BMC Rheumatology

RESEARCH

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# The impact of virtual rheumatology care on patient outcomes and hospital admissions: an ambispective study

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## Abstract

**Introduction** The impact of virtual care on clinical outcomes, healthcare resources and long-term patient satisfaction will help to inform healthcare providers. We aimed to evaluate the impact of virtual rheumatology care on patients' clinical outcomes and healthcare utilization.

**Methods** Patients who had at least a phone-visit during the early-pandemic and enrolled in a previous survey were invited to attend this study. Through patient surveys and review of medical charts, patients' clinical outcomes were collected, face-to-face visits in the pre-COVID-19 era (Jan 2019, 2020) and virtual care visits (VCV) in the pandemic period (Mar 2020-June 2021).

**Results** Within 226 patients, the total number of rheumatology (median (IQR): 2 (2–3) vs. 3 [2, 3, 4], $p < 0.001$), emergency visits (19% vs. 29.3%, p:0.006) and hospital admissions (12.9% vs. 20.8%, p:0.015) due to any cause were increased during the pandemic, whereas there was no increased ER visit or admissions due to their rheumatological disease. Around 1/3 of patients reported being on more pain medication during the COVID-19-period. Failed VCV, requiring an additional in-person-visit within 60 days, was observed in 23 (8.3%) patients and 25 (3.1%) of 800 VCV. Close to 50% of the patients with failed-VCV were treated with additional steroid therapies during the pandemic.

**Discussion** Our results support ongoing VCV with no increased healthcare utilization and a low rate of failed visits. These findings suggest that virtual care is here to stay for some patients and in some circumstances, and it is important to establish algorithms for implementing it to healthcare system. Our results provide evidence to inform insurers' decision-making regarding virtual care.

**Keywords** Virtual visits, Pandemic, Patient satisfaction

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## Introduction

With the onset of the COVID-19 pandemic, most rheumatology consultations were converted to virtual care visits (VCV) [1]. Since then, many studies have highlighted the value of VCV during this period [2–5]. Most studies reported that rheumatology patients were generally satisfied with VCVs [6, 7]. Factors leading to high satisfaction included avoidance of potential infections, the convenience of scheduling, and the reduced need for travelling. Some studies have investigated the impact of VCV on clinical outcomes in rheumatoid arthritis. They reported similar outcomes using composite indices and were completed ten months to one year after the VCV [5].

Although patient satisfaction is essential and has been reported in several studies, there is a paucity of data on clinical patient outcomes. In addition, prior studies did not consider the differences between the early and late pandemic periods in terms of both patient satisfaction and the effect of disease outcome measures. The results of previous studies are promising for the ongoing incorporation of VCVs in rheumatology practice. However, the evidence on long-term patient outcomes and healthcare systems are lacking. The primary objective of this study is to evaluate the impact of VCV on patients' clinical outcomes and healthcare utilization for the number of rheumatology, emergency room visits and hospitalizations, and patients' need for additional medications for pain or corticosteroids. The secondary objective is to evaluate if patients' satisfaction with VCVs remained high beyond the first year of its implementation.

## Methods

### Study design

This is an ambispective study conducted at The Ottawa Hospital Arthritis Centre, Canada. Ambispective studies allow for the collection and analysis of both retrospective and prospective data, enabling an understanding of the different aspects of the study question. This study included two components: A retrospective chart review of patients to measure the health care utilization and a prospective survey of the same patients to understand the patients' perspective and confirm the data collected by the chart review. Human Ethics and Consent to Participate declarations have been collected from participants. Informed consent to participate was obtained from all of the participants in the study.

Ethics approval was obtained in accordance with the Declaration of Helsinki from The Ottawa Health Science Network Research Ethics Board (20210457–01 H).

### Patient selection and timelines

We previously conducted a quality improvement project in 2020, to understand patient satisfaction levels with VCV during the early stages of the pandemic [7]. The study's target population was patients with at least one VCV in rheumatology between March-16th, 2020- June-19th, 2020, when the VCV was a provincial mandate. Participants from the previous study who consented to a subsequent follow-up study and had at least one other VCV with their rheumatologist between August-2021 and May-2022 were approached to participate in the current study. Patients were excluded from this study if they had any of the following: refused to participate, did not have at least one VCV with a rheumatologist during the pandemic period, were deceased, or were initially misdiagnosed with rheumatic disease. Patients who consented received the surveys between August-2021 and March-2022, and the surveys collected until August-2022 were included in the analysis.

*Patient surveys' timelines*: Patients were asked to provide data in two terms: (1) Pre-pandemic; January-2019-March-2020; (2) pandemic (March-2020 to present – meaning when they received the survey).

*Chart review*:Patients whose surveys were received by the research team had chart reviews, also at the same two pre-pandemic and pandemic periods.

### Patient survey questionnaires

The survey questions were adapted from the 2020 QI study [7] (See supplementary file). The survey was developed in English and French and delivered to patients via telephone, email, or mail. The questionnaire included:

1. Characteristic of VCV: Number of VCV and in-person visits, and type of VZVs (phone vs. video).
2. Healthcare utilization: Number of emergency room (ER) and walk-in clinic visits and hospital admissions, (a) due to any cause and (b) due to their rheumatological disease.
3. Medication changes: If there has been an increase in their (a) immunosuppressive medications and (b) pain medications (including NSAIDs, acetaminophen, opioids, and medical marijuana).
4. Patient satisfaction: Their satisfaction levels on the VCVs, and factors that could impact the satisfaction, questions formulated based on the previous survey results Fig 1. We utilized a Likert scale from 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neither agree/disagree, 4 = agree, 5 = strongly agree).

### Chart review

A retrospective chart review of all patients who completed the survey was conducted by an investigator (TS) to collect demographic data such as age, gender, and rheumatological disease diagnosis, all ambulatory and ER visits and admissions at the Ottawa Hospital. Data corroborating the survey questions (pain and

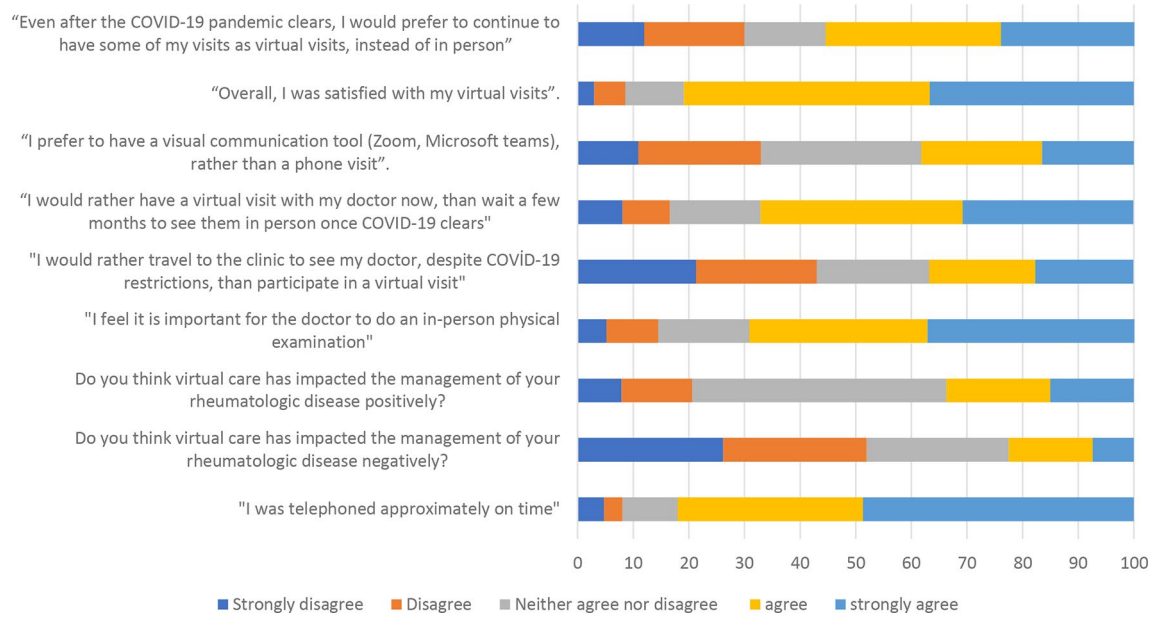


**Fig. 1** Patient satisfaction survey results with virtual care visit in the late pandemic period

immunosuppressant medications, number of hospital admissions and ER visits due to any reason and rheumatologic disease) were also collected. The analysis of ER visits before and during the pandemic was conducted using the mean number of visits across the entire group. In addition, the rate of "failed-VCVs" was identified. Failed-VCVs were defined as the VCV being deemed insufficient by the attending rheumatologist, as documented in the patient's charts, and having triggered an in-person visit within 2 months of the VCV.

### Statistical analysis

Descriptive statistics were presented as median (interquartile range- IQR) or numbers (percentages). Chi-square and Fisher's exact test, Mann-Whitney U test, or Wilcoxon signed-rank test were used to compare the groups or pre-pandemic and pandemic periods, as appropriate. To understand factors related to patient satisfaction with VCVs, we first tested independent factors (age, sex, virtual visit tool, staff vs. resident, being called on time, capability of using phone) with univariate logistic regression analysis based on our previous study; and variables with a significance of $p < 0.20$ were carried to the multivariable logistic regression model. Statistical analysis was performed using SPSS (version 22.0,IBM® corp.,Armonk, NY, USA).

## Results

### Patients' demographics and features of VCV

Among the 742 participants in our previous study, 486 consented to a follow-up survey and were approached. A total of 276 patients met the inclusion/exclusion criteria. The median (IQR) age was 67 (58–75), and 199 (72.1%) patients identified as female. The most common diagnoses were rheumatoid arthritis (37.6%), systemic lupus erythematosus (15%), vasculitis (10.9%) and psoriatic arthritis (8.4%). There were 800 VCVs (759 phone and 41 video visits) and 115 in-person visits.

### Comparison of healthcare utilization between pre-pandemic and pandemic periods

Compared to the pre-pandemic period, there was an increase in the total number of rheumatology outpatient visits during the pandemic period [median (IQR): 2(2-3) vs. 3 [2, 3, 4], $p < 0.001$], similar to the ER visits (19% vs. 29.3%, $p = 0.006$) and the rate of hospitalization (12.9% vs. 20.8%, $p = 0.015$) *due to any cause*. However, no significant change was observed in these results due to the underlying rheumatological disease Table 1.

### Pain management and modifications of immunosuppressive therapies

Approximately one-third of patients (32.7%) reported being on more pain medications during the VCV, compared to the pre-pandemic period. However, the medical records did not corroborate this, with no increase in the analgesic treatments (29.3% vs. 28.3%). Table 1 During the VCV, 55 (19.9%), 31 (11.2%), 3 (1.1%), and 2 (0.7%) of patients initiated/increased the dose of steroids, non-narcotic pain medications, opioids, or medical cannabis, respectively, as noted in their chart.

The number of patients with any treatment modification was similar between the VCV 55 (19.9%) and pre-pandemic 60 (21%) periods Table 1.

**Table 1** Comparison of healthcare utilization between pandemic and pre-pandemic period

| | Pre-pandemic Period (Jan 2019-Mar 2020) | Pandemic Period (Mar 2020- June 2021) | *p* |
|---|---|---|---|
| Total number of rheumatology outpatient visits *median (IQR)*[δ] | 2 (2–3) | 3 (2–4) | < 0.001[a] |
| ER visits due to any cause *n/N (%)*[#] | 49/258 (19) | 80/273 (29.3) | 0.006[b] |
| Walk-in clinic visits due to any cause *n/N (%)*[#] | 41/255 (16.1) | 51/275 (18.5) | 0.454 [b] |
| Hospital admissions due to any cause *n/N (%)*[#] | 34/263 (12.9) | 57/274 (20.8) | 0.015 [b] |
| Total any cause | | | |
| ER visits due to underlying rheumatological disease *n/N (%)*[#] | 10/252 (4.0) | 11/258 (4.3) | 0.867 [b] |
| Walk-in clinic visits due to underlying rheumatological disease *n/N (%)*[#] | 10/246 (4.1) | 13/265 (4.9) | 0.647 [b] |
| Hospital admissions due to underlying rheumatological disease *n/N (%)*[#] | 6/261 (2.3) | 12/270 (4.4) | 0.172 [b] |
| Total Rheum | | | |
| Increased medications for pain relief due to underlying rheumatological disease *n/N (%)*[*δ] | 78/276 (28.3) | 81/276 (29.3) | 0.778 [b] |
| Modification in csDMARD therapies *n/N (%)*[δ] | 46/276 (16.7) | 37/276 (13.4) | 0.284 [b] |
| Modification in advanced therapies *n/N (%)*[δ] | 24/276 (8.7) | 23/276 (8.3) | 0.879 [b] |
| Modification in immunosuppressive therapies *n/N (%)*[δ] | 60/276(21) | 55/276(19.9) | 0.140[b] |

ER: Emergency Room, csDMARD: conventional synthetic disease-modifying antirheumatic drugs, IQR: Interquartile range

* steroid / nonsteroidal anti-inflammatory drugs/ opioid / medical cannabis

[a]: Wilcoxon test [b]: chi-square test

# Data from patient survey, δ Data from chart review

### Failed-VCV

Failed-VCV were observed in 23/276 (8.3%) patients and 25/800 (3.1%) virtual visits. Failed VCVs led to an additional 25 in-person visits after a median (IQR) of 12(6–31) days. The demographics of patients who had failed-VCV were similar to patients without failed-VCV (Table 2). "Reasons for failed visits included the need for an injection in 7 visits (3%), a physical exam in 15 visit (5.4%), both a physical exam and injection in 2 visit (0.7%), and further assessment in 1 visit (0.4%)."

Patients with failed-VCV needed a higher number of rheumatology visits compared to patients without [median: 5(IQR:4–7) vs. 3 [2, 3, 4], $p < 0.001$]. In addition, it was observed that patients with failed-VCV had more frequent changes in csDMARD treatments and an increase in pain medications. Close to 50% of the patients with failed-VCV were treated with additional steroid therapies (Table 2).

### Patients' satisfaction with VCV in the late pandemic period

81% of patients were satisfied overall with the VCV, and 55% stated they would prefer to continue to have some VCVs (Fig. 1). In multivariate analysis, factors affecting patient satisfaction were determined as capability of using a phone [Odds ratio (confidence interval): 4.461 (1.257–15.829), $p = 0.021$] and being called on time [2.388 (1.155–4.937), $p = 0.019$] (See supplementary file).

## Discussion

In the present study we set out to determine if VCV could become part of routine rheumatology care. The success of VCV is dependent on (a) the need, (b) patients' preferences, (c) short and long-term impacts on the patients' outcomes and (d) impacts on the healthcare system. There are many facets to each of these items and we aimed to find an answer to a few.

One concern at the beginning of VCV expansion was the potential to miss disease activity (due to the lack of physical examination), resulting in more ER visits and hospitalizations [8]. Nevertheless, this was not observed in our study. The rate of ER visits or hospitalizations *due to any cause* was higher, most likely related to the coronavirus infection. However, the responders in the current study did not seek extra medical attention *due to their rheumatological diseases* during virtual care.

To understand the impact on healthcare utilization, we also investigated the frequency of failed-VCVs. Although 8.3% of patients had at least one failed-VCV, this corresponded only to 3.1% of the 800 VCVs and led to an additional 25 in-person visits. Although the overall rate of failed visits was low, we observed a disparity in patient management: patients with failed visits were more frequently treated with steroids and reported being on pain medications more frequently. Although the number of failed visits was low, the potential impacts on these individuals are concerning and must be addressed if we continue to provide VCV.

Finally, patients reporting a high level of satisfaction were high, although slightly lower at the end of the two years (81%) compared to the early stages of the pandemic (88%) [7]. It is crucial to recognize which patient demographics are unlikely to be satisfied with VCV. The capability of using a phone and being called on time were the only two parameters that impacted the satisfaction levels in our cohort. While the VCVs enable fast care, technical illiteracy can be a significant barrier affecting patients and clinicians. Thus, the success of remote care depends on overcoming these technological challenges while

**Table 2** Clinical outcomes of virtual care during the pandemic

| | | Patients with Failed virtual visit *n* (%) | Patients without Failed virtual visit *n* (%) | *P* |
|---|---|---|---|---|
| Sex | *Female* | 19 (82.6) | 180 (71.1) | 0.241[a] |
| Virtual visit type | *Only phone call* | 20 (87.3) | 233 (92.5) | 0.410[b] |
| Doctor spoken to only resident | *Only resident* | 3 (13) | 35 (14.2) | 1.00[b] |
| Capability using a telephone | *Very capable* | 18 (78.3) | 199 (79.3) | 0.991[a] |
| | *Somewhat capable* | 4 (17.4) | 41 (16.3) | |
| | *Very limited capability* | 1 (4.3) | 11 (4.4) | |
| Overall Satisfied | *Agree* | 18 (81.8) | 198 (80.8) | 0.181[a] |
| | *Neutral* | 4 (18.2) | 24 (9,8) | |
| | *Disagree* | 0 | 23 (9.4) | |
| Prefer virtual visit even after the COVID-19 pandemic | *Agree* | 13 (59.1) | 135 (55.1) | 0.936[a] |
| | *Neutral* | 3 (13.6) | 36 (14.7) | |
| | *Disagree* | 6 (27.3) | 74 (30.2) | |
| Total number of rheumatology outpatient visits | *median (IQR)*[δ] | 5 (3) | 3 (2) | < 0.001[c] |
| ER visits due to any cause[#] | | 7 (31.8) | 73 (29.1) | 0.787[a] |
| ER visits due to underlying rheumatological disease[#] | | 0 | 11 (4.7) | 0.606[b] |
| Walk-in clinic visits due to any cause[#] | | 3 (13) | 48 (19.0) | 0.587[b] |
| Walk-in clinic visits due to underlying rheumatological disease[#] | | 0 | 13 (5.3) | 0.608[b] |
| Hospital admissions due to any cause[#] | | 8 (34.8) | 49 (19.5) | 0.105[b] |
| Hospital admissions due to underlying rheumatological disease[#] | | 1(4.4) | 11 (4.4) | 1.00[b] |
| Medications [δ] | *Increased medications for pain relief due to underlying rheumatological disease** | 15 (65.2) | 66 (26.1) | < 0.001[a] |
| | *Steroid* | 11 (47.8) | 37 (14.6) | < 0.001[b] |
| | *Modification in csDMARD therapies* | 7 (30.4) | 30 (11.9) | 0.021[b] |
| | *Modification in advanced therapies* | 3 (13) | 20 (7.9) | 0.421[b] |

ER: Emergency Room, csDMARD: Conventional synthetic disease-modifying antirheumatic drugs, IQR: Interquartile range

* steroid / nonsteroidal anti-inflammatory drugs/ opioid / medical cannabis

[a]= chi-square test. [b]=fisher exact test [c]: Mann Whitney U test

+ *The comparison of patients' demographic, characteristics of virtual visits and health care utilization between patients with or without failed virtual visits during pandemic period has been given in this table*

# Data from patient survey, δ Data from chart review

leveraging its benefits [9]. The capability of using a phone can be easily incorporated into any algorithm by asking patients for information before planning VCVs. "Being called on time" certainly requires further attention, as determining the patients' satisfaction, compared to other factors investigated.

From the healthcare system's cost perspective, current evidence on the cost-effectiveness of telemedicine compared to standard care in Canada is mixed and often inconclusive. While upfront technology costs can be high, telemedicine may lead to long-term savings by reducing missed appointments and emergency visits, as well as optimizing healthcare workforce utilization [10]. Regarding the reimbursement in our setting, during the pandemic period, all virtual visits were paid the same as in-person visits, which made physicians comfortable to choose either during that period. Furthermore, currently, virtual visits are still paid at a reduced rate in our practice. However, in our results, comparing the pre- and during pandemic periods, there was an increase in rheumatology outpatient visits, emergency room visits, and hospitalizations during the pandemic, though not necessarily related to underlying rheumatic disease. This trend may reflect a greater tendency among patients to seek medical attention during the pandemic for any reason.

This study has several limitations. To avoid a recall bias, we confirmed the healthcare utilization data from two resources- patients and chart review. However, the ambispective design of the study can still not be as good as performing a prospective study to measure the rate of ER visits and hospitalizations. Also, analysis was done as the mean number of visits, and we were not able to perform a per-patient analysis. We tried to match the timelines between the pre-pandemic and pandemic periods to make a fair comparison, reflected by the first survey date. However, as the data collection lasted seven months,

the pandemic period was longer than the pre-pandemic period for a subset of patients. Regardless, not having more ER visits and hospitalizations due to rheumatological conditions with the VCVs, despite the term being longer for some patients, is more in favour of the use of VCVs. The failed-VCVs were captured through the clinic notes. It is possible that some failed visits were not documented. Due to the low number of video visits, we were unable to perform a meaningful comparison of patient satisfaction between phone and video visits. Additionally, this study lacks data on factors that may potentially affect satisfaction, such as education and socioeconomic status. Our strength is the comprehensiveness of the data collection on the impact of VCV, which includes gathering data from multiple sources and targeting multiple facets.

In summary, our research provides some reassurance that VCVs continue to be well accepted by patients in the long term without increasing the utilization of healthcare resources due to their rheumatological disease. VCVs appear to stay for some patients and in some circumstances. With the lessons learned from the rapid implementation of VCV during the pandemic, we can improve care by developing criteria to identify which patients are better candidates for VCV. Virtual care should be a shared decision between patients and treating physicians, requiring both stakeholders' approval. Our findings may help guide future decisions by insurers regarding the support of virtual care services.

Incorporating the patients' perspectives and preferences and the physicians' knowledge of the diseases and outcomes will lead to better satisfaction and outcomes. This study underlines the importance of VCV and the need for resource allocation for these types of visits in long-term rheumatology care.

**Abbreviations**

| | |
|---|---|
| VCV | Virtual care visits |
| QI | Quality improvement |
| ER | Emergency |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41927-025-00558-z.

Supplementary Material 1

**Acknowledgements**

Paula Patterson, Rokhsana Chowdhury, Urusa Shah Thanks to our research coordinator and research assistants for helping us with data collection.

**Author contributions**

Sibel Aydin, Susan Humphrey, Catherine Ivory, Nancy Maltez, and Nataliya Milman significantly contributed to the conception and design of the study. Hart Goldhar, Ummugulsum Gazel, Tommy Han, and Tara Swami were responsible for data acquisition, analysis, and interpretation. Seyyid Acikgoz and Ricardo Sabido developed the new software utilized in the study. All authors participated in drafting or making substantial revisions to the work.

**Funding**

None.

**Data availability**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethics approval and consent to participate**

Human Ethics and Consent to Participate declarations have been collected from participants. Ethics approval was obtained in accordance with the Declaration of Helsinki from The Ottawa Health Science Network Research Ethics Board (20210457–01 H).

**Consent for publication**

Not Applicable.

**Competing interests**

The authors declare no competing interests.

Received: 18 March 2025 / Accepted: 12 August 2025
Published online: 21 August 2025

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## Publisher's note