaluation fatigue	Proposed competencies to assess: • Recognize limitations of TH • Elicit appropriate history and remote targeted physical examine for a virtual visit • Evaluate performance with conducting TH visits • Communicate effectively with patients and participants of TH visits • Conduct web presence professionally • Use appropriate type of telemedicine • Complete documentations for TH visit
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			patient and physician, technical issues).			• Understand licensing/ billing/ legal considerations for telemedicine
2020	Kohan et al.	Gather patient consent to TH visit and trainee presence with clinical care 3-way videoconference for patient, attendings, and residents.	As of April 13 2020, R provided TH services under direct supervision of a teaching physician for the duration of the COVID-19 public health emergency	After TH visit, P expected to share feedback regarding trainee's engagement in patient care and virtual care workflow.	N/A	Proposed structure of a competency assessment checklist (e.g., format, topics to assess)
2020	Kowalski et al.	R conducted TH visits from home. Precepting facilitated via remote access to EMR and merged audio calls.	R started an independent evaluation of the patient and assist with implementing a treatment plan.	After initial assessment, R reached out to P (attending physician, psychologists) via phone. P gave guidance on mental health disorder treatments. P then join R in virtual room to implement plan. R debriefed with P on how visit progressed and their comfort in managing complex situations.	Virtually co-precepting by a psychologist and family physician was perceived by R as valuable experiences.	N/A
2020	Lau et al.	N/A	R led history-taking and patient exams.	1 P paired with 1 R per week. Dyads discussed impressions and recommendations with patients present. Counselling took place in tandem.	Several P remarked that they could witness R taking a complete history more readily.	P evaluated interview efficiency and communication skills (e.g., responsive listening).
2020	Lowe et al.	N/A	N/A	N/A	Explored ways to enhance registrar's confidence	Trainee confidence in handling tele-

					(e.g., supervision with triaging referrals, give diagnostic/management advice)	dermatology referrals extremely low (58%), 27% unsure about their clinical skills.
					Registrars opened to training in increased frequency	Staff availability for teaching cited as obstacle (38%).
					Trainee involvement increased by shadowing, review consults with attending)	
2020	Lum et al.	N/A	N/A	Trainees should first observe well-conducted TH consults, then perform them supervised. P should observe R do 10 consecutive consultations. 2 or more attendings should complete summative evaluations per trainee.	N/A	Entrustment estimated to occur at end of PGY-1. Proposed observation tool in TH consultations. Items rated with 3-point Likert scale and a "Not applicable" option. Categories based on the stages of a TH consult.
2020	Mallon et al.	N/A	49 programs (98%) did not use TH in the pre-COVID-19. During COVID-19, fellows from 39 programs (76%) used TH.	14 programs (27%) indicated P present by video during entire visit. 12 programs (25%) reported attending did not staff TH encounter. PDs reported varied TH training approaches: • Fellow and attending completes TH visit on same computer (18%). • Fellow and attending on separate	"Isolating fellows and attendings from each other" reported as a "critical" change to fellowship programs during COVID-19. PDs interested in learning how fellows were supervised in TH encounters.	N/A

				computers, but participated entire video visit (18%).		
				• Attending joined video call midway (47%). • Before visit ended, fellow contacted attending (20%). • Fellow debriefed with attending after TH visit ended (24%).		
2020	Stephenson et al.	R assigned an exam room for doing virtual appointments or worked at home.	N/A	R instructed to use speakerphone and P observed virtual visits via a remote camera system. P could also join video visits.	Feedback on virtual visits paralleled feedback given after observing in-person visits.	ACGME competencies and milestones can be assessed (i.e., patient care, knowledge, professionalism, communication skills).
2020	Suarez-Cedeno et al.	EMR-embedded Polycom RealPresence Web Suite or ZOOM platforms for video visits, or converts to phone visit if no video connection	130 visits (28 new patient) seen over 22 clinic days by a fellow. Fellow's role in TH workflow: Connected with patient, completed patient evaluation and initial counseling, paused virtual visit to privately review case with attending, ended virtual visit under supervision and prepared summary of patient	P might have joined fellow's evaluation to observe the exam but stayed muted. Fellow reviewed case with their P via phone. 1 P was able to virtually supervise up to 3 fellows Lack of tone, sensory, and balance testing were limits to a teleneurology evaluation so more guidance was needed with new patient evaluations (e.g., second opinion on diagnosis).	Attendings had more time to pick up subtle findings as a silent spectator – a role that is difficult to achieve with in-person encounters. Overall rate of fellow's satisfaction with telestaffing was 69.	N/A

2021	Pritchard et al.	Virtual outpatient setting	instructions using EMR system. Since March 2020, 5 of 23 residents (22%) involved in TH visits	Pre-clinic staffing model adjusted to virtually review cases in advance.	Educational value of virtual outpatient visits rated as "very useful" by 2R, and "extremely useful", "slightly useful" and "moderately useful" by 1R each. R were receptive to pre-staffing method	N/A
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ACGME = Accreditation Council for Graduate Medical Education, COVID-19 = Coronavirus Disease 2019, P = preceptors, R = residents, ED = emergency department, EM = Emergency Medicine, EMR = electronic medical record, PD = program director, PGY = post-graduate year, TH = telehealth, VA = Veteran Affairs,

Table S4*Accreditation Standards and Requirements for Clinical Teachers of Canadian Family Medicine Training Programs*

Domain	Standard	Element	Requirement	Indicators
Education program	Residents are prepared for independent practice.	Teachers facilitate residents' attainment of competencies and/or objectives.	Resident learning needs, stage or level of training, and other relevant factors are used to guide all teaching, supporting resident attainment of competencies and/or objectives.	Teachers use experience-specific competencies and/or objectives to guide educational interactions with residents. Teachers align their teaching appropriately with residents' stage or level of training and individual learning needs and objectives. Teachers contribute to the promotion and maintenance of a positive learning environment. An identified teacher works longitudinally with the resident to assist them in reflecting on progress toward achieving competence for independent practice as described in the competency-coach definition in the FTA Framework.
		There is an effective, organized system of resident assessment.	The residency program has a planned, defined, and implemented system of assessment.	Teachers are aware of the expectations for resident performance based on level or stage of training and use these expectations in their assessments of residents.
Resources	The delivery and administration of the residency program are supported by appropriate resources.	The residency program has the appropriate human resources to provide all residents with the required educational experiences.	Teachers appropriately implement the residency curriculum, supervise and assess trainees, contribute to the program, and role model effective practice.	The number, credentials, competencies, and scope of practice of the teachers are adequate to provide the breadth and depth of the discipline, including required clinical teaching, academic teaching, assessment, and feedback to residents. The number, credentials, competencies, and scope of practice of the teachers are sufficient to supervise residents in all clinical environments, including when residents are on-call and when providing care to patients, as part of the residency program, outside of a learning site.
Learners, teachers, and administrative personnel	Safety and wellness are promoted throughout the learning environment.	The safety and wellness of patients and residents are actively promoted.	Residents are appropriately supervised.	Residents and teachers at all learning sites follow central policies and any program-specific policies regarding the supervision of residents, including ensuring the physical presence of the appropriate supervisor, when mandated, during acts or procedures performed by the resident, and

			ensuring supervision is appropriate for the level or stage of training.
			Teachers are available for consultation for decisions related to patient care in a timely manner.
			Teachers follow the policies and processes for disclosure of resident involvement in patient care and for patient consent for such participation.
Teachers deliver and support all aspects of the residency program effectively.	Teachers are assessed, recognized, and supported in their development as positive role models for residents in the residency program.	Teachers are regularly assessed and supported in their development. Teachers in the residency program are effective role models for residents.	Faculty development for teaching that is relevant and accessible to the program is offered on a regular basis. Teachers exercise the dual responsibility of providing quality, ethical patient care and excellent supervision and teaching. The residency program promotes and supports resiliency and well-being for their teachers.

Source:

CFPC. Standards of Accreditation for Residency Programs in Family Medicine. Mississauga, ON: CFPC; 2020.

Table S5*Virtual Care Competencies and Core Activities for Canadian Family Medicine Training Programs*

Defined Competence	Framework	Role/Area	Competencies/Core Professional Activities (CPA)
Core competence	CanMEDS-FM (COVID-19 version) ¹	Communicator	List the advantages, disadvantages, and risks of engaging with patients using virtual care Describe practice adaptations (i.e., skills, equipment, procedures) required to provide virtual care Consider what factors identified in a virtual encounter would mandate an in-person visit
		Professional	Use appropriate billing codes for virtual encounters Engage in indirect patient care and can contribute remotely (from home if necessary) if unable to participate in direct care of patients
		Health advocate	Advocate for the ongoing care of your patients through eConsult, virtual consult with specialists or other means to ensure other health care needs are met during this time
		Expert	Demonstrate enhanced clinical reasoning and diagnosis and treatment in situations with no physical examination (e.g., virtual care) Provide care in contexts with limited resources and physical distancing: • triage patients who can be cared for virtually vs in person • creatively seek ways to provide care (avoiding unnecessary visits) • proactively plan for patients to follow up in person
		Collaborator	Use virtual systems (e.g. telemedicine) to support social distancing and minimize community spread of the virus List limitations of virtual care, including security risks, risks to confidentiality, and when virtual care is not appropriate
		Scholar	Participate actively in online teaching, video calls and teleconferences, teaching during the pandemic

	Residency Training Profile for Family Medicine ²	Primary care in the community/office setting	CPA #1: Provide first-contact access and relational continuity of care as part of an overall system of care to the practice • Provide virtual care to enhance first-contact access and relational continuity for patients • Plan access and outreach for patients who are unable to attend the office
		Emergency care	CPA #22: Manage all patients presenting with emergent and urgent conditions in the office, home, and other community settings • Recognize and triage urgent patient situations via virtual care and determine the course of action with patients and other care providers
		Home and long-term care	CPA #24: Provide primary care for patients with complex medical needs in their homes, long-term care facilities, and other community-based settings • Respond to unplanned and urgent care needs, which often requires virtual assessment and management
Community-adaptive competence	Residency Training Profile for programs leading to Certificates of Added Competence ²	Category 1 Enhanced Skills programs for Palliative Care (PC)	PC CPA #3: Manage palliative care in the home (whatever patients deem home to be) • Provide virtual care as part of care support (this varies by region but is a likely reality of the future) PC CPA #5: Provide consultation and peer support • Provide virtual care consultations including e-consults, telephone, video, etc.
	Assessment Objectives for Certification in Family Medicine ³	Priority topics for rural and remote family medicine: Acute cardiac presentations	For a patient presenting with symptoms indicative of a myocardial infarction, assess the need for telephone consultation versus immediate or delayed transfer • Skill assessed: clinical reasoning • Clinical encounter phases to assess: treatment, referral

Sources:

¹ Woollorton, E., Seale, E., Lewis, D., Noel, K., Liddy, C., Viner, G., Shoppoff, L., & Archibald, D. (2020). Rapid, collaborative generation and review of COVID-19 pandemic-specific competencies for family medicine residency training. *Canadian Medical Education Journal*, 11(5), e50-e55.

² Fowler N and Wyman R (2021) Residency Training Profile for Family Medicine and Enhanced Skills Programs Leading to Certificates of Added Competence. Mississauga, ON: CFPC.

³ Crichton T, Schultz K, Lawrence K, et al. (2020) Assessment Objectives for Certification in Family Medicine. Mississauga, ON: CFPC.

Appendix B: Survey Questionnaire

Please indicate on a scale of 0 to 100

1. When you are precepting family medical residents in your clinical practice, what portion of family medicine residents have prior experience in virtual care? ☐ not sure
2. Over the past 12 months, what portion of virtual care visits have been seen with/by a family medicine resident?
Note: All responses must add up to 100%
 - a. Of those, what portion was you observing the family medicine resident facilitate virtual visits?
 - b. Of those, what portion was the family medicine resident observing you facilitate virtual visits?
 - c. Of those, what portion of the virtual visit were completed by you and a family medicine resident?
 - d. Of those, what portion was the visit attended by a family medicine resident only and preceptor was consulted when necessary?

N.B. If response to Question 2 is 'none', questions 2(a) to 2(d) will be skipped.

Please select one

3. To what extent do you trust that family medicine residents can do the following tasks independently during a virtual visit:

Scale

- 1 — “I had to do”—i.e., Requires complete hands on guidance, did not do, or was not given the opportunity to do
- 2—“I had to talk them through”—i.e., Able to perform tasks but requires constant direction
- 3—“I had to prompt them from time to time”—i.e., Demonstrates some independence, but requires intermittent direction
- 4—“I needed to be in the room just in case”—i.e., Independence but unaware of risks and still requires supervision for safe practice
- 5—“I did not need to be there”—i.e., Complete independence, understands risks and performs safely, practice ready

a. Obtain patient consent	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
b. Complete medical history	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
c. Relay information about possible diagnosis(es)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
d. Communicate next steps about a treatment plan	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
e. Arrange for appropriate follow-up	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
f. Triage the need for in-person medical visit	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
g. Provide patient education or support	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ N/A
4. How often do you meet with family medicine resident prior to the start of a virtual clinic?			☐ Never	☐ Rarely	☐ Often	☐ Always
5. Are there resources on virtual care that you provide to family medicine residents?			☐ Yes	☐ No		

- a. If yes, what resources do you recommend to family medicine residents:

- ☐ Online documents
☐ Video demonstrations
☐ Clinic/Site champions
☐ Virtual care tool support

6. What faculty development (or continuing professional development) resources have helped you prepare family medicine residents for virtual care tasks?

Please select one

7. To what extent does virtual environments impact your overall ability to:

- | | | | | | |
|--|---|--|-------------------------------------|--|---|
| a. Supervise family medicine residents during a patient encounter | ☐
Negatively impact | ☐
Some degree negative | ☐
Neutral | ☐
Some degree positive | ☐
Positively impact |
| b. Teach family medicine residents after a patient encounter | ☐
Negatively impact | ☐
Some degree negative | ☐
Neutral | ☐
Some degree positive | ☐
Positively impact |
| c. Coach family medicine residents to improve their clinical skills | ☐
Negatively impact | ☐
Some degree negative | ☐
Neutral | ☐
Some degree positive | ☐
Positively impact |
| d. Develop a plan for family medicine residents' involvement in virtual care | ☐
Negatively impact | ☐
Some degree negative | ☐
Neutral | ☐
Some degree positive | ☐
Positively impact |

8. How often do you document family medicine residents' involvement in virtual care on assessment forms?	☐ Never	☐ Rarely	☐ Often	☐ Always
9. To what extent can you assess family medicine residents' ability to demonstrate the following CanMEDS-FM roles in virtual healthcare settings:				
a. Professional	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely
b. Scholar	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely
c. Health advocate	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely
d. Leader	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely
e. Collaborator	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely
f. Communicator	☐ Not possible	☐ To some extent	☐ To most extent	☐ Completely

Demographics

10. Please indicate your academic department at the University of Ottawa:

- ☐ Anesthesiology
- ☐ Radiology
- ☐ Emergency Medicine
- ☐ Family Medicine
- ☐ Medicine
- ☐ Obstetrics and Gynecology
- ☐ Surgery
- ☐ Ophthalmology
- ☐ Otolaryngology
- ☐ Pathology and Laboratory Medicine
- ☐ Pediatrics
- ☐ Psychiatry

11. How many year(s) have you been in clinical practice?

_____ years

12. How many year(s) have you been a clinical preceptor for the University of Ottawa?

_____ years

13. How many year(s) have your practice been offering virtual healthcare services to patients?

_____ years

a. How frequent does your practice provide virtual care?

- ☐ Daily
- ☐ Weekly
- ☐ Bi-weekly
- ☐ Monthly
- ☐ At home
- ☐ Clinic office
- ☐ Academic/Research office
- ☐ Other: _____

b. Where do you currently practice virtual care? (please check all that apply)

Contact Information

14. Will you be interested in completing a 30-minute follow-up interview with our research team? ☐ Yes ☐ No

15. Will you be interested in receiving a summary of the study findings? ☐ Yes ☐ No

16. First name of participant

Last name of participant

17. Preferred email contact

(if 'yes' is indicated for Questions 15 and/or 16)

Appendix C: Interview Guide

Interview Information

- Date of interview: _____
- Start time: _____
- Finish time: _____
- Informant identifier number _____
- Interviewer: _____
- Transcript file name: _____

[interviewer starts audio recording]

Introduction

Thank you for taking the time to complete this interview with me today. My name is Rachelle Lee-Krueger, the researcher who will be interviewing you today.

Purpose and Goals

The purpose of this study is to examine in what ways preceptors interact with family medicine residents and what different preceptor roles occur with them in virtual healthcare settings.

Today, I hope to have an open discussion with you to learn about some of things that you experience within the current medical education system, specifically on clinical preceptorships in virtual healthcare settings. Our conversation will last for approximately 30 minutes.

I will now ask if you have read the consent form provided to your email [pause to wait for answer]. Do you have any questions about the consent form provided? [pause to wait for answer]. At this point, you may feel free to accept the terms under the last section titled ‘Participant Statement of Consent’ to proceed or decline. Do you provide your verbal consent to be a participant for this study? [pause to wait for answer; if the participant responds “No”, the interview will not proceed and recording ends here]

Interview Guidelines:

Before we start, I hope that we can agree on some guidelines for this discussion. It is my responsibility to ensure that the interview ends on time, so I will try to keep our conversation focused on the specific topics that are the purpose of the interview. Many other interesting topics will come up and we will get to talk about some of them. However, we may not be able to talk about all topics so we can finish the interview within the allotted time.

Please know that I will not share any private information that is discussed here with others. I also want to emphasize that participation is voluntary, and you can choose to terminate at any point. There is no penalty if you decide that you no longer want to participate, and you do not have to explain your reason for withdrawing from the study. Our team will anonymize the transcribed recording for today’s interview, which will then be analyzed to understand what is common across the interviews as well as what are the differences. Your name will never be used or discussed. Do you have questions about what you are being asked to do today? [pause to wait for any questions]

GENERAL INTERVIEW STRATEGY

- Ask open-ended questions to draw out more details as the interview unfolds.
- Follow the sequence of events as presented by the participant.
- I may refer to items from the question menu below, if is not mentioned earlier in the interview.

Interview questions

- To begin, can I confirm that you have been engaged as a clinical preceptor for family medicine residents? In which clinical specialty do you provide virtual care services for?
- Can you briefly describe when you began practicing virtual care and the context in which you provide these services?
- Please briefly describe your perceptions to precepting family medicine residents in virtual healthcare settings.
- Please describe your role as a clinical preceptor before engaging family medicine residents into the virtual care workflow.
- In what ways do you interact with family medicine residents during the virtual care workflow (both with patients present and not present)?
- In what ways can you assess family medicine residents' ability to demonstrate [a specific CanMEDS-FM role] (i.e., professional, scholar, health advocate, leader, collaborator, communicator) in virtual healthcare settings?
- In what ways can you provide family medicine residents with feedback about their performance in virtual work settings?
- How does the virtual work environment impact your ability to coach family medicine residents for improved clinical skills?
- What are your general impressions to the learning experiences of residents in virtual healthcare settings?

Appendix D: Certificate for Research Ethics



CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	S-03-21-6707
Titre du projet / Project Title	Clinical Preceptorship in Virtual Healthcare Settings
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Renouvelé / Renewed
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	20/04/2021
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	19/04/2023

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Rachelle LEE-KRUEGER	Faculté d'éducation / Faculty of Education	Chercheur Principal / Principal Investigator
Douglas ARCHIBALD	Département de médecine familiale / Department of Family Medicine	Superviseur / Supervisor
Katherine MOREAU	Faculté d'éducation / Faculty of Education	Co-superviseur / Co-supervisor

Conditions spéciales ou commentaires / Special conditions or comments



Notice of ethics approval
Hôpital Montfort Research Ethics Board (HM-REB)

May 17, 2021

Principal investigator:

Rachelle Lee-Krueger
Faculty of Education
University of Ottawa
[REDACTED]

Supervisor

Douglas Archibald
Faculty of Education, University of Ottawa
[REDACTED]

Co-supervisor

Moreau Katherine
Faculty of Education, University of Ottawa
[REDACTED]

Project title: « Clinical Preceptorship in Virtual Healthcare Settings _ Phase II »

File number: 21-22-04-001

Start date: May 17, 2021

End date: May 16, 2022

In accordance with the latest edition of Tri-Council Policy Statement - Ethical Conduct for Research Involving Humans Subjects (TCPS 2), I confirm that the Hôpital Montfort Research Ethics Board (REB) has evaluated and **approved the Phase II of the research project** and the following documents for the start and end dates mentioned above:

- REB application approved by the University of Ottawa, version submitted on April 21, 2021
- Invitation Letter for Study Phase II (EN), version submitted on April 9, 2021
- **Appendix 1** : Survey for Phase II (EN), version submitted on April 9, 2021
- **Appendix 3** : Consent form Phase II (EN & FR), version dated April 29, 2021

The Hôpital Montfort REB is established and operates in compliance with the Clinical Practice Guidelines: Consolidated Guidelines of the International Council for the Harmonization of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH-GCP E6), Part C, Title 5 of the Food and Drug Regulations, and The applicable regulations, Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations, the "Code of Federal Regulations" of the United States, the Ontario Personal Health Information Protection Act, 2004, and the laws and regulations applicable in Ontario. Montfort's REB is registered with the U.S. Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).

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The protocol of the study cannot be amended without prior approval of the REB unless there is an immediate safety issue for the participants. You must notify the REB immediately of any changes, adverse event or new information that may increase the risk of the study, changing the course of the study or reach the safety of participants. The changes to the project and recruitment tools must be submitted to the REB.

Please send us **four weeks before the due date of the notice of approval**, a final report to close the file or to request the renewal of the certificate of ethical approval for the study.

If you have any questions, please do not hesitate to contact the Research Ethics Office by phone at [REDACTED] extension [REDACTED] or e-mail at [REDACTED]



Richard Carpentier, Ph. D.
Chair of the Research Ethics Board — Hôpital Montfort



Affilié à l'Université d'Ottawa | Affiliated with the University of Ottawa

**Notice of ethics approval
Hôpital Montfort Research Ethics Board (HM-REB)**

June 11, 2021

Principal investigator:

Rachelle Lee-Krueger
Faculty of Education
University of Ottawa
[REDACTED]

Supervisor

Douglas Archibald
Faculty of Education, University of Ottawa
[REDACTED]

Co-supervisor

Moreau Katherine
Faculty of Education, University of Ottawa
[REDACTED]

Project title: « Clinical Preceptorship in Virtual Healthcare Settings _ Phase III »

File number: 21-22-04-001

Start date: June 11, 2021

End date: June 10, 2022

In accordance with the latest edition of Tri-Council Policy Statement - Ethical Conduct for Research Involving Humans Subjects (TCPS 2), I confirm that the Hôpital Montfort Research Ethics Board (REB) has evaluated and **approved the Phase II of the research project** and the following documents for the start and end dates mentioned above:

- **Appendix 2:** Interview Guide for Phase III (EN), version submitted on June 4, 2021
- **Appendix 4 :** Invitation letter and consent form Phase III (EN & FR), version dated on June 4, 2021

The Hôpital Montfort REB is established and operates in compliance with the Clinical Practice Guidelines: Consolidated Guidelines of the International Council for the Harmonization of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH-GCP E6), Part C, Title 5 of the Food and Drug Regulations, and The applicable regulations, Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations, the "Code of Federal Regulations" of the United States, the Ontario Personal Health Information Protection Act, 2004, and the laws and regulations applicable in Ontario. Montfort's REB is registered with the U.S. Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).

The protocol of the study cannot be amended without prior approval of the REB unless there is an immediate safety issue for the participants. You must notify the REB immediately of any changes, adverse event or new information that



Page 2 sur 2

may increase the risk of the study, changing the course of the study or reach the safety of participants. The changes to the project and recruitment tools must be submitted to the REB.

Please send us **four weeks before the due date of the notice of approval**, a final report to close the file or to request the renewal of the certificate of ethical approval for the study.

If you have any questions, please do not hesitate to contact the Research Ethics Office by phone at [REDACTED] extension [REDACTED] or e-mail at [REDACTED]


Richard Carpentier, Ph. D.
Chair of the Research Ethics Board — Hôpital Montfort



Western University

Date: December 21, 2021

To: Rachelle Lee-Krueger, D. Archibald, and K. Moreau, University of Ottawa

Study Title: Clinical Preceptorship in Virtual Healthcare Settings

Review Type: Administrative Review

Dear Ms. Lee-Krueger and team,

The Office of Human Research Ethics, on behalf of Western University's Research Ethics Boards, has conducted an administrative review of the University of Ottawa approved study documents, and has determined that this research recruitment can be conducted at Western University as outlined in the following documents:

Appendices combined.pdf, Received December 20th, 2021

revisionApprovedStudy-Rachelle-Lee-Krueger-RED-6707.pdf, Received December 20th, 2021

approvalLetter20-04-2021, Received December 20th, 2021

The following recommendations have been noted and addressed to ensure that this research meets the standards deemed acceptable by Western University's REBs:

- No collection of participant identifiers in the same data collection form/online survey as other study data.

Additionally, please note that language referencing any REB approval would not be supported locally and our recommendation would be that it is removed.

Please note that Western University's REBs are not approving this research, as a local Principal Investigator is not directly involved in this research. As such there is no local oversight on the conduct of this research. Ms. Lee-Krueger and the University of Ottawa's REB remain responsible for overseeing the conduct of this study. Nonetheless, Western's REBs acknowledge that this research is taking place and that there are no major objections to the manner in which it will be conducted as described in the study documents listed above.

Please note that there should be no references to Western University's REBs in your communications with participants (including, but not limited to, the consent form) as the REBs do not provide oversight for this project.

If, during the course of this study, there are changes to the project or new information comes to light, which would affect the determination stipulated above, these should be brought to the immediate attention of the Office of Human Research Ethics for re-assessment.

If Western's Office of Human Research Ethics is contacted to confirm Western's REBs' position on this external study, we will confirm that it has been reviewed and acknowledged.

Best wishes for the successful completion of your project.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer

The Office of Human Research Ethics, on behalf of Western University's Research Ethics Boards



**UNIVERSITY OF
SASKATCHEWAN**

**Research Ethics Board (REB)
Letter of Acknowledgement**

Name of Institution conducting Primary Research Ethics Board Review: University of Ottawa	Name of Researcher's Home Institution: University of Ottawa
University of Ottawa REB File #: S-03-21-6707	University of Saskatchewan REB File #: Beh ID 3151
Title of Research Project: Clinical Preceptorship in Virtual Healthcare Settings	
Sponsor or Funding Agency: NA	
Name of Principal Investigator(s): Douglas Archibald and Katherine Moreau	Name of Local University of Saskatchewan Investigator: NA

This letter serves as acknowledgement that the University of Saskatchewan is in receipt of the above named research project application and associated Certificate of Ethics Approval from the University of Ottawa REB.

The University of Saskatchewan REB has issued a Letter of Acknowledgement in lieu of a Certificate of Approval. All post-approval research activities including continuing ethics review or the review of amendments to the project will be conducted by University of Ottawa REB. It should be noted that you are also responsible for bringing any project specific deviations, unanticipated problems, or new project information related to the research project to the attention of the University of Ottawa REB.

When the research project completion report is filed with the University of Ottawa REB, please also provide a copy to the University of Saskatchewan Research Ethics Office [REDACTED].

The University of Saskatchewan will retain this Letter of Acknowledgement and would ask that you provide a copy to the University of Ottawa REB.

This agreement is limited to and applicable only to the above named research project.

Digitally Approved by Diane Martz, Chair
Behavioural Research Ethics Board
University of Saskatchewan

Date: 3 February 2022



**Health Sciences Research Ethics Board
Letter of Acknowledgement**

December 17, 2021

Rachelle Lee-Kreuger
External\External (Canada)

Dear Rachelle,

File #: 2021-5949
Project Title: Clinical Preceptorship in Virtual Healthcare Settings

On behalf of the Health Sciences Research Ethics Board, I am writing to acknowledge receipt of your approved research ethics submission and the associated REB approval letter. Dalhousie University has authorized me to recognize the University of Ottawa Faculty of Education REB as the board of record for this research involving humans on the condition that this research complies with Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans and that this research will be undertaken under the oversight of the University of Ottawa Faculty of Education REB.

If at any point the scope of this research involving humans is not overseen by the board of record named above, you must immediately advise the Dalhousie University research ethics board. In such instances, an application to the Dalhousie REB will be required and no research involving humans may be undertaken without active REB approval from the board of record or the Dalhousie University research ethics board.

For the duration of the research project involving humans, you are expected to comply with the oversight requirements of the board of record, including documenting changes, reporting incidents or adverse events and annual/final reporting responsibilities. Additional ethical review by the Dalhousie University REB is therefore not required.

Sincerely,

A blacked-out redacted signature.

Dr. Lori Weeks
Chair, Health Sciences Research Ethics Board

Appendix E: Consent Forms for Study Phase II

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Invitation Letter for Study Phase II

Name of Study Investigator:

Rachelle Lee-Krueger, PhD(c)
Faculty of Education, University of Ottawa
Email:
Telephone: 613-562-6262

Name of Supervisors:

Douglas Archibald, PhD
Associate Professor
University of Ottawa
Faculties of Education, Medicine
DArchibald@bruyere.org
613-562-6262 (ext. 2914)

Katherine Moreau, PhD
Associate Professor
University of Ottawa
Faculty of Education
Katherine.Moreau@uottawa.ca
613-562-5800 (ext. 2808)

Invitation to Participate: I am invited to participate in the research study entitled “Clinical Preceptorship in Virtual Healthcare Settings” conducted by Rachelle Lee-Krueger. Research ethics for conducting this study is granted by the University of Ottawa [S-03-21-6707]. This project is conducted as part of Mrs. Lee-Krueger’s PhD Thesis, under the co-supervision of Professors Archibald and Moreau.

Purpose of the Study: I understand that the purpose of the study is to examine in what ways preceptors interact with family medicine residents and what different preceptor roles occur with them in virtual healthcare settings.

Participation: My participation will consist essentially of one 5-minute online survey administered via an anonymized link with Qualtrics®. I will also be provided the option to grant consent to be contacted for participating in one follow-up telephone interview session.

Risks: I understand that since my participation in this study will entail that I respond to questions about precepting as a clinical educator; however, there are no identifiable risks to sharing personal experiences and insights.

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Benefits: My participation in this study will provide information to a research team doing medical education research at the University of Ottawa and will not have direct benefits for myself. However, I acknowledge the sharing of my experiences may improve educational practices of other clinical educators, as well as the training experiences of future medical residents, in virtual healthcare settings.

Confidentiality and Anonymity: I have received assurance from the study investigator that the information I share will remain strictly confidential. I am aware that my IP address or location information will not be collected or stored on data servers. I am aware that identifiers will be removed from the reporting of research findings and analyses will only be performed with de-identified data.

Conservation of data: The study investigator will have access to the original Qualtrics® dataset that includes participant's name and email. De-identified survey response will be separately kept in a secure manner on a password-protected external hard drive with restricted access for the research team. No hard copies of research documents will be produced for this study. The data retention period for this study will be five years upon the publication of research findings.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I may withdraw from the study at any time and/or refuse to answer any questions. If I choose to withdraw from the survey, all survey data gathered until the time of withdrawal will be destroyed.

Acceptance: I, _____, agree to participate in the above research study conducted by Rachelle Lee-Krueger (PhD Candidate of the Faculty of Education), which research is under the supervision of Professors Archibald and Moreau. I agree to have the survey data used for this study. I agree to provide my email address to be contacted for

- a 30-minute telephone interview
- the sharing of study results

If I have any questions about the study, I may contact the study investigator or her supervisors at the numbers mentioned above.

If I have any ethical concerns regarding my participation in this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, (613) 562-5387 or

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ethics@uottawa.ca, or the Hôpital Montfort Research Ethics Board,
745-A Montreal Road, Ontario by telephone at 613-746-4621, extension
2221, or by email at ethique@montfort.on.ca.

Participants are encouraged to print or save a copy of this consent form
for their personal records.

Lettre d'invitation à la phase II de l'étude

Chercheuse responsable de l'étude :

Rachelle Lee-Krueger, candidate au doctorat
Faculté d'éducation, Université d'Ottawa
Courriel :
Téléphone : 613 562-6262

Directeurs de recherche :

Douglas Archibald, Ph. D
Professeur agrégé
Université d'Ottawa
Faculté d'éducation et
Faculté de médecine
DArchibald@bruyere.org
613 562-6262 (poste 2914)

Katherine Moreau, Ph. D
Professeure agrégée
Université d'Ottawa
Faculté d'éducation
Katherine.Moreau@uottawa.ca
613 562-5800 (poste 2808)

Invitation à participer : Je suis invité/invitée à participer à l'étude de recherche intitulée *Clinical Preceptorship in Virtual Healthcare Settings* (préceptorat clinique dans les environnements de soins de santé virtuels) menée par Rachelle Lee-Krueger. L'éthique de la recherche pour la réalisation de cette étude est accordée par l'Université d'Ottawa [S-03-21-6707]. Ce projet est mené dans le cadre de la thèse de doctorat de Mme Lee-Krueger, sous la codirection des professeurs Douglas Archibald et Katherine Moreau.

But de l'étude : Je comprends que le but de l'étude est d'examiner de quelles manières les précepteurs interagissent avec les résidents en médecine familiale et quels sont les différents rôles des précepteurs dans les environnements de soins de santé virtuels.

Participation : Ma participation consistera essentiellement à répondre à un sondage en ligne de 5 minutes administré via Qualtrics® grâce à un lien anonymisé. Je pourrai également consentir ou non à ce qu'on communique avec moi pour participer à une entrevue téléphonique de suivi.

Risques : Je comprends que ma participation à l'étude m'amènera à répondre à des questions sur le préceptorat en tant que formateur/formatrice clinique et que je ne serai exposé/exposée à

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aucun risque identifiable du fait de partager mes expériences et mes points de vue.

Bénéfices : Ma participation à cette étude permettra de fournir de l'information à une équipe de recherche sur l'éducation médicale à l'Université d'Ottawa et ne m'apportera aucun bénéfice direct. Cependant, je reconnais que le partage de mes expériences peut améliorer les pratiques éducatives d'autres formateurs cliniques, ainsi que les expériences de formation des futurs résidents en médecine, dans des environnements de soins de santé virtuels.

Confidentialité et anonymat : J'ai reçu l'assurance de la chercheuse responsable de l'étude que les renseignements que je partage resteront strictement confidentiels. Je reconnais que mon adresse IP ou tout renseignement au sujet de mon emplacement ne sera pas recueilli ou emmagasiné sur les serveurs de données. J'ai connaissance du fait que les identifiants seront supprimés des rapports sur les résultats de la recherche et que les analyses ne seront effectuées qu'avec des données anonymisées.

Conservation des données : La chercheuse responsable aura accès à l'ensemble initial de données Qualtrics® qui comprend le nom et l'adresse courriel des participants. Les réponses anonymisées du sondage seront conservées séparément de manière sécurisée sur un disque dur externe protégé par un mot de passe et dont l'accès sera limité à l'équipe de recherche. Aucune copie papier des documents de recherche ne sera produite pour cette étude. La période de conservation des données pour l'étude sera de cinq ans après la publication des résultats de la recherche.

Participation volontaire : Je n'ai aucune obligation de participer à l'étude. Si je décide d'y participer, je peux refuser de répondre à toute question ou me retirer de l'étude à tout moment. Si je choisis de me retirer de l'étude, toutes les données du sondage recueillies jusqu'au moment de mon retrait seront détruites.

Acceptation : Je, _____, accepte de participer à l'étude de recherche ci-dessus menée par Rachelle Lee-Krueger (candidate au doctorat de la Faculté d'éducation), sous la supervision des professeurs Douglas Archibald et Katherine Moreau. J'accepte que les données du sondage soient utilisées aux fins de

l'étude. J'accepte également de fournir mon adresse courriel pour qu'on puisse communiquer avec moi pour :

- une entrevue téléphonique de 30 minutes
- le partage des résultats de l'étude

Si j'ai des questions au sujet de l'étude, je peux communiquer avec la chercheuse responsable de l'étude ou ses directeurs de recherche aux coordonnées dont il est fait mention ci-dessus.

Si j'ai des préoccupations d'ordre éthique concernant ma participation à l'étude, je peux communiquer avec le ou la responsable d'éthique en recherche de l'Université d'Ottawa : 550 rue Cumberland, salle 154, Ottawa Ontario par téléphone au (613) 562-5387, ou par courriel à ethics@uottawa.ca, ou le Comité d'éthique de la recherche de l'Hôpital Montfort, 745-A chemin Montréal, Ontario par téléphone au 613-746-4621, poste 2221, ou par courriel à ethique@montfort.on.ca.

Les participants sont encouragés à imprimer ou à sauvegarder une copie de ce formulaire de consentement et à la conserver.

Appendix F: Consent Form for Study Phase III

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Invitation Letter for Study Phase III

Name of Study Investigator:

Rachelle Lee-Krueger, PhD(c)
Faculty of Education, University of Ottawa
Email:
Telephone: 613-562-6262

Name of Supervisors:

Douglas Archibald, PhD
Associate Professor
University of Ottawa
Faculties of Education, Medicine
DArchibald@bruyere.org
613-562-6262 (ext. 2914)

Katherine Moreau, PhD
Associate Professor
University of Ottawa
Faculty of Education
Katherine.Moreau@uottawa.ca
613-562-5800 (ext. 2808)

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Invitation to Participate: I am invited to participate in the research study entitled "Clinical Preceptorship in Virtual Healthcare Settings" conducted by Rachelle Lee-Krueger. Research ethics for conducting this study is granted by the University of Ottawa [S-03-21-6707]. This project is conducted as part of Mrs. Lee-Krueger's PhD Thesis, under the co-supervision of Professors Archibald and Moreau.

Purpose of the Study: I understand that the purpose of the study is to examine in what ways preceptors interact with family medicine residents and what different preceptor roles occur with them in virtual healthcare settings.

Participation: My participation will consist essentially of one follow-up telephone interview session of approximately 30 minutes during which I will be interviewed. The interview has been scheduled for a date and time that are convenient for me, which will be completed in the English language. Prior to the start of the interview, I will be asked to provide verbal consent for participation and recording of the conversation for research purposes. An electronic version of this consent form will also be provided to me at least one day before the interview time. All interviews will be audio-recorded and transcribed for research purposes.

Risks: I understand that since my participation in this study will entail that I respond to questions about precepting as a clinical educator, it may cause

me to feel that I am sharing personal reflections and insights. I have received assurance from the researcher that every effort will be made to respect these responses and personal reflections in the writing and reporting of the research.

Benefits: My participation in this study will provide information to a research team doing medical education research at the University of Ottawa and will not have direct benefits for myself. However, I acknowledge the sharing of my experiences may improve educational practices of other clinical educators, as well as the training experiences of future medical residents, in virtual healthcare settings.

Confidentiality and Anonymity: I have received assurance from the study investigator that the information I share will remain strictly confidential. I am aware that identifiers will be removed from the reporting of research findings and analyses will only be performed with de-identified data.

Conservation of data: De-identified audio recordings and transcripts will be kept in a secure manner on a password-protected external hard drive with restricted access for the research team. No hard copies of research documents will be produced for this study. The data retention period for this study will be five years upon the publication of research findings.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I may withdraw from the study at any time and/or refuse to answer any questions. If I choose to withdraw from the interview, all interview data gathered until the time of withdrawal will be destroyed.

Acceptance: I, _____, agree to participate in the above research study conducted by Rachelle Lee-Krueger (PhD Candidate of the Faculty of Education), which research is under the supervision of Professors Archibald and Moreau. I also agree to have the interview data used for the completion of this study.

If I have any questions about the study, I may contact the study investigator or her Supervisors at the numbers mentioned above.

If I have any ethical concerns regarding my participation in this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, (613) 562-5387 or ethics@uottawa.ca.

Please print or save a copy of this consent form for your personal records.

Lettre d'invitation à la phase III de l'étude

Chercheuse responsable de l'étude :

Rachelle Lee-Krueger, candidate au doctorat
Faculté d'éducation, Université d'Ottawa

Courriel :

Téléphone : 613 562-6262

Directeurs de recherche :

Douglas Archibald, Ph. D

Professeur agrégé

Université d'Ottawa

Faculté d'éducation et Faculté de
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DArchibald@bruyere.org

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Katherine Moreau, Ph. D

Professeure agrégée

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Katherine.Moreau@uottawa.ca

613 562-5800 (poste 2808)

Invitation à participer : Je suis invité/invitée à participer à l'étude de recherche intitulée *Clinical Preceptorship in Virtual Healthcare Settings* (préceptorat clinique dans les environnements de soins de santé virtuels) menée par Rachelle Lee-Krueger. L'éthique de la recherche pour la réalisation de cette étude est accordée par l'Université d'Ottawa [S-03-21-6707]. Ce projet est mené dans le cadre de la thèse de doctorat de Mme Lee-Krueger, sous la codirection des professeurs Douglas Archibald et Katherine Moreau.

But de l'étude : Je comprends que le but de l'étude est d'examiner de quelles manières les précepteurs interagissent avec les résidents en médecine familiale et quels sont les différents rôles des précepteurs dans les environnements de soins de santé virtuels.

Participation : Ma participation consistera essentiellement en une entrevue téléphonique de suivi d'environ 30 minutes au cours de laquelle je serai interviewé/interviewée. L'entrevue a été fixée à une date et à une heure qui me conviennent, et se déroulera en anglais. Avant le début de l'entrevue, on me demandera de fournir mon consentement verbal à y participer et à ce que la conversation soit enregistrée aux fins de la recherche. Une version électronique de ce formulaire de consentement me sera également fournie au moins un jour avant le début de l'entrevue. Toutes les entrevues seront enregistrées et transcrites aux fins de la recherche.

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Risques : Je comprends que, comme ma participation à l'étude m'amènera à répondre à des questions sur le préceptorat en tant que formateur/formatrice clinique, je pourrais avoir le sentiment de partager des réflexions et des idées personnelles. J'ai reçu l'assurance de la chercheuse responsable de l'étude que tout sera mis en œuvre pour respecter mes réponses et mes réflexions personnelles dans la rédaction et le rapport de la recherche.

Bénéfices : Ma participation à cette étude permettra de fournir de l'information à une équipe de recherche sur l'éducation médicale à l'Université d'Ottawa et ne m'apportera aucun bénéfice direct. Cependant, je reconnais que le partage de mes expériences peut améliorer les pratiques éducatives d'autres formateurs cliniques, ainsi que les expériences de formation des futurs résidents en médecine, dans des environnements de soins de santé virtuels.

Confidentialité et anonymat : J'ai reçu l'assurance de la chercheuse responsable de l'étude que les renseignements que je partage resteront strictement confidentiels. J'ai connaissance du fait que les identifiants seront supprimés des rapports sur les résultats de la recherche et que les analyses ne seront effectuées qu'avec des données anonymisées.

Conservation des données : Les enregistrements audio et les transcriptions anonymisés seront conservés de manière sécurisée sur un disque dur externe protégé par un mot de passe et dont l'accès sera limité à l'équipe de recherche. Aucune copie papier des documents de recherche ne sera produite pour cette étude. La période de conservation des données pour l'étude sera de cinq ans après la publication des résultats de la recherche.

Participation volontaire : Je n'ai aucune obligation de participer à l'étude. Si je décide d'y participer, je peux refuser de répondre à toute question ou me retirer de l'étude à tout moment. Si je choisis de me retirer de l'entrevue, toutes les données de l'entrevue recueillies jusqu'au moment de mon retrait seront détruites.

Acceptation : Je, _____, accepte de participer à l'étude de recherche ci-dessus menée par Rachelle Lee-Krueger (candidate au doctorat de la Faculté d'éducation), sous la supervision des professeurs Douglas Archibald et Katherine Moreau. J'accepte également que les données de l'entrevue soient utilisées pour la réalisation de cette étude.

Si j'ai des questions au sujet de l'étude, je peux communiquer avec la chercheuse responsable de l'étude ou ses directeurs de recherche aux coordonnées dont il est fait mention ci-dessus.

Si j'ai des préoccupations d'ordre éthique concernant ma participation à l'étude, je peux communiquer avec le ou la responsable d'éthique en recherche de l'Université d'Ottawa : 550 rue Cumberland, salle 154, (613) 562-5387 ou ethics@uottawa.ca.

Les participants sont encouragés à imprimer ou à sauvegarder une copie de ce formulaire de consentement et à la conserver.