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Assessing patient experiences with a Virtual Triage and Assessment Centre (VTAC): a mixed-methods study using an online survey and semi-structured interviews in Renfrew County, Ontario

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Abstract

Background In March 2020, the Renfrew County Virtual Triage and Assessment Centre (VTAC) was launched as a large-scale, innovative, hybrid healthcare program. VTAC aims to alleviate pressure on emergency departments by providing additional and more equitable access to family physicians and allied health professionals. This study's objective was to evaluate patients' experiences with VTAC.

Methods In this mixed-methods study, we distributed 3,026 surveys, receiving 383 responses that met our inclusion criteria (13%), and conducted 10 semi-structured interviews with Renfrew County residents aged 18 and above who had utilized VTAC at least once since 2023. Survey data were analyzed through descriptive statistics, chi-squared tests, and a multivariate binary logistic regression, while semi-structured interviews were coded and analyzed using reflexive thematic analysis.

Results The majority of survey respondents were aged over 55 (58%), identified as Caucasian (91%) and women (70%), with 76% having college or university-level education. Additionally, 81% were either unattached, or attached to a doctor who was not easily accessible. Our findings demonstrate overall satisfaction with VTAC, with 86% patients reporting that they were satisfied or very satisfied with the program. This was irrespective of demographic characteristics, health status, or appointment modality. In our interviews, four main themes emerged: "Healthcare in Renfrew County", "Accessing VTAC", "VTAC Clinical Care", and "Improving VTAC". These themes underscore major difficulties residents encounter in accessing healthcare in Renfrew County and illustrate that services from VTAC align with a genuine population-level need, contributing to mitigating some of these challenges.

Conclusion Renfrew County, like many other underserved regions, is grappling with a crisis of access to healthcare. VTAC addresses this gap by providing timely access to a family doctor. Our findings demonstrate patient acceptability

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and satisfaction with VTAC, offering insights that could guide the design of similar healthcare programs. This model may also serve as a scalable solution for improving healthcare access in underserved regions facing similar challenges.

Keywords Virtual care, Hybrid care, Primary care, Healthcare program, Patient experiences, Access to care, Rural healthcare

Background

In Canada, primary care providers (mainly family physicians supplemented by nurse practitioners) act as the initial point of access to the healthcare system, and are tasked with addressing the majority of patients' healthcare needs throughout their lives, ranging from prevention to diagnosis, management, and treatment [1, 2]. However, the Canadian primary care system faces numerous challenges in ensuring equitable access to healthcare services for all citizens. These challenges include an aging population with increasing healthcare needs, growing administrative burdens, reduced time for direct patient care, and a decreasing number of medical graduates choosing primary care specialization [3–6]. Emergency departments often serve as an alternative entry point to the healthcare system in high-income countries, including Canada, particularly for individuals who face barriers to accessing primary care [7]. However, emergency departments are increasingly experiencing extreme overcrowding, which compromises their ability to deliver high-quality care to patients [8].

Access challenges are not unique to Canada, with a recent study estimating that an additional 6.4 million physicians – a 50% increase – are needed globally to meet the minimum threshold for skilled health worker density [9, 10]. In Canada, nationwide survey results indicate that 6.5 million residents lack a primary care provider, classified as “unattached” or “non-enrolled” [11]. Furthermore, the Canadian Medical Association (2024) reports that one-third of formally “attached” Canadians struggle to secure an appointment with their primary care provider [12]. A recent Commonwealth Fund survey found that only 26% of Canadians can access same- or next-day appointments, a sharp decline from 46% in 2016, and well below the Commonwealth average of 42% [13]. This access to care crisis has become one of the most pressing concerns facing Canadian healthcare [14], and is particularly severe in rural regions, with only 8% of physicians practicing there, despite 18% of Canadians residing in these areas [15]. Access to care challenges in rural regions also stems from large geographical areas, lack of healthcare infrastructure, and frequent staff turnover [16–20]. These factors leave more residents vulnerable, ultimately resulting in worse patient health outcomes, including higher mortality rates [21, 22].

In Renfrew County, Ontario, the emergence of the COVID-19 pandemic, combined with the previously mentioned challenges in rural healthcare, prompted the

rapid establishment of the Virtual Triage and Assessment Centre (VTAC) in March 2020. VTAC, a 24/7 centralized healthcare service, emerged from an unprecedented collaboration between family doctors, community paramedics, local public health, hospitals, primary care teams, and a broad spectrum of existing local healthcare services and allied health professionals. Initially conceptualized as a response to COVID-19, VTAC has always included assessment and care from family doctors. The program's directive is clear: prioritize contacting your family physician first for any health concerns. For residents with an urgent health concern who do not have a family doctor or cannot access their regular primary care provider, VTAC is available as an alternative to an emergency department and as a safety net to prevent people from suffering at home in silence without access to healthcare. The program provides multiple layers of care, featuring three main visit modalities: virtual assessments conducted by family doctors, hybrid assessments that involve a community paramedic in-person with the patient and a physician real time by virtual means, and in-person assessments conducted by community paramedics either at the patient's home or at a Clinical Assessment Centre [23].

VTAC, a living and evolving healthcare program and innovative method of care delivery, warrants close attention to improve and understand its impact. Aligned with the well-recognized quintuple aim framework [24–26], VTAC has demonstrated clinical and economic benefits, as supported by a comprehensive evaluation [27]. Furthermore, VTAC providers have reported positive experiences with the program [28]. However, no thorough evaluation has previously been conducted to assess patient experiences with the program.

While several studies have evaluated patient experiences with programs that share components similar to VTAC, none fully capture its unique structure and rural context. An evaluation of VTAC's attachment arm, the Integrated Virtual Care (IVC) program, which enrolls previously unattached patients to remote physicians embedded in a local Family Health Team in Renfrew County, demonstrated high patient satisfaction, regardless of attachment status prior to enrollment. However, while the IVC emphasizes providing comprehensive care, VTAC focuses primarily on accessibility rather than continuity or comprehensiveness [29]. Other research on patient experiences with virtual care programs is generally positive, with studies highlighting efficiency and

time savings as core benefits. Conversely, common barriers include technology limitations, internet access, language and cultural differences, and “mechanical” patient-provider interactions [30, 31]. VTAC addresses some of these barriers by offering a wide range of in-person options, enabling care to meet patients where they are – a feature highlighted as “key” in previous Australian studies on patient and clinician experiences with a hybrid care model [32, 33]. Our study aimed to investigate the experiences of patients with VTAC and identify factors that contribute to patient satisfaction and positive experiences.

Methods

Study setting

VTAC operates in Renfrew County, the largest county in the province of Ontario. Located along the western bank of the Ottawa River, the county is home to approximately 107,000 residents and spans a large geographical area of approximately 7,600 square kilometers [34]. The large territory poses a unique challenge in the county, affecting access to care differently across the urban-rural continuum. Within the county, residents in more rural areas may need to travel up to twenty times farther to reach a provider compared to those in semi-urban communities [16]. Furthermore, the county boasts some of the highest rates of chronic physical and mental illnesses in the province, compounded by above-average unemployment rates and low socioeconomic status [34]. The difficult healthcare landscape is exacerbated by a notable shortage of family physicians, leading to one of the highest rates of unattachment in Ontario, which is estimated to be between 20 and 25% [35]. Moreover, Renfrew County uniquely lacks any walk-in clinics, leaving residents without a family physician heavily reliant on the region’s 5 emergency departments – Renfrew Victoria Hospital, Pembroke Regional Hospital, St. Francis Memorial Hospital, Deep River and District Hospital, and Arnprior Regional Health – for medical care [23]. These emergency departments handled approximately 94,000 visits during the year 2023/2024, according to local feedback from the Ottawa Valley Ontario Health Team, which services Renfrew County. VTAC is accessible to any resident within Renfrew County who has a valid health card number and can be reached through a designated phone service listed on the website (rcvtac.ca). Initial triaging starts with instructions provided on the website, guiding patients on when to call VTAC or seek care in other settings (e.g., the emergency department, their own doctor, self care). After calling the VTAC number, patients speak with a trained medical receptionist who determines the most appropriate appointment type, whether in-person or virtual. As of December 2023, VTAC employed 44 physicians, many

of whom worked from outside the county, in addition to community paramedics and administrative staff.

Since its establishment, VTAC has played an important role in addressing Renfrew County’s healthcare access challenges. As of the end of January 2024, VTAC has completed approximately 130,000 assessments for over 44,000 unique patients, in addition to more than 70,000 COVID-19 tests completed during the pandemic [36]. Throughout 2023, specifically, more than 70% of appointments were with unattached residents. Since June 2023, the majority of VTAC appointments (86%) were virtual assessments with a family doctor, conducted almost exclusively via phone (> 99%). Hybrid assessments involving both a paramedic and a physician accounted for 6% of all appointments, and an additional 7% of encounters were in-person, paramedic-only assessments. In-person appointments take place either at one of the five VTAC paramedic-led clinical assessment centers, located throughout the county, or at the patient’s home. Lastly, a small number of encounters were with paramedics by virtual means and in-person appointments with a family doctor [36].

Study design

In this mixed-methods study, we administered an anonymous online survey and conducted in-depth semi-structured interviews with participants selected from the pool of survey respondents. Throughout this process, we ensured compliance with the Standards for Reporting Qualitative Research guidelines [37].

Study participants

We invited all VTAC patients to participate in the survey, regardless of the type of encounter, who meet the following inclusion criteria: (1) attended a VTAC appointment between July 2023 and January 2024, (2) were 18 years of age or older, (3) had a valid health card number, and (4) had previously provided consent to be contacted during their most recent VTAC visit. Recruitment for the study occurred between July 2023 and January 2024. We invited participants to a one-on-one, semi-structured interview through the online survey and all participant communications, providing an email for interested respondents. Individuals who expressed interest were then identified and selected from these invitations without linking potential interview participants to their anonymous survey responses. Informed consent was obtained from all participants in the study, both before the administration of the online survey and before the interview process.

Patient partners

To ensure that our research aligned with the realities of Renfrew County, we recruited three patient partners (DBP, MH, and KM) who reside in different communities

within the county, each with personal experience as VTAC patients. They were recruited through an online advertisement posted on VTAC's social media and randomly selected from the pool of interested participants. These partners brought diverse backgrounds and experiences to our study and were actively involved in every phase, from its initial design to the analysis of findings and manuscript editing.

Online surveys

Prior to conducting the interviews, we administered a 37-question online survey hosted on Microsoft Forms [38]. We sent survey invitations to potential respondents through VTAC's dedicated email communication platform, followed by a reminder to enhance participation. A power calculation, considering Renfrew County's population of 107,000, determined that a sample size of 385 participants was necessary to achieve a 5% margin of error with a 95% confidence level [39]. The survey aimed to explore patients' experiences with VTAC, informed by previous studies on healthcare program evaluation [29, 40–44], and developed in collaboration with patient partners to address VTAC's multi-layered care model. We also adapted a digital literacy questionnaire, which integrated two questions from Nelson et al.'s tool to create a digital literacy scale ranging from 2 to 10 (Supplementary Table 7). The survey was further refined through pilot testing with patient partners and VTAC staff to ensure clarity and relevance [45].

Semi-structured interviews

We developed a preliminary set of interview questions based on an initial analysis of survey data (Appendix B). We aimed to achieve thematic saturation for VTAC's primary visit modality, which comprises virtual appointments with physicians (representing more than 85% of total appointments since June 2023). We included patient perspectives on other visit modalities such as paramedic visits, even though these comments did not reach thematic saturation. To refine and ensure the clarity of these questions, we conducted pilot interviews with the patient partners. The data from these interviews were included in the analysis [36]. Then, we randomly selected patients for additional study interviews. Concurrent analysis revealed that we had neared or achieved thematic saturation across the data themes after eight interviews. To ensure comprehensive demographic representation and thematic saturation of the data, we conducted two additional interviews, specifically targeting participants under 35 years of age [46]. In total, we conducted 10 interviews with VTAC patients. The interviews were conducted by a trained health science researcher (AS). To maintain transparency and mitigate potential biases, interview questions were carefully formulated to avoid leading or

suggestive language. The interviews lasted between 25 and 35 min. As a gesture of appreciation, the interviewees received a \$25 gift card.

Statistical analysis - quantitative data

We analyzed survey results using descriptive statistics (frequency distributions, medians, and interquartile ranges), and conducted chi-square tests to explore the strength of the associations between survey questions and satisfaction. Finally, we built a binary logistic regression model to assess the association between demographic characteristics, self-perceived health, the clinical outcome of issue resolution following the VTAC appointment, and overall satisfaction with VTAC. In the logistic regression, the outcome variable was categorized as either "Satisfied" (if the responses were either "Satisfied" or "Very satisfied") or "Not Satisfied" (for "Neutral," "Dissatisfied," or "Very Dissatisfied" responses). Covariates included age, gender, education level, attachment status, digital literacy, self-perceived health, and medical issue resolution (Supplementary Tables 5 and 6). Data with missing values were omitted from the analysis. The analysis was performed using R software, version 4.2.3 [47].

Statistical analysis - qualitative data

Two members of the research team, AS and CP, conducted the analysis of interview transcripts through reflexive thematic analysis [48, 49]. The interviews were recorded and transcribed using the auto-transcription feature in Microsoft Teams [50], and then checked for verbatim accuracy. The two researchers individually examined the transcripts, and then collaboratively discussed the data to compare codes and identify initial themes and subthemes. After reaching a common conceptualization of the content, preliminary codes were arranged into a coding framework and inserted into Taguette [51], a free, open-source qualitative-data-analysis software, along with the interview transcripts. All 10 interview transcripts were consensus-coded by AS and CP. The coding framework was adjusted throughout based on shared meaning and coding frequency within the transcripts. Following the coding, AS and CP met to review all quotes to ensure consistency and to conduct thematic analysis to identify and define themes and subthemes in the data.

Ethis approval

This study received approval from the Institut du Savoir Montfort Research Ethics Board.

Results

Survey statistics, demographic and patient health characteristics

We distributed a total of 3,026 surveys to eligible participants, resulting in 383 responses, yielding a response rate of approximately 13%. Most respondents were white (European or North American; 90.9%) women (69.9%) aged 55 years and older (58.2%). A majority were college or university educated (76.4%) and scored high on the digital literacy scale (69.7%). Notably, fewer than one in five respondents (19%) reported being attached to an accessible family physician, while the majority were either unattached (58%) or enrolled with a provider who was not easily accessible (23%). Although most rated their overall health as “Good” or “Very Good” (66.7%), a majority also reported having a preexisting chronic condition (64.6%). Table 1 summarizes the demographic and health characteristics of the respondents. The breakdown of visit types shows that 70% ($n=267$) of survey respondents had experienced a virtual physician appointment, with 96% conducted via phone. Additionally, 13% ($n=50$) had experienced a hybrid appointment (where a paramedic provided in-person care while collaborating in real time with a physician via virtual consultation), and 15% ($n=59$) an in-person appointment with a community paramedic.

Overall satisfaction

Most respondents (86%) expressed being satisfied or very satisfied with their VTAC encounter. Satisfaction levels were high across modalities: 89% for virtual appointments, 92% for hybrid appointments, and 98% for in-person paramedic appointments (Fig. 1).

Overall VTAC experiences

Participants gave high scores to questions pertaining to various aspects of their overall experience with VTAC, including the booking process, visit outcomes, and interactions with receptionist staff. Specifically, 83% of respondents agreed or strongly agreed that they knew the next step in their care, while 80% felt that their health concern was effectively resolved. Additionally, 76% indicated that they would have sought care at the nearest emergency department if VTAC was not available (Fig. 2).

Virtual physician experiences

Survey respondents who reported having a virtual encounter with a VTAC physician expressed favorable views toward the physician, the quality of care, and virtual care (Fig. 3). The majority (96%) of appointments with physicians were conducted via phone (Supplementary Table 2). Over 70% of the attached respondents mentioned that they had tried contacting their physician

before resorting to VTAC. In regard to care quality, 65% indicated that the quality of virtual care was either comparable or superior to that of in-person care, and 79% mentioned that their healthcare needs were satisfactorily met through virtual care. The lowest score was observed for whether residents were able to book an appointment at their preferred time, with only 55% agreeing or strongly agreeing (Fig. 3).

Hybrid experiences

Survey respondents reported very positive experiences with hybrid appointment modalities, with 92% agreeing or strongly agreeing that the hybrid model was an effective way to administer healthcare. Additionally, over 85% expressed agreement for questions related to the added value of having an in-person paramedic and a virtual physician simultaneously, as well as the staff's collaboration (Fig. 4).

Paramedic experiences

The highest Likert scale ratings were observed for questions pertaining to in-person community paramedic appointments (over 89% agreement; Fig. 5). In addition, while more than 60% of respondents seen by a community paramedic mentioned that they would have sought a physician's care without the paramedic intervention, less than 40% were advised to visit a physician, indicating that community paramedics effectively addressed healthcare needs without the need for further physician consultation (Supplementary Table 4).

Results of chi-square test

Visit-related factors emerged as more influential determinants of patient satisfaction with VTAC than demographic or health characteristics. While individuals with chronic conditions and male participants tended to report lower satisfaction levels, these differences were not pronounced. Factors such as age, education, economic status, and digital literacy demonstrated minimal associations with satisfaction (Supplementary Table 8). Conversely, nearly all survey questions regarding care experience showed stronger associations with satisfaction (Supplementary Table 9). In terms of satisfaction with virtual physicians, respondents who reported trust in VTAC, who perceived that their health issue was addressed, or who reported the care quality as high were more likely to report satisfaction ($p < 0.001$) (Supplementary Tables 9 and 10).

Binary logistic regression results

Consistent with the patterns observed in the chi-square analyses, the logistic regression model identified issue resolution as the only variable significantly associated with overall patient satisfaction. Specifically,

Table 1 Sociodemographic characteristics of the Survey respondents

Demographic Information	n (%)
Age	
18–24	9 (2.4)
25–34	43 (11.4)
35–44	53 (14.1)
45–54	52 (13.8)
55–64	105 (27.9)
65–74	88 (23.4)
75–84	24 (6.4)
85+	2 (0.5)
Prefer not to answer	0 (0.0)
Total (missing)	376 (7)
Gender	
Woman	262 (69.9)
Man	104 (27.7)
Non-binary	4 (1.1)
Other	5 (1.3)
Prefer not to answer	0 (0.0)
Total (missing)	375 (8)
Race/Ethnicity	
Asian (including East, Southeast, and South Asian)	3 (0.8)
Indo-Caribbean or Caribbean Black	0 (0.0)
Middle Eastern/North African	0 (0.0)
Black - Sub-Saharan African, Northern American or Caribbean	2 (0.5)
Latin American/Hispanic	0 (0.0)
Indigenous (including First Nations, Inuk/Inuit, and Métis)	16 (4.3)
White - European or North American	341 (90.9)
Mixed Heritage	5 (1.3)
Prefer not to answer	3 (0.8)
Other	5 (1.3)
Total (missing)	375 (8)
Attachment Status	
I have a family physician	71 (18.6)
I have a family physician, but they are not easily accessible to me	89 (23.4)
I do not have a family physician but am in the process of finding one	96 (25.2)
I do not have a family physician	125 (32.8)
Total (missing)	381 (2)
Education Level	
Less than high school	11 (2.9)
High school diploma	70 (18.6)
College or technical diploma	195 (51.9)
University degree	92 (24.5)
Prefer not to answer	8 (2.1)
Total (missing)	376 (7)
Yearly Income	
Less than \$20,000	33 (8.8)
\$20,000 - \$40,000	72 (19.2)
\$40,000 - \$60,000	67 (17.9)
\$60,000 - \$80,000	68 (18.1)
Greater than \$80,000	72 (19.2)
Prefer not to answer	63 (16.8)
Total (missing)	375 (8)
Preferred Language	
English	374 (99.5)

Table 1 (continued)

Demographic Information	n (%)
French	2 (0.5)
Other	0 (0.0)
Total (missing)	376 (5)
Current Living Arrangement	
I live with a partner, spouse, or family member(s)	302 (80.7)
I live with friend(s)	7 (1.9)
I live alone	61 (16.3)
Other	4 (1.1)
Total (missing)	374 (9)
Digital Literacy Scale	
2 to 4	32 (8.5)
5 to 7	65 (17.3)
8 to 10	262 (69.7)
Overall Health	
Very poor	7 (1.9)
Poor	27 (7.2)
Fair	92 (24.5)
Good	188 (50.0)
Very good	61 (16.2)
Prefer not to answer	1 (0.3)
Total (missing)	376 (7)
Presence of Chronic Conditions	
Yes	243 (64.6)
No	126 (33.5)
Prefer not to answer	7 (1.9)
Total (missing)	376 (7)
Current Mobility	
I have no problems walking about	241 (64.1)
I have slight problems walking about	60 (16.0)
I have moderate problems walking about	54 (14.4)
I have severe problems walking about	14 (3.7)
I am unable to walk about	3 (0.8)
Prefer not to answer	3 (0.8)
Total (missing)	375 (8)
Distance from Nearest Hospital	
Less than 5 km	123 (32.7)
5 to 10 km	85 (22.6)
10 to 20 km	89 (23.7)
More than 20 km	75 (19.9)
I am not sure/not applicable	4 (1.1)
Total (missing)	376 (7)

participants who concurred that their medical issue was resolved following the VTAC appointment were nearly 10 times more likely to report satisfaction with VTAC in the adjusted model (odds ratio: 9.81, CI: 3.85–26.26, $p < 0.001$). None of the demographic variables demonstrated a significant association with satisfaction in either the adjusted or unadjusted models (Supplementary Tables 5 and 6).

Semi-structured interviews

The interview participants represented a diverse age range, with three aged 18–34 and five aged 55 or older. The majority were women (6 out of 10) and unattached to a primary care provider (8 out of 10). Most participants (9 out of 10) had experienced a virtual physician appointment, while 2 had an in-person paramedic encounter. Our qualitative analysis revealed the presence of four primary themes within the interview codes: “Healthcare in Renfrew County”, “Accessing VTAC”, “VTAC Clinical Care” and “Improving VTAC”. Within these primary

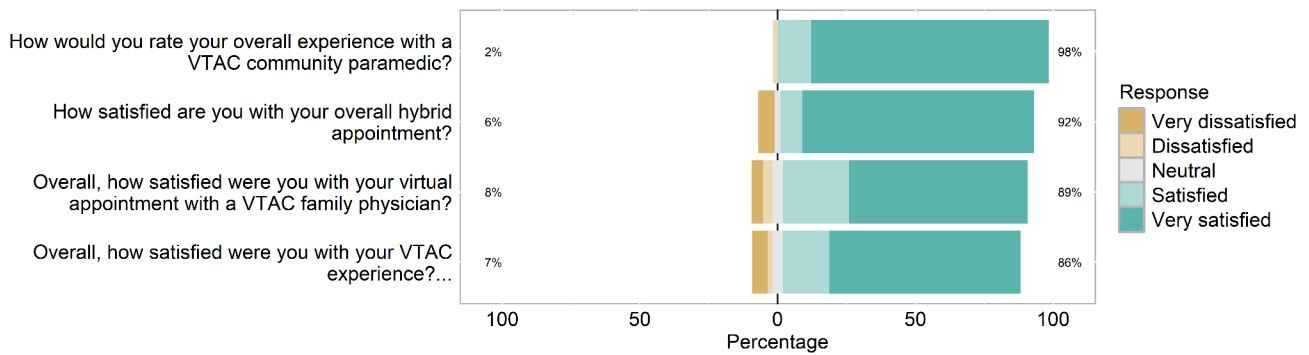


Fig. 1 Satisfaction with VTAC’s main visit modalities and overall satisfaction

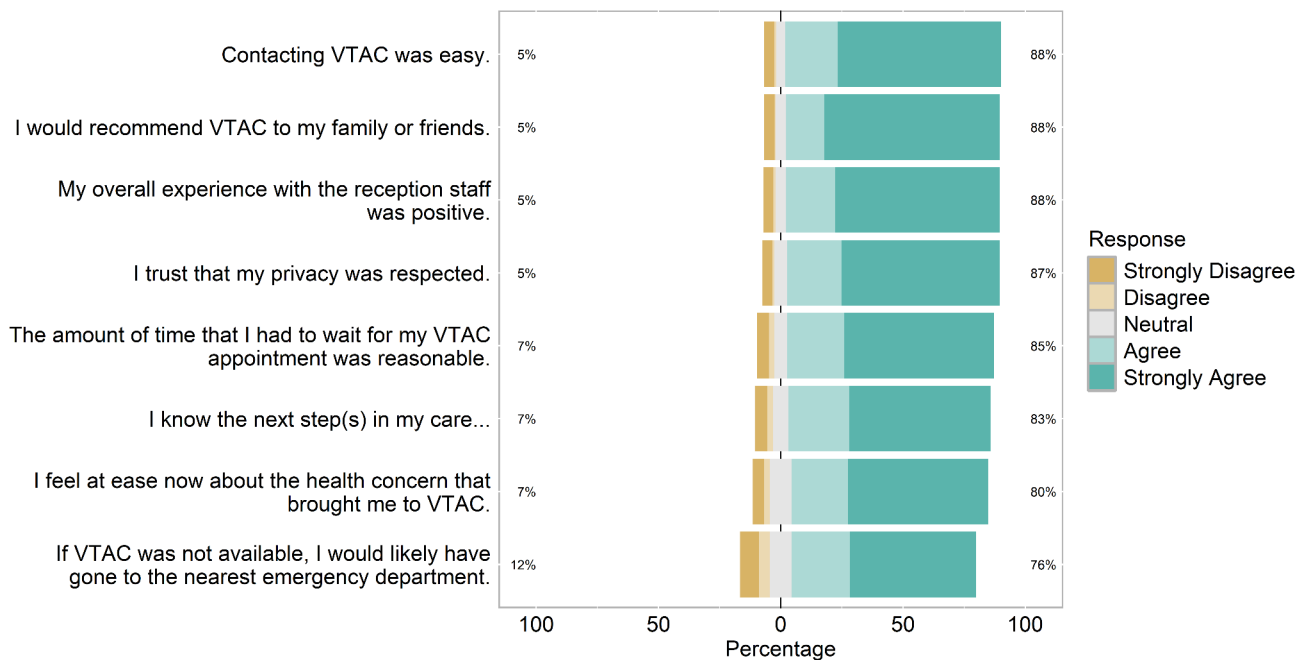


Fig. 2 Likert-scale survey responses: overall patient experiences

themes, we further identified specific subthemes to aid with the analysis (Appendix C). In the following section, we expand upon these themes, supplementing our explanations with quotations extracted from the semi-structured interviews.

Healthcare in Renfrew County

Participants in our study identified deep-rooted access to care challenges in Renfrew County, typical of rural healthcare, including provider shortages, long travel distances, and excessive reliance on emergency departments, exacerbated by the lack of walk-in clinics: “if there was no VTAC... Yeah, I’d be constantly at the emergency, and I believe the amount of people that use VTAC surely aids in the lower number of people going to emergency...” (P8). Participants residing in regions further from urban centres reported that travel burdens severely impacted their ability to access care: “If there was a

walk-in clinic it in the county, it could be 90 minutes from my house, [...] I think a lot of the time I would just not access it...” (P6).

Interestingly, access challenges were reported by both unattached and attached participants. Notably, the unattached complained about having to rely excessively on emergency departments to access routine care, such as medication renewals: “...waiting rooms are long waits and a lot of people either avoid that because they don’t want to wait six or eight or however many hours.” (P3). Meanwhile, interviewees attached to a primary care provider reported that access remained a major hurdle, citing their doctors as far away, overburdened and inaccessible: “... Most of the time you phone when you need advice or an appointment and you can’t get an appointment for maybe two weeks, so that’s not acceptable.” (P2). The attached participants consistently identified travel distance as a major barrier to accessing traditional primary care: “...

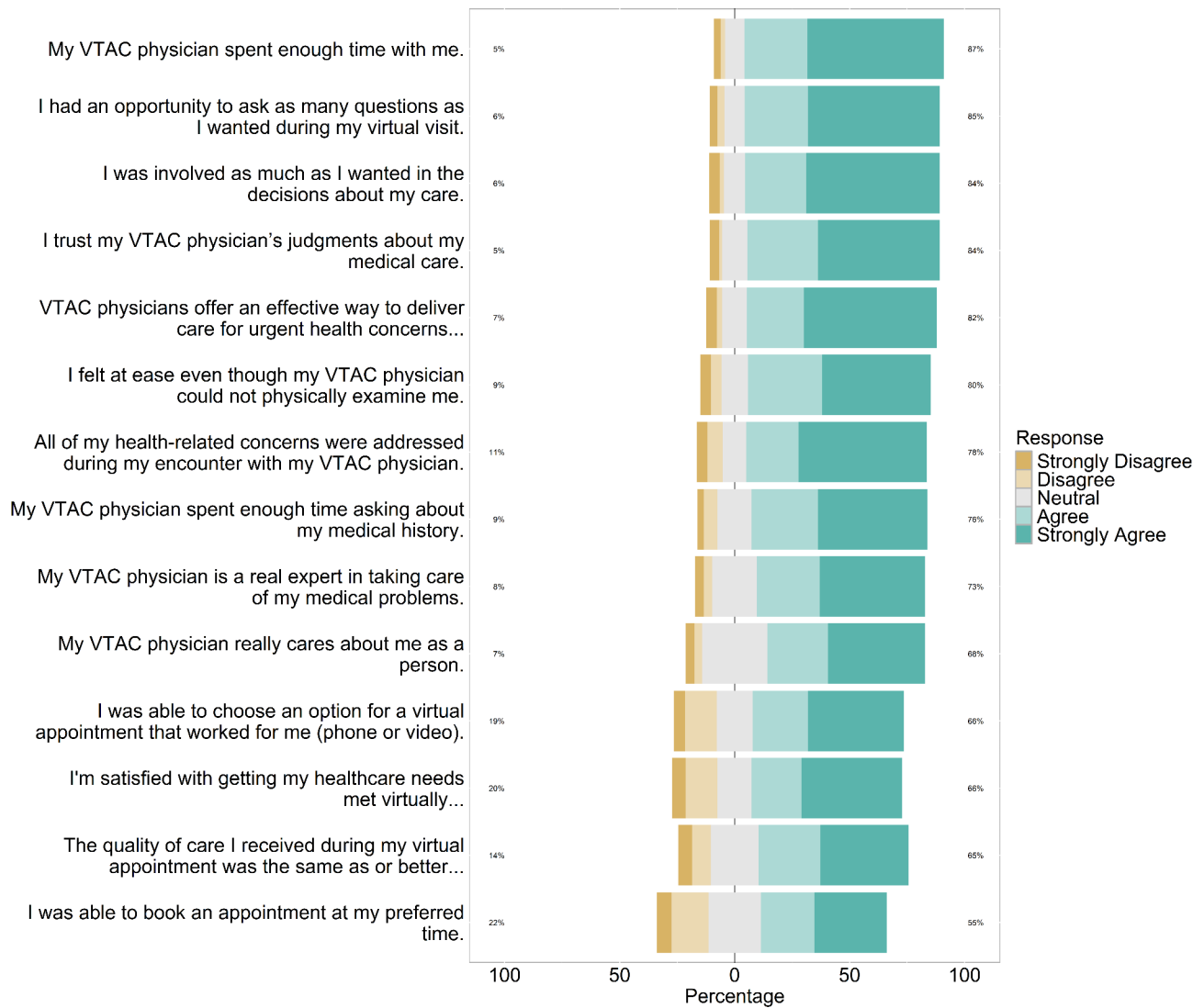


Fig. 3 Likert-scale survey responses: patient experience with virtual physician appointments

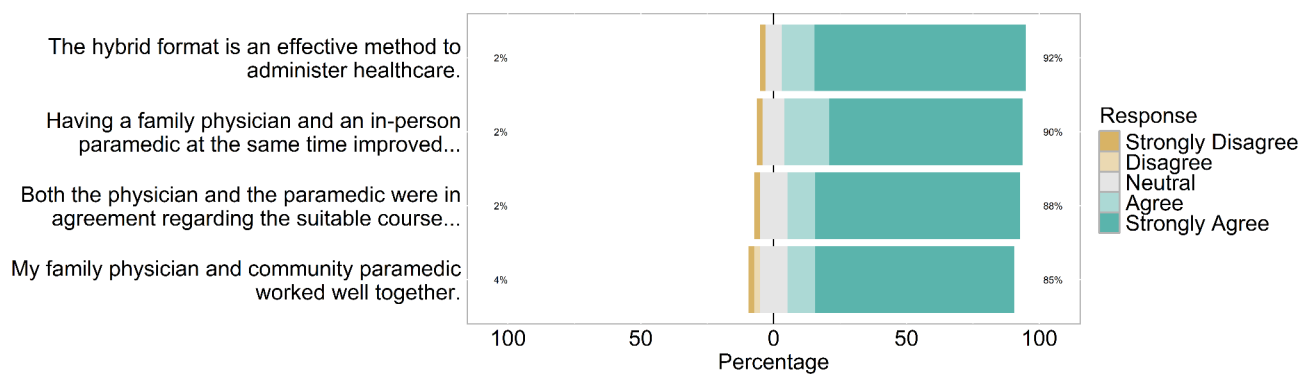


Fig. 4 Likert-scale survey responses: patient experience with hybrid appointments

The other reason I'd use VTAC is if I need them to look at something. I know my family doctor can't do that and I can't drive to her office cause it's five hours away, so I would use VTAC for that." (P5). Despite these challenges,

residents recognized the importance of having a family physician who is familiar with their medical history, emphasizing the significance of care continuity: "I like it that I have a doctor who knows me and for managing my

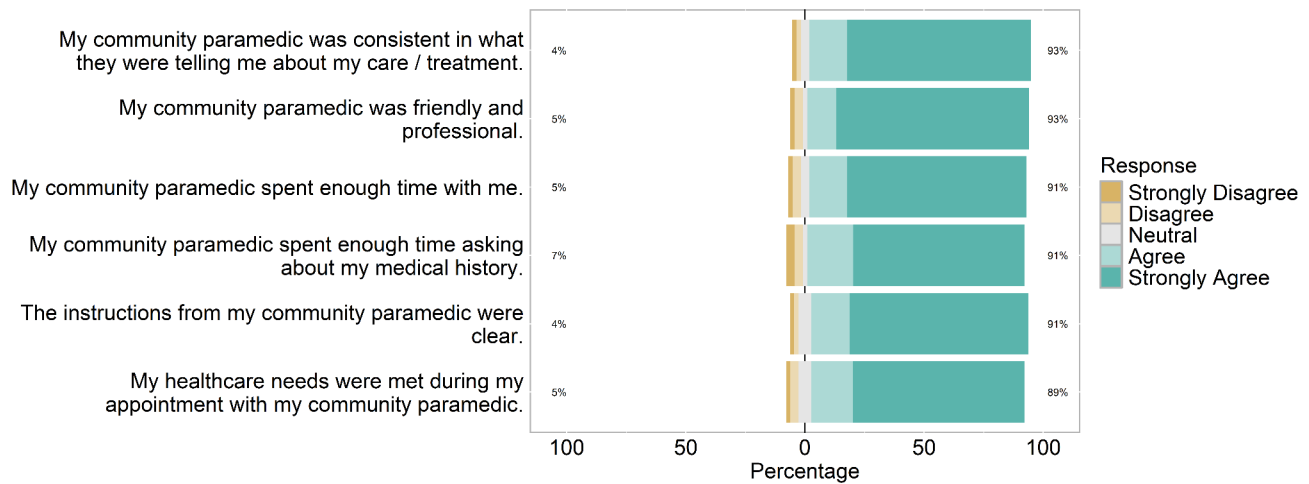


Fig. 5 Likert-scale survey responses: patient experience with in-person paramedic appointments

thyroid over the years, or managing my like family building, conception, pregnancy stuff, like I can do all that with her..." (P6).

Accessing VTAC

Participants reported various motivations for utilizing VTAC. Many compared VTAC to a virtual walk-in clinic and utilized the program's services for non-urgent matters, including seeking medical advice, acute episodic care, and assistance with managing chronic conditions, including medication review and prescription renewals: "I have like six prescriptions that I get renewed (through VTAC). You know, like within, you know, 36 hours I had prescriptions delivered to my door by the pharmacy." (P8).

Facilitators of access to VTAC among study participants included the ease of accessing virtual care, VTAC's fast same-day appointments, and its seamless integration with local healthcare networks. These factors ultimately led to important reductions in time, cost, and stress for participants: "... if there was no VTAC, you know, I'd be going to emergency and you know that's a, you know, \$35 cab ride there and back each time..." (P8). On the other hand, the most notable barrier to access, as pointed out by the interviewees, was related to VTAC's appointment scheduling system. This system often required residents to call early in the morning or be instructed to call back the following day, creating a considerable hurdle for timely access: "Once we called in and they didn't have any same day appointments left. So, they said that we needed to call back the next day, closer to 9:00 AM, and we would be able to get an appointment the next day" (P6). Additional barriers included challenges associated with access to care for residents lacking adequate levels of digital or healthcare literacy: "There's a lot of people who can't use virtual... Whether they have internet or don't have internet or don't have computers" (P3).

VTAC clinical care

Consistently and across all interviews, participants voiced their satisfaction with VTAC, highlighting its importance within the region: "...We moved to this area (Renfrew County) for a bunch of reasons, and one of the things we were worried about was healthcare, and whether we would be able to access healthcare [...] But VTAC... It feels like I have better access to healthcare, living way out here than I did living in the city..." (P6). The interviewees expressed high satisfaction with virtual care, acknowledging its limitations in certain situations, such as physical examinations. However, many reported that the care they received was comparable to in-person visits and improved access to care: "I think virtual is even better in a way. Like it's definitely not worse. [...] You know, I'm not waiting in a room doing nothing, or nowadays, being exposed to COVID or something like that. I can just do my own thing, and if they're 15 minutes later, or half an hour late, it doesn't matter because they just call me when they call me, and I carry on with my life. The actual care itself has been very comprehensive and just as effective as being in person." (P6). Many also emphasized the quality of virtual care provided through VTAC, which leverages a wide range of digital technologies not commonly available in a primary care setting. These include digital monitoring tools such as stethoscopes, high-resolution webcams, and the ability to upload photos: "... I had a new mole on my body, [...] and so I didn't call my family doctor because she would want to see it and I can't send her a picture of it. But VTAC is set up to receive a photograph." (P6). While participants widely appreciated the quality of care and virtual services provided by VTAC, they underscored the importance of achieving a balance between virtual and in-person consultations: "They need to see you and assess you at least once a year. I would think that would be my personal perspective and whether it be VTAC or family

doctor. I think a personal touch occasionally would be an asset if the person can get there at all.” (P2).

VTAC staff were consistently recognized for the quality of care provided, as well as for their professionalism and compassionate approach: “So, I called the practitioner, and she was very emotionally supportive, not just textbook-wise. [...] Like reflective listening, almost, rather than just pushing me along.” (P9). Participants reported multiple instances of physicians maintaining high standards in care delivery, including conducting follow-ups to address errors or for additional testing: “... They set up an appointment for follow up. And the doctor followed up [...] to say she had sort of double thought the prescription that she was giving me and sent me for more blood work and a CT scan.” (P7). Participants also noted that VTAC physicians used a humane, patient-centered approach: “They’re all very, um, patient oriented. That’s like their first, um important thing is to help you with your problem...” (P4). At times, challenges arose when VTAC physicians from outside Renfrew County had limited awareness of local resources and residents’ locations, impacting care coordination and efficiency: “The physician was not in Renfrew County, so didn’t know where I lived or what was near to me. [...] So, it was a bit like solving a puzzle with somebody who didn’t know the local resources...” (P6).

Participants described positive interactions with community paramedics and medical receptionists. Two participants mentioned having appointments with community paramedics and described the care provided as high-quality and patient-oriented: “... whenever my husband was the main patient when they would visit... [...] I get bronchitis at times, and I’d say, would you mind listening to my chest? No problem. You know, they check me out and let me check your blood pressure while I’m at it. And they gave me my flu shot as well as his. So, because they knew I couldn’t leave him unless I had someone here. So just excellent...” (P2). The same was true for medical receptionists, with patients expressing trust in their ability to make triage decisions: “The person on the phone is very knowledgeable to say whether it was something that would fall under (VTAC) [...] or if we should be going to the emergency department, and then an appointment was scheduled.” (P3).

Improving VTAC

Participants identified two main areas for improving VTAC: expanding in-person appointment options and raising awareness of VTAC services. Despite having multiple in-person Clinical Assessment Centres led by community paramedics across the county, participants noted unclear and limited access to in-person consultations with VTAC, describing the process of securing appointments as opaque: “I’m learning more now of some of the other options that are available, like the clinics and

the being seen in person. [...] like I wasn’t even aware of it when I made the calls more recently. Like that option wasn’t given to me...” (P3). Some participants were also confused about VTAC services, mistaking it for a COVID-19 clinic or an alternative to emergency 911. Similarly, some interviewees were also unaware of the full range of services VTAC offers, and were unsure about logistical details such as wait times, visit options and hours of operation: “I did not know how long to expect to wait for an appointment, whether it would be a live appointment or a phone appointment...” (P7).

Discussion

This mixed-methods study aimed to assess the experiences of Renfrew County residents with VTAC, and to identify factors that influence their satisfaction with the program. Survey data analysis revealed that participants expressed high satisfaction with all visit modalities (virtual physician, hybrid, in-person paramedic). Importantly, visit-related factors, such as issue resolution, played a significantly greater role in determining patient satisfaction than demographic factors such as age, gender, economic status or digital literacy. Qualitative interviews revealed four key themes (“Healthcare in Renfrew County”, “Accessing VTAC”, “VTAC Clinical Care” and “Improving VTAC”), underscoring a widespread perceived access-to-care crisis, affecting both unattached residents and some attached residents in Renfrew County. The findings also suggest that residents value VTAC’s accessibility, care quality, and effectiveness in meeting regional healthcare needs, while also identifying areas for improvement.

VTAC also includes an attachment arm, known as the Integrated Virtual Care (IVC), which enrolls patients to a named family physician predominantly working off-site, embedded within existing local family health teams. While VTAC aims to provide timely access to care, the IVC focuses on providing continuous and comprehensive primary care for previously unattached patients. The IVC provides team-based care through a blend of in-person, at-home, and virtual care tailored to their individual needs and preferences. Although the IVC is a part of VTAC, it was not the focus of this study, as it is currently undergoing its own independent evaluation [29, 52].

Rural healthcare challenges are well documented in Ontario [17, 20, 21]. During our study, we identified a deep-rooted access-to-care crisis within Renfrew County. On the one hand, the county has an important number of unattached residents [35], and the region lacks the required resources and infrastructure, such as walk-in clinics, to address the acute and episodic healthcare needs of this unattached population. On the other hand, residents attached to a family doctor also encounter notable barriers to accessing care. A recent report suggests

that one-third of attached patients experience difficulties accessing care [12]. In our survey, only one-in-five respondents reported being both attached to a provider and having easily accessible care. Interviews revealed that this issue could be partly due to a provider shortage, with many current providers being located outside the county, distant from patients, and overburdened – challenges that are particularly acute in rural areas. These findings suggest that the access-to-care crisis affects not only unattached residents but also a consequential portion of those formally attached to a provider.

Previous work suggests that longer travel distance contributes to “distance decay,” leading to worse health outcomes [19]. In our study, only one-third of survey respondents reported living within 5 km of the nearest hospital, with distance also being a recurring complaint during study interviews. Our findings show, however, that virtual care represents an excellent tool in response to the aforementioned challenge, especially considering Renfrew County’s widespread broadband internet access [16]. Our survey and interview results suggest that VTAC effectively diverted patients from the emergency department, with many participants indicating that their VTAC appointment could have otherwise resulted in an emergency department visit. This aligns with previous research, which found that following VTAC’s implementation, Renfrew County experienced a significant reduction in emergency department visits, a relative reduction about 75% greater than that observed in neighboring jurisdictions [27]. This context, coupled with the high levels of satisfaction and positive experiences reported in our surveys and interviews, suggests that VTAC’s mode of care delivery is a well-suited complement to the existing care delivery options in Renfrew County.

Concerns often emerge about the relationship between virtual care and digital literacy, stemming from the notion that residents with lower levels of digital or healthcare literacy may struggle to adapt to new technologies, potentially exacerbating the “digital divide” [31, 53]. However, a recent Canadian systematic review of mixed-methods studies by Ilali et al. found that older adults adapt well to telemedicine in primary care settings [54]. In line with this evidence, our survey data indicate that VTAC satisfaction is not strongly linked to demographic factors such as age or digital literacy. This may be explained by VTAC’s hybrid model, which enables in-person support for “hands-on” assessments, unlike strictly virtual programs that rely more heavily on video for conditions requiring demonstration of health symptoms. Due to this in-person support, providers can more frequently rely on phone-based consultations, a modality that minimizes the need for high digital literacy [55]. In addition, although some interviewees mentioned concerns about digital or healthcare literacy,

overall satisfaction was more closely linked to visit-related factors, including the perceived quality of care and the successful resolution of health concerns. These findings are consistent with previous research from the United States on patient experiences with virtual care [42, 56]. Furthermore, despite potential barriers related to technology skills, older residents benefit from virtual care as it reduces travel time and provides convenient access – advantages that are particularly crucial in rural areas like Renfrew County [54]. Notably, for many older adults, healthcare-related activities can consume up to 23 h per month, emphasizing the potential value of virtual care in reducing these burdens [57]. Nonetheless, additional efforts should be made to further support and educate less digitally literate residents. This could involve providing technical assistance or setting up virtual care support services at accessible locations such as libraries, pharmacies or in patients’ homes. Additionally, targeted campaigns to promote the benefits of virtual care could help increase adoption and ensure all residents can fully utilize these services [57].

A previous study by our group demonstrated high patient satisfaction with the comprehensive, team-based care delivered through the IVC program [29]. The current further shows that VTAC, with its emphasis on access over comprehensiveness, maintains similar satisfaction levels. However, patient feedback reveals a desire for expanded in-person care options. This aligns Splinter et al.’s findings that, while patients are comfortable with virtual care, they “prefer” in-person care in many contexts, particularly when physical examinations are necessary [58]. Given the limited pool of doctors in Renfrew County, offering in-person physician consultations to all VTAC patients may remain infeasible. Instead, future research could explore leveraging the county’s well-established network of community paramedics [59–61], alongside the feasibility of forming new collaborations with other healthcare providers, such as community pharmacists. The overwhelmingly high satisfaction rates with hybrid and in-person appointment modalities in our survey, combined with previous findings, support exploring said avenues [59].

VTAC’s triaging system presents an opportunity for future investigation into enhancing transparency and flexibility by offering patients options for consultation modes—phone, video, or in-person. Currently, patients have little to no involvement in this decision-making process. Additionally, interviews raised issues with VTAC’s booking system, which suggests future directions should explore alternative approaches, such as reevaluating policies on same-day appointments, or revamping the booking system by integrating an online scheduling tool, which, as highlighted in a recent scoping review, can enhance patient experience, access and information

transparency [62]. Additionally, despite VTAC's extensive efforts to increase public awareness, including the dissemination of informational postcards and posters in emergency departments [35], there is a need to continue and strengthen these efforts, particularly by clarifying VTAC's scope of practice, as many residents still perceive VTAC as solely an alternative to a 911 line or a COVID-19 clinic, despite its broader capabilities.

Limitations

Our patient-centered design, involving community partners, coupled with a mixed-methods approach, ensures that the study aligns with community needs and provides a comprehensive understanding of patient experiences with VTAC. However several limitations warrant consideration. First, the findings from the survey should be approached with caution due to sampling bias and other inherent biases associated with online surveys [63]. The virtual mode of delivery, a low response rate of 13%, and a participant demographic that does not fully reflect the broader VTAC population also introduce bias. Survey respondents were generally older, with 58% over the age of 55 compared to 54% in the VTAC population and 40% in the general Renfrew County population. The respondents were also predominantly female (70% vs. 63% in the VTAC population and 50% in Renfrew County), and notably less likely to be unattached to a primary care provider (58% unattached vs. 73% in the VTAC population and 20% in Renfrew County) [33, 35]. These discrepancies suggest that certain communities and patient groups were likely underrepresented in the study sample. Second, while survey questions were informed by prior research and co-designed with patient partners, they were not derived from validated instruments. The absence of validated questions may affect the reliability and accuracy of certain measures, potentially limiting the identification of latent variables and reducing the generalizability of findings to other contexts. Third, the interview participants were limited to individuals who engaged in virtual appointments with physicians and in-person appointments with community paramedics. While these two modalities account for the majority (92%) of VTAC appointments [36], we did not interview participants who had experienced hybrid appointments or other rare visit types, suggesting that our study did not cover all appointment modalities. Another limitation is the lack of reporting on potential unintended consequences of VTAC, as its innovative structure, reliance on virtual technology, and use of physicians from outside the county may introduce challenges that are not fully captured in this study, such as placing unintended strain on limited healthcare resources in other regions. Finally, the healthcare landscape in which VTAC operates – a publicly funded, universal healthcare system in rural Canada

– should be considered when interpreting the broader applicability of these findings. The generalizability of our findings may be limited, and direct applicability to urban or suburban settings or other healthcare delivery models that are non-universal or non-publicly funded cannot be assumed and requires further exploration.

Conclusion

This study aimed to explore the experiences of Renfrew County residents with VTAC, an innovative hybrid model of care delivery. Our findings suggest that VTAC is a service well-aligned with patient needs and perceived as a potential contributor to addressing challenges in accessing healthcare in this rural part of Ontario. Throughout the surveys and interviews, participants reported high levels of satisfaction with all visit modalities. Patients frequently outlined that VTAC enabled them to access healthcare that addressed their concerns in a timely manner. Combined with previous work by our group assessing other dimensions of the quintuple aim framework, this study suggests that VTAC can serve as a valuable blueprint for other regions facing similar challenges with a lack of attachment to primary care. Whilst ongoing assessment of the care delivered by VTAC remains important, the findings suggest a generally positive patient experience. Previous studies by our group indicate that VTAC has materially contributed to improved healthcare utilization in Renfrew County [27, 35], and we are currently conducting further research into VTAC's clinical effectiveness, compared to other ways that patients access care for concerns best managed in primary care. Meanwhile, this study demonstrates that patients' experience with VTAC is largely positive and highlights its role as a trusted healthcare provider in the region. As one participant noted, "*I just want to make sure everyone knows that it's an excellent thing.....and I'm glad to be in an area that has it.*" (P10).

Supplementary Information

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Supplementary Material 1

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Author contributions

All authors have met the necessary requirements to be listed as authors on this manuscript. AS made significant contributions to the study conception, design, acquisition, analysis, interpretation, and manuscript preparation. CP contributed significantly to the study design, analysis, interpretation, and manuscript preparation. Patient partners (DBP, KM, and MH) made significant contributions to the study conception, design, analysis, interpretation, and manuscript preparation. JF contributed significantly to the study conception,

design, interpretation, and manuscript preparation. All authors critically revised the manuscript, approved the final version for publication, and agreed to be accountable for all aspects of the work.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to the qualitative nature of the research and the necessity of safeguarding patient confidentiality, but de-identified data are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

All research conducted in this study adhered to the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2). Formal ethical approval for the study was obtained from the Montfort Hospital Research Ethics Board (REB). Informed consent to participate was obtained from all of the participants in the study. Prior to completing the survey, participants provided online informed consent. For interviews, verbal informed consent was obtained prior to the commencement of each interview. All data were securely stored. Survey responses were collected anonymously. Interview recordings were anonymized to maintain confidentiality.

Consent for publication

Not applicable.

Competing interests

JF is the medical lead of VTAC; however, he was not involved in data collection. AS and CP hold salaried positions at the Institut du Savoir Montfort, partially funded by allocations for VTAC evaluation. Patient partners (DBP, KM, and MH) received an honorarium from VTAC for their involvement in the project. There are no other competing interest to declare.

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