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# The rise of telemedicine in primary care: understanding patients' and healthcare workers' perspectives on acceptability of the COVID-19 remote care model

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A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

Summary Background. Remote monitoring of vital signs combined with teleconsultations has been proposed as an effective method of care for COVID-19 patients. However, the acceptability of the remote care model has yet to be explored.

Objectives. To explore patients' and healthcare workers' views and experiences with the COVID-19 remote care programme using the Theoretical Framework of Acceptability (TFA) and identify challenges for further dissemination.

Material and methods. A qualitative study was conducted with 25 patients and 5 healthcare workers from three primary care centres in Slovenia who participated in the COVID-19 remote care programme. In-depth interviews, informed by the TFA, were conducted by phone or face-to-face, recorded and transcribed verbatim. Transcripts were analysed by two independent researchers using a template content analysis guided by seven TFA domains, with the possibility of inductively adding codes from the text as needed.

Results. The remote care model proved acceptable to patients and healthcare workers in all seven TFA domains. For patients, the remote care model provided a sense of security, physician interest and the ability to detect deterioration in health early, while healthcare workers found it useful for triaging and protecting against disease transmission. However, both reported the additional burden and risk of unreliable pulse oximetry readings.

Conclusions. The remote care model proved acceptable and scalable to other respiratory diseases in primary care. Key challenges to further scaling include the complexity of system design and data sharing, the uncertain role of registered nurses and family members and the need to implement follow-up programmes focusing on self-management behaviours.

Key words: patient acceptance of health care, telmemedicine, primary health care, chronic disease, oximetry.

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# Background

The COVID-19 (Coronavirus Disease 2019) pandemic has caused widespread disruption to health systems worldwide. The rapid spread of the virus, its unpredictable course and the emergence of new variants have led to significant impacts on the functioning of healthcare organisations [1, 2].

Primary health care is often the first line of defence against infectious diseases (including COVID-19, seasonal influenza and other viral infections) and a gatekeeper for authorisation of further diagnostic procedures or hospital treatment [3]. During the COVID-19 pandemic, primary care faced challenges such as interrupted continuity of chronic care, poor communication between healthcare services, frequently changing recommendations and fewer face-to-face contacts [4, 5].

In response to the challenges posed by the COVID-19 pandemic, several primary care organisations turned to telephone consultations to ensure continuity of care while minimising the risk of infection [6, 7]. However, relying solely on remote consultation can negatively impact patient satisfaction and safety [8]. To mitigate these issues, telemonitoring has emerged as a potential solution to ensure the safety and well-being of high-risk COVID-19 patients. By remotely monitoring patients' vital signs, healthcare providers can quickly identify and respond to any changes in their condition, reducing the risk of complications and improving patient outcomes [5, 9–11].

Despite the potential benefits of telemonitoring, it is still unclear how well it is accepted by patients and healthcare providers, and there are several challenges to integrating it into primary care workflows [6, 11–13]. Previous research has not provided a comprehensive definition of acceptability and has relied on surrogate measures such as satisfaction, dropout rates, recruitment rates, protocol adherence or adverse events rather than using a comprehensive definition that has only recently been formed [13, 14].

According to the Theoretical Framework of Acceptability (TFA), acceptability is a multi-faceted construct that "reflects the extent to which people receiving healthcare intervention consider it to be appropriate, based on anticipated or experimental cognitive and emotional responses to the intervention" [14]. Acceptability encompasses more than just the patient's attitude or opinion about the effectiveness and burden but also

includes aspects such as ethics, opportunity cost and coherence of the intervention [14].

To address this knowledge gap, we conducted a qualitative study informed by the TFA to explore patients' and healthcare workers' views and experiences with the COVID-19 remote care model and to identify challenges for further scale-up in the context of other chronic diseases.

# Material and methods

# Study design

We conducted a qualitative study between September 2021 and March 2022 as part of a larger multicentre parent study investigating the effectiveness of a remote care model for CO-VID-19 patients at high risk of hospitalisation.

# **Ethic and consent**

The study received approval from the Medical Ethics Committee of the Republic of Slovenia (0120-59/2021/3) and followed the guidelines of the Declaration of Helsinki. Participants were provided with information about the study's goals and oral or written informed consent was obtained before taking part in the research.

## Study setting

The study took place in three primary healthcare centres in Slovenia (Trebnje, Vrhnika, Postojna) providing healthcare service to about 70 000 people. All three regions are considered rural, located 20-45 minutes of the nearest hospital.

### Sampling strategy

We used a purposive sampling strategy with subjects who participated in the COVID-19 remote care programme and met the inclusion criteria. Participants were invited by phone (patients) or in person (healthcare workers) and selected by age, underlying disease, gender, need for hospitalisation and healthcare centre.

Inclusion criteria for patients were: (a) participation in a remote care programme, (b) confirmed infection with SARS-CoV-2 by PCR testing, (c) mild to moderate course of COVID-19, (d) evaluated as a high-risk patient for deterioration by their general practitioner (GP), (e) being able to measure vital signs alone or by an accompanying caregiver. The inclusion criteria for healthcare workers were participation in a COVID-19 remote care programme and willingness to participate in the study.

#### **Remote care model**

High-risk COVID-19 patients were provided with a free telemedicine package, which consisted of a pulse oximeter, a detailed measurement protocol and a measurement diary. Patients were instructed to monitor and record their oxygen saturation ( $SpO_2$ ), heart rate and body temperature three times a day. A GP determined the individual critical values of vital signs and trained patients in the proper use of the pulse oximeter, advising them to contact emergency services if these values were outside the individually determined range.

During the follow-up period, patients were contacted every other day by their GP to report their vital signs and symptoms until they improved or required hospitalisation. If the readings were normal, the GP documented them in the medical record and provided additional care instructions. If the patient's condition worsened, he or she was referred to hospital.

## Data collection

#### **Theoretical framework**

The semi-structured interviews were informed by the TFA [14]. The TFA describes acceptability as a multi-faceted construct consisting of seven domains explained in Figure 1, which we adapted to measure retrospective acceptability of the remote care model.

#### Semi-structured interviews

Before participating in the study, participants were asked to give either oral consent (for phone interviews) or written consent (for face-to-face interviews) and to provide information on socio-demographic and clinical data. The semi-structured interviews with patients were conducted by phone and lasted an average of 20 minutes. The semi-structured interviews with healthcare workers were conducted face-to-face and lasted an average of 25 minutes. No external observer was present. The topic guide was informed by the TFA and included topics related to health context, measurement routine, affective attitude, change in patient–doctor relationship, burden, intervention coherence, benefits, drawbacks and suggestions for change.

Interviews were conducted by two researchers (MM, DP). MM is a medical doctor, DP is a medical student, both with previous experience in qualitative content analysis. The interviews



Figure 1. TFA domains of acceptability in the context of the COVID-19 remote care model

were audio recorded and transcribed verbatim, and the sample size was determined based on the saturation process, with 30 interviews being conducted in total. No compensation was given for the patients' nor healthcare workers' time, and they were aware of the interviewers' profession.

# **Data analysis**

The qualitative analysis was conducted using a combined deductive-inductive approach. The analysis started with a topdown approach using Template Content Analysis [15] with seven constructs from the TFA as a guide. Two coders (MM, DP) independently coded the first 10 interviews using the TFA template and added codes inductively derived from the interviews as necessary. After coding the first 10 interviews, the coders met to compare their codebooks and resolve any discrepancies, with the senior researcher MPŠ being consulted as an arbiter, if needed. Once the preliminary codebook was established, the rest of the interviews were coded. After coding 30 interviews, no new themes or sub-themes emerged, indicating that saturation had been reached.

# **Results**

# **Participant characteristics**

A total of 25 patients and 5 healthcare workers were included in the study. The mean age of the patients was  $65.8 \pm 14.2$  years, and the majority were female (15/25). The most common underlying diseases were arterial hypertension (15/25), type 2 diabetes (5/25), heart failure (5/25) and chronic kidney disease (3/25). Nearly one-third (8/25) were hospitalised due to COVID-19. All included healthcare workers were female with mean age of  $45.8 \pm 10.6$  years.

# **Qualitative results**

In the qualitative analysis, we identified 7 themes arising from the TFA framework. Within them, there were 19 sub-themes (Table 1).

Table 1. Themes and sub-themes identified in the qualitative analysis	
Theme	Subthemes
Affective attitude	<ul> <li>Reassuring effect of normal readings</li> <li>Feeling of the doctor's interest in the patient's health</li> <li>Feeling safe from transmission of SARS-CoV-2</li> </ul>
Perceived effective- ness	<ul> <li>Early detection of health deterioration</li> <li>Centralised loan of pulse oximeters</li> <li>Delayed transport to hospital</li> <li>More efficient triage of COVID-19 patients</li> </ul>
Burden	<ul> <li>Obsession with measurements</li> <li>Lack of interest of doctors in participating in the programme</li> <li>Inaccuracy of pulse oximeters</li> </ul>
Ethicality	<ul> <li>Integration into the patient's environment</li> </ul>
Coherence	<ul><li>Simple instructions</li><li>Scalability to other diseases</li></ul>
Self-effi- cacy	<ul> <li>Confidence in self-management skills</li> <li>Vertical transfer of management skills to nurses</li> <li>Disinformed patients</li> </ul>
Opportu- nity cost	<ul> <li>Burden placed on family members</li> <li>Additional time needed to train healthcare workers</li> <li>Lack of a telemedicine portal</li> </ul>

## Theme 1: Affective attitude

Patients were satisfied with the remote care programme and the free pulse oximeters that helped them manage their health during the pandemic with support from their GP. The oximeters were particularly useful for monitoring symptoms, and healthcare workers were satisfied with the programme because they felt protected from SARS-CoV-2 transmission and because they were able to triage COVID-19 patients more efficiently.

"When I had trouble breathing, I used the pulse oximeter, and the normal readings reassured me that it was not that serious" (P3, male, 53 years).

## Theme 2: Perceived effectiveness

The remote care programme was effective in practice, though some patients delayed calling emergency services due to bravery or misinterpreting pulse oximeter readings. Healthcare workers found the programme effective with the centralised loan of pulse oximeters and clear instructions. Free accessibility for all patients without charge was also cited as a factor supporting good effectiveness.

"I felt fine, but SpO<sub>2</sub> levels were low, and I was hospitalised. Without the telemonitoring package, I would have stayed at home" (P23, female, 40 years).

## Theme 3: Burden

Patients had mixed experiences with pulse oximetry during remote care, with some feeling obsessed with the readings or frustrated by inaccuracies. Healthcare workers also experienced inaccuracies and extra work. Patients found the instructions easy to follow, but healthcare workers noted a lack of interest due to workload.

"There were times when patients called that their  $SpO_2$  was low, but they actually reported their heart rate" (GP2, female, 62 years).

#### **Theme 4: Ethicality**

Patients found the remote care programme well integrated into their homes and not interfering with their values. However, in some cases, telemonitoring added burden on family members caring for the sick patient.

"Telemedicine gives you good support, but if you are really sick, you need another person to help you with the measurements" (P9, female, 84 years).

#### Theme 5: Coherence

Patients understood the remote care programme, found it easy to use and were aware of their responsibilities. Some purchased pulse oximeters for future use. Healthcare workers recognised the benefits and suggested expanding the programme to other chronic diseases once the pandemic subsided.

"I think the future lies in a combination of face-to-face consultations and remote care. Telemedicine can be a good substitute for those checks that do not require an in-depth clinical examination" (GP1, female, 51 years).

# Theme 6: Self-efficacy

Patients found the remote care programme easy to use and showed confidence in taking regular measurements and reporting them to their GPs. Some patients with chronic conditions even purchased new pulse oximeters for continued monitoring. However, some did not adhere to instructions and relied on Internet information. GPs suggested training nurses for remote monitoring and limiting consultation only to significant health deterioration.

"I read on the Internet how to treat COVID. I inhaled saline, I slept on my stomach because I saw it on TV, and I also applied horseradish to the front and back of my chest. I think I saved my life" (P7, female, 57 years).

### Theme 7: Opportunity costs

Patients reported the programme placed additional responsibilities on their family members. Healthcare workers cited limitations, such as training time and costs, and lack of a telemedicine platform for better patient follow-up.

"It would have been better if the readings were transmitted directly to the telemedicine portal. It was all done over the phone, and sometimes it was difficult to get patients on the phone" (GP1, female, 53 years).

# 4. Discussion

Principal findings and comparison with existing literature

The results of this study show that telemonitoring was considered as a highly acceptable form of remote care by both patients and healthcare workers during the COVID-19 pandemic. However, there are still some challenges to overcome in future implementation of this model.

Telemonitoring systems for remote care of COVID-19 were generally well accepted by patients [9, 16–19]. The participants in our study reported many strengths, including user-friendly instructions, increased patient safety, improved triage efficiency, early detection of deteriorating health, self-management support and protection for healthcare workers. In previous studies, telemonitoring has also been shown to be effective in reducing short-term hospitalisations among COVID-19 patients, which is an important consideration for health policy makers [20].

On the other hand, the extra burden is a significant barrier to the widespread adoption of remote care programmes in primary care [12, 13, 21, 22]. Given the shortage of GPs and limited interest in integrating new technologies and models of care, the pace of adoption can be slow. According to the diffusion of innovation theory [23], this can be partly attributed to the lack of early adopters and the fear of increased workload and reduced quality of care due to the lack of face-to-face contact with patients and GPs [24].

Previous studies reported that for good scalability, healthcare interventions need to be assessed not only for acceptability but also for feasibility and fidelity [13, 25]. Our study identified several factors that affect all three concepts, including the difficulty of the training required to use telemonitoring equipment, the measurement routine, the methods used to report the measurements, the validity of the measurement devices and the start-up costs [12, 21, 22]. Our paper-based remote care system may not be as technologically advanced as other centralised telemonitoring platforms [9, 11], but it has the advantages of low start-up costs, ease of use and comparable measurement validity, as reported by healthcare workers [26]. This makes it more feasible for widespread implementation and integration into daily practice [27].

## Implications for practice

Despite good overall acceptability, our study identified five key implementation challenges that need to be addressed to reach the full public health potential of the remote care programme.

#### 1. Reliability of self-measured oxygen saturation

In primary care,  $\text{SpO}_2$  measurements are essential to assess respiratory failure and identify the potential need for hospitalisation. To ensure that self-assessed  $\text{SpO}_2$  is accurate, a standardised method of measurement should be used [20]. One example is to check the  $\text{SpO}_2$  value after resting for 5–10 minutes. Another option is to measure  $\text{SpO}_2$  after a 1-minute sit-to-stand test, which has been shown to have high sensitivity and specificity compared to the 6-minute walk test, which is still the golden standard [28].

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#### 2. Complexity of data sharing

In primary care, where resources are limited, simple remote care models without telemonitoring platforms may be an appropriate approach to introduce the concept and motivate healthcare workers who can promote positive attitudes towards telemedicine [19, 23, 29]. While such low-tech models can be a good starting point, they may not provide the same level of patient care as more advanced telemonitoring systems [19, 25].

#### 3. Role of registered nurses

Delegation of tasks such as checking medical readings and making follow-up calls to patients by registered nurses can reduce the GP workload [10, 19]. A well-structured clinical protocol listing critical values for signs and symptoms could enable registered nurses to manage patients effectively and contact GPs only when health deteriorates [19].

#### 4. Role of family members

Involving family members in telemonitoring programmes may increase acceptability and lead to better outcomes [30, 31]. Our study and previous research showed that frail patients often relied on the help and support of family members [20, 30]. Involving family members in training programmes and educating them about self-management protocols can improve understanding and acceptance of remote care programmes, leading to better health outcomes for patients [31].

#### 5. Self-management education and follow-up programmes

A 14-day telemonitoring period is inadequate to teach patients how to manage their chronic disease. As high-risk COVID-19 patients have multiple underlying diseases [1], care should be prolonged by establishing follow-up programmes that promote self-management behaviour and ensure adherence to non-pharmacological measures in the long term.

### Strengths and limitations of the study

This study is the first to examine the acceptability of the COVID-19 remote care model in the context of the TFA framework and provides a comprehensive understanding of the paradigm under study. The study involved a heterogeneous group of patients and healthcare professionals from different centres and backgrounds, resulting in a wide range of views and experiences. However, the results should be interpreted with caution as only motivated participants were included.

In terms of transferability, the remote care model could be applied to the treatment of other acute respiratory diseases and exacerbations of chronic diseases such as asthma, COPD or heart failure. However, the results may not be directly transferable to healthcare systems that are structured differently from the Bismarck model used in Slovenia.

# Conclusions

Our study has contributed to a better understanding of the acceptability of the remote care programme among patients with COVID-19 and healthcare workers who provided care during the pandemic. While patients and healthcare workers reported good overall acceptability, we identified five key implementation challenges related to telemonitoring system design, task delegation, inclusion of family members, self-management education and establishment of follow-up programmes. We conclude that a simple, low-cost remote care model can be useful in public health emergencies requiring a quick response, but more advanced telemonitoring systems should be explored for long-term implementation.

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Tables: 1 Figures: 1 References: 31

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