

## SCIENTIFIC REPORTS

# Implementation of virtual primary care: a comparative study of family medicine residents' experiences

Udoka Okpalauwaekwe,<sup>1</sup> Cathy MacLean,<sup>1</sup> Angela Baerwald<sup>1</sup>

\*Author information is provided in the back matter of this manuscript

## Abstract

**Background:** Virtual care (VC) was rapidly adopted during the COVID-19 pandemic to ensure continuity of primary care. In this study, we explored Family Medicine (FM) residents' evolving experiences with VC across early (2020), late (2022), and post-pandemic (2024) phases in Saskatchewan, focusing on satisfaction, preparedness, supervision, and perceived impact on training and well-being.

**Methods:** FM residents across eight distributed sites were surveyed at three time points using a standardized tool. Responses were analyzed using chi-square, Kruskal-Wallis, and post hoc Mann-Whitney U tests ( $p < 0.05$ ).

**Results:** Seventy-eight residents participated (2020:  $n = 26$ ; 2022:  $n = 19$ ; 2024:  $n = 33$ ). Satisfaction with VC tended to decline over time ( $p = 0.074$ ), while requests for additional VC training did not change ( $p = 0.269$ ). Confidence to use VC post-residency dropped significantly from 100% (2020) to 60.6% (2024;  $p < 0.001$ ), despite a consistent and moderate amount of supervision. The negative impact of COVID-19 on training declined by 2024 ( $p = 0.008$ ), while trust in the provincial response to the COVID-19 pandemic also decreased ( $p < 0.0001$ ).

**Conclusions:** Although FM residents adapted to VC during the pandemic, long-term sustainability to use VC requires improved training, structured supervision, and curricular integration. Embedding VC competencies into postgraduate education is essential to support hybrid models of care in the evolving primary care landscape.

# Mise en œuvre des soins primaires virtuels : étude comparative des expériences des résidents en médecine familiale

## Résumé

**Contexte :** Les soins virtuels (SV) ont été rapidement adoptés pendant la pandémie de COVID-19 afin d'assurer la continuité des soins primaires. Dans cette étude, nous avons exploré l'évolution des expériences des résidents en médecine familiale (MF) avec les SV au cours des phases précoce (2020), tardive (2022) et post-pandémique (2024) en Saskatchewan, en nous concentrant sur la satisfaction, la préparation, la supervision et l'impact perçu sur la formation et le bien-être.

**Méthodes :** Les résidents en MF de huit sites répartis ont été interrogés à trois moments différents à l'aide d'un outil standardisé. Les réponses ont été analysées à l'aide des tests du chi carré, de Kruskal-Wallis et post hoc de Mann-Whitney U ( $p < 0,05$ ).

**Résultats :** Soixante-dix-huit résidents ont participé (2020 :  $n = 26$  ; 2022 :  $n = 19$  ; 2024 :  $n = 33$ ). La satisfaction à l'égard des SV a eu tendance à diminuer au fil du temps ( $p = 0,074$ ), tandis que les demandes de formation supplémentaire en SV n'ont pas changé ( $p = 0,269$ ). La confiance dans l'utilisation des SV après la résidence a considérablement diminué, passant de 100 % (2020) à 60,6 % (2024 ;  $p < 0,001$ ), malgré un niveau de supervision constant et modéré. L'impact négatif de la COVID-19 sur la formation a diminué en 2024 ( $p = 0,008$ ), tandis que la confiance dans la réponse provinciale à la pandémie de COVID-19 a également diminué ( $p < 0,0001$ ).

**Conclusions :** Bien que les résidents en MF se soient adaptés aux SV pendant la pandémie, la viabilité à long terme de l'utilisation des SV nécessite une formation améliorée, une supervision structurée et une intégration dans les programmes d'études. L'intégration des compétences en matière de SV dans la formation postdoctorale est essentielle pour soutenir les modèles hybrides de soins dans le paysage en évolution des soins primaires.

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## Introduction

The advent of the coronavirus 2019 (COVID-19) pandemic prompted healthcare systems worldwide to rapidly adopt virtual care (VC) as a means of maintaining continuity of care while minimizing infection risk.<sup>1,2</sup> Virtual care refers to the delivery of medical services remotely through technologies such as videoconferencing, telephone consultations, email, and text messaging.<sup>1</sup> Virtual care quickly became integrated into primary care during the pandemic and beyond, reshaping traditional doctor-patient interactions.

The benefits of virtual primary care include improved access for patients in remote or underserved areas, reduced need for travel, increased scheduling flexibility, decreased redundancy in healthcare assessments, and streamlined follow-up care.<sup>1,2</sup> VC also contributes to infection control and helps conserve personal protective equipment (PPE) during public health emergencies.<sup>2,3</sup> However, challenges persist, such as limitations in physical examination, digital literacy gaps, unequal access to technology, equipment-related difficulties, privacy concerns, and potential disruptions to the quality of physician-patient communication.<sup>2-4</sup> In light of these considerations, the College of Family Physicians of Canada

(CFPC) recommends that VC be used to complement (not replace) in-person care within primary care systems.<sup>5</sup>

The University of Saskatchewan Family Medicine (FM) Residency Program enrolls over 100 residents annually across eight distributed training sites (including urban, rural, and remote settings) throughout the province. The two-year program integrates clinical training with scholarly activity. The training focus is on comprehensive primary care, with additional rotations in emergency medicine, obstetrics, internal medicine, psychiatry, pediatrics, long-term care, palliative care, and several electives. Residents train in both academic and community-based clinics under the supervision of experienced family physicians.

Given the program's distributed structure and emphasis on community-based care, the COVID-19 pandemic necessitated a rapid shift to VC to maintain educational continuity and patient safety. To balance residents' learning needs and well-being during this period, the FM residency program implemented VC across all sites. Hence, to understand the impacts of this transition and how residents have adapted to VC over time, we investigated and compared the experiences of FM residents providing VC during the early (June 2020), late (July 2022), and recovery (March 2024) phases of the pandemic. As such our study provides insight into evolving trends, satisfaction, supervision, and preparedness in virtual primary care delivery within a postgraduate training environment.

## Methods

### Study design

In this study, we used a cross-sectional, comparative design to examine FM residents' experiences with virtual care (VC) across three time points: early pandemic (June 2020), late pandemic (July 2022), and post-pandemic recovery (March 2024).

## Participants, setting, and measures

At each time point (i.e., 2020, 2022, and 2024), we surveyed FM residents from all 8 distributed training sites in Saskatchewan. We assessed the Family Medicine Resident experiences with VC, including satisfaction, supervision, educational preparedness for a pandemic, confidence, and the perceived impact of COVID-19 on training and mental health using a customized survey. The initial survey instrument was developed collaboratively by a team of three faculty members and one researcher within the Department of Academic Family Medicine (DAFM) at the University of Saskatchewan. This team included the provincial postgraduate program director, a faculty member with expertise in medical education research, a faculty member working in postgraduate education, and a researcher with expertise in qualitative research methods. The survey was developed to address key issues observed during early stages of virtual care implementation for postgraduate education and informed by literature on virtual medical education and telehealth delivery. The tool was reviewed for content validity by program directors and piloted with a small group of residents ( $n = 5$ ) for clarity and relevance. Minor adjustments were made based on feedback. Given the rapid progression of the pandemic and implementation efforts for VC, no standardized questionnaires for VC were available. While the survey has not undergone formal psychometric validation, it was tailored to capture the experiences of FM residents across the distributed training network in Saskatchewan (see Supplementary File A). We rated responses using Likert scales, with additional open-ended questions to capture qualitative insights.

### Data analyses

We analyzed responses descriptively using frequency distributions within each survey year and comparatively across the 2020, 2022, and 2024 cohorts. As the sample did not meet assumptions of normality, we used the Kruskal-Wallis test to compare responses across the three time points. Where significant differences were detected, post hoc pairwise comparisons were conducted using Mann-Whitney U tests with Bonferroni correction to adjust for multiple comparisons. Statistical significance was set at  $p < 0.05$ .

## Ethical considerations

This study was reviewed by the University of Saskatchewan Research Ethics Board (Bio #2131) and received exemption status under Article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2).<sup>6</sup>

## Results

A total of 78 residents participated in the study: 26 in 2020, 19 in 2022, and 33 in 2024. The FM residents' experiences with VC delivery across the three time periods (i.e., 2020, 2022 and 2024) are shown in Figure 1 (A-E). Satisfaction with VC delivery across training sites was highest in 2022 (84.2%) but shown a trend towards decline to 51.5% by 2024 ( $p = 0.074$ ) (Figure 1A). Residents' perception of supervision remained consistent throughout all 3 time periods, with most residents reporting "little to moderate" supervision (Figure 1B). The proportion of residents indicating a need for more VC training rose from 46.2% (2020) to 66.7% (2024), though not statistically significant ( $p = 0.269$ ) (Figure 1C). However, confidence to use VC after residency dropped sharply from 100% (2020) and 94.7% (2022) to 60.6% (2024) ( $p < 0.0001$ ) (Figure 1D). Preference for telephone VC decreased over time [from 88.5% (2020) to 73.7% (2022) to 58.1% (2024);  $p = 0.093$ ] while the desire to continue using all VC modalities increased from 3.8% early-pandemic to 32.3% post pandemic [from 3.8% (2020) to 26.3% (2022) to 32.3% (2024);  $p = 0.093$ ] (Figure 1E).

The broader COVID-19 impacts on VC use across the three time periods are demonstrated in Figure 2 (A-E). A perceived negative effect of COVID-19 on clinical training peaked in 2022 (73.7%) but dropped significantly to 15.2% by 2024 ( $p = 0.008$ ) (Figure 2A). The effectiveness of the response to the COVID-19 pandemic for facilitating postgraduate education generally increased over time ( $p < 0.0001$ ), especially between 2020 and later years (data here) (Figure 2B). The negative impacts of the COVID-19 pandemic on mental health followed a declining trend over time [from 42.3% (2020) to 24.2% (2024)]; however, changes were not statistically significant ( $p = 0.071$ ) (Figure 2C). The majority of residents felt that the COVID-19 pandemic generally had a neutral or positive effect on the ability to provide primary care; responses were not different across the three time points (Figure 2D). Residents felt they were a little to moderately prepared for practicing within a pandemic; perceptions of preparedness did not differ early, late, and post pandemic (from 46.2% (2020) to 63.6% (2024);  $p = 0.121$ ) (Figure 2E).

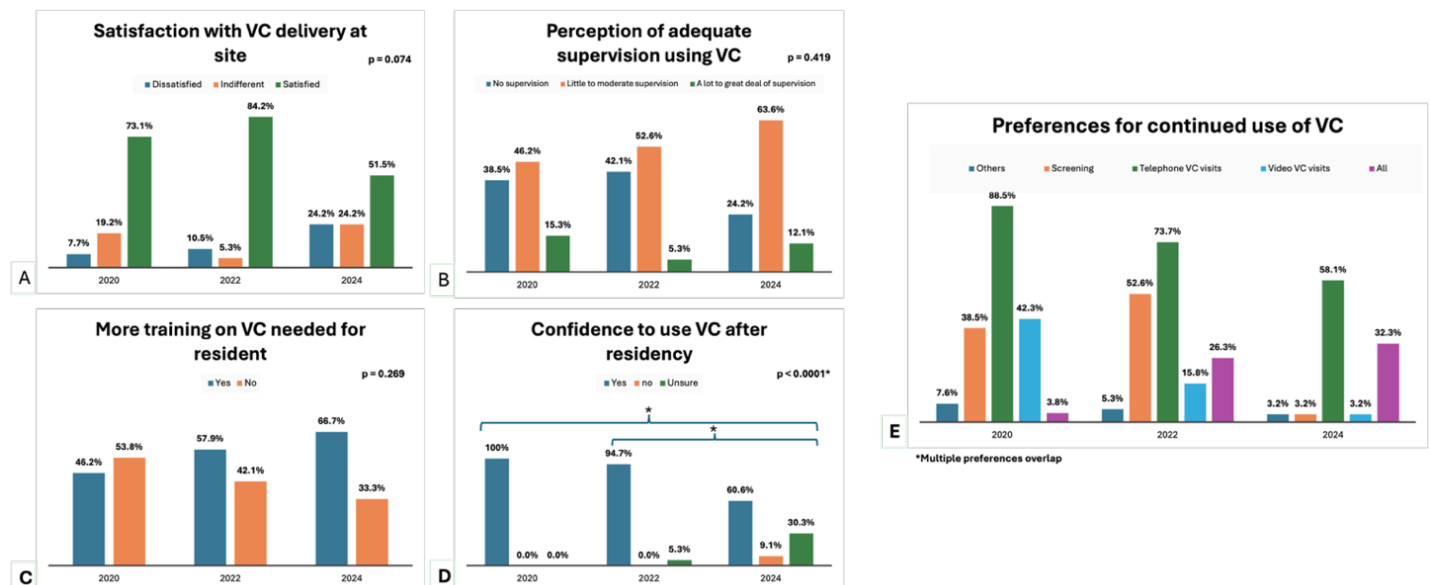


Figure 1. Experiences related to Virtual Care provision across time periods

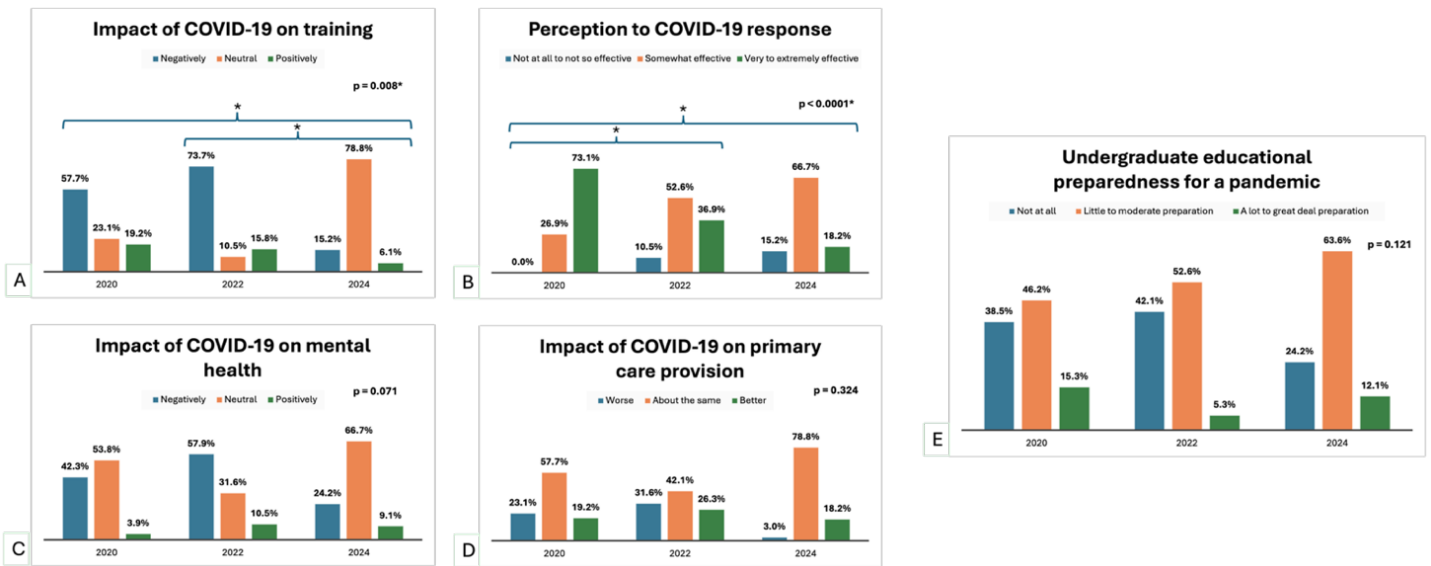


Figure 2. Experiences of Virtual Care use related to COVID-19 across time periods

## Discussion

In this study, we provide longitudinal insights into the evolving experiences of Family Medicine (FM) residents in Saskatchewan using virtual care (VC) during the COVID-19 pandemic and beyond. Our findings reveal several important patterns that speak to the sustainability, preparedness, and pedagogical alignment of VC within postgraduate training. While initial satisfaction with VC was high, likely driven by the perceived value and necessity during the early pandemic, we observed a decline in satisfaction by 2024. This waning enthusiasm for VC may have resulted from a myriad of reasons including performance (perfunctory) fatigue after the urgency of pandemic-driven care had subsided, unintentional lack of structured support, gaps in curriculum alignment that left residents uncertain about expectations or learning objectives related to VC, and inadequate supervision during VC visits. Similar patterns have been documented in post-crisis implementation science, where innovative strategies often lose traction without systemic reinforcement.<sup>2,3,7-10</sup> The drop in confidence to use VC post-residency (from 100% in 2020 to 60.6% in 2024,  $p < 0.0001$ ), along with the increasing desire for more VC training, also point to potential curricular deficiencies and suboptimal infrastructural support for VC. Despite universal uptake of VC during and following the pandemic, training in virtual care communication, medico-legal considerations,

and patient engagement aspects of VC delivery remain poorly understood among postgraduate trainees<sup>9,10</sup> For example, the Associations of Faculties of Canada (AFMC) Entrustable Professional Activities (EPAs) do not yet explicitly address telemedicine readiness despite its growing role in practice.<sup>11</sup> Likewise, while the Triple C Competency-Based Curriculum promotes comprehensive and community-adaptive care, it does not currently include virtual care as a formal curricular priority.<sup>12</sup> As recommended by the College of Family Physicians of Canada (CFPC) Virtual Care Guide,<sup>13,14</sup> future training should include digital communication skills, virtual physical examination techniques, ethical and legal considerations, and awareness of limitations in equity and access,

Adequate supervision emerged as another theme in our study. Across all three time periods, most residents reported only “little to moderate” supervision. It is possible that traditional in-person preceptorship models and shared spaces for residents to conduct virtual care did not easily translate well to virtual platforms. In addition, faculty supervisors themselves may have lacked the time, space, comfort, training or resources for evaluating the provision of VC. In the present study, virtual care evaluation forms were developed part-way through the pandemic in some, but not all, training sites, which would have potentially cofounded our study findings. Regardless, the results of this research provide an opportunity to explore alternative

pedagogical models such as remote co-consultation, asynchronous review, and structured virtual care evaluation processes to enhance the quality of VC supervision for medical trainees.<sup>15</sup> Shifts in resident preferences also shed light on the evolving utility of VC. Telephone visits consistently ranked highest, while support for video visits and pre-appointment infectious screening declined over time, possibly due to workflow inefficiencies or reduced urgency post-pandemic. Interestingly, by 2024, over 30% of residents expressed a preference for using all VC modalities, signaling increased openness to integrated or hybrid digital care.

The FM residents' perception of the pandemic's negative impact on training and mental health peaked in 2022 but improved markedly by 2024. This trajectory may reflect early disruption followed by education, gradual recovery and system adaptation. For example, the ability and processes required for billing for virtual care visits evolved throughout the pandemic; family medicine residents were educated as information from the provincial Ministry of Health became available. The need to evolve to a constantly changing system for delivering care likely had a negative effect on training and mental health. The early toll was substantial and aligns with broader literature highlighting the psychological burden of the pandemic on trainees.<sup>16-18</sup> As clinical training models continue to evolve, it is important that residency programs prioritize mental health supports, particularly during rapid transitions. In like manner, perceptions about the effectiveness of the pandemic response for facilitating education declined significantly over the study periods ( $p < 0.0001$ ), likely reflecting frustrations with inconsistent communication, unclear policies, or perceived inequities in support. While not a primary focus of our study, we believe such perceptions may influence training satisfaction and even future practice intentions.

Perceived preparedness for responding to a pandemic remained low across all time periods, with only modest improvements by 2024. Most residents reported receiving little to moderate undergraduate or postgraduate training in crisis response and digital health. This finding reveals another foundational gap that medical schools should address, ensuring early exposure to systems-based thinking,

virtual care tools, and public health crisis management.<sup>17</sup>

Interestingly, the residents' preparedness to use VC was highest during the early pandemic, possibly reflecting early exposure and the concentrated teaching efforts during that period. By 2024, however, perceived preparedness had declined, suggesting that intermittent and inconsistent VC instruction was not sufficient to sustain confidence.

## Implications for medical education and primary care

As primary care continues to confront long-standing challenges (e.g., access, workforce shortages, and administrative burden) VC remains a critical part of the solution. Virtual Care has been shown to improve access in rural areas and reduce wait times, but it also introduces new demands that may exacerbate physician burnout and contribute to regional inequities.<sup>2,3,20</sup> Our findings suggest that Family Medicine residency programs should prepare residents not only to function independently but to collaborate effectively within interdisciplinary, team-based VC environments.<sup>19</sup> Additionally, the adoption of VC in practice requires access to technology. Residents in our study were consistently more comfortable with telephone versus video visits, with lesser interests in video-based VC post pandemic. The reasons for these preferences could be attributed to lack of video resources at their teaching site, lack of knowledge or comfort with the use of videoconferencing, and/or experiences with patients who couldn't adapt to the video-based VC or needed administrative and/or technical support to assist them with using the technology. It is possible that the additional time and administration required to co-ordinate video visits compare to phone visits, during a busy clinic schedule, may not be worthwhile. From a patient perspective, VC requires access to and comfort with the use of technology, which can be a limiting factor for some patients, in particular the elderly.<sup>21</sup> As such, patients should be educated, empowered and supported to ensure equitable access to and meaningful participation in VC delivery.<sup>21</sup>

## Future directions

Future directions for research in virtual delivery of primary care could include evaluating the strengths and weaknesses of VC conducted using team-based care models such as the Patient Medical Home.<sup>19</sup> It is possible that similarities or differences may exist in VC requirements from different members of the care team (e.g. physicians, pharmacists, psychologists) and for different aspects of primary care delivery (e.g. physical examination versus counselling). It is also timely to understand how technology (including the emergent use of generative Artificial Intelligence) can be leveraged to support VC while reducing administrative burden. Furthermore, it is essential to elucidate patient perspectives on VC at clinical teaching sites (particularly in rural and underserved areas).

## Study limitations

A validated study for VC use in postgraduate education was not available when we initiated our research. Thus, our study relied on self-reported survey data, which may be subject to recall and response bias. While our survey was content-informed and piloted, it was not a formally validated instrument which may affect the generalizability and psychometric robustness of some findings. However, the questions were designed so that they may be relevant for additional postgraduate family medicine programs across the country. Secondly, the survey question assessing perceptions of the COVID-19 response at residency sites may have been interpreted variably by respondents. While intended to reflect the effectiveness of institutional or system-level support during the pandemic, the wording of the question ("Has the response to COVID-19 at your practice location been effective?") was broad and may have been influenced by clinical, educational, or public health-related interpretations. Future surveys should consider refining such items for clarity and contextual specificity.

## Conclusion

This study provides longitudinal insights into Family Medicine residents' experiences with Virtual Care (VC) during and after the COVID-19 pandemic.

While VC was initially embraced as a necessary innovation, sustained integration into training revealed gaps in curriculum, supervision, and resident preparedness. Declines in satisfaction and confidence, alongside growing requests for structured VC training, underscore the need to formalize VC competencies within postgraduate medical education. As VC continues to evolve within team-based models of primary care, training programs should prioritize equitable, collaborative, and well-supervised approaches that reflect the realities of digitally connected practice. Optimization of postgraduate curricula to better equip learners with the skills and support systems needed for hybrid models of care will ensure readiness for future crises and facilitate sustainable virtual care delivery.

#### Author information:

1- Department of Family Medicine, University of Saskatchewan, Saskatchewan, Canada

#### Correspondence to:

Dr. Udoka Okpalauwaekwe

email: [udokaokpala.uo@usask.ca](mailto:udokaokpala.uo@usask.ca)

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#### Conflict of Interest:

The authors report no conflicts of interest.

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