Title: Remote monitoring program for patients with COVID-19 after hospital discharge: Exploring user's experience and perspectives on two telehealth platforms.

Marie-Pascale Pomey, Khayreddine Bouabida, Bertrand Lebouché, Kathy Malas, Annie Talbot, Marie-Ève Desrosiers, Frédéric Lavoie, Melissa Taguemout, Edmond Rafie, David Lessard

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Abstract

Background: As Covid-19 pandemic circumstances created the need to act to reduce the spread of the virus and alleviate healthcare services from congestions, protect healthcare providers and support them in maintaining a satisfactory quality and safety of care, Covid19 patient remote monitoring platforms quickly emerged.

Objective: This study aimed to evaluate the capacity and contribution of two different platforms' services to monitor remotely patients with Covid-19. The first is a platform of telecare calls (Telecare-Covid), and the second platform is a telemonitoring app (Tactio-Covid). The study sought to examine the differences in acceptability, usefulness, and conviviality of those two different platforms services from users' perspectives and evaluate their contribution in maintaining the quality and safety of care, and engaging patients in their care.

Methods: We performed a retrospective cross-sectional study using a survey. The data were collected through phone calls between May and August 2020. The data were analyzed using descriptive statistics, and t-test analysis. The participants' responses and comments on open-ended questions were analyzed using content analysis. The research approach through descriptive statistics allowed us to examine the differences in acceptability, usefulness, and conviviality of those two different platforms services from users' perspectives and determine their contributions to maintaining the quality and safety of care and promoting patient engagement. Whereas the content analysis of the general comments enabled the identification of certain stakes and challenges and improvements paths of the platforms.

Results: In total, 51 patients participated in the study. 18 participants have used the Tactio-Covid platform and 33 participants have used the Telecare-Covid platform. Overall, the satisfaction rate regarding the quality and safety of the care services provided through the two platforms was 80%. Over 88% of users on each platform considered the services offered by the two platforms as engaging, useful, convivial, and meet their needs. The survey identified very few significant differences in users' perceptions regarding certain aspects on each platform. The survey identified four well-appreciated domains by the platforms' users: (1) the ease of access and the proximity of care teams, and (2) the conviviality of the platform features (3) the continuity of care, and (4) the multitude of services. Certain stakes and limits such as the importance of maintaining human contact and confidentiality have been also identified and suggestions for improvement have been formulated.

Conclusions: This study provided preliminary evidence suggesting that the two remote monitoring platforms were well-received by users by users with very few significant differences between users' experience and perspectives over the two platforms.
This type of program can be considered in a post-pandemic era and for other post-hospitalization clienteles. To maximize

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Abstract

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This type of program can be considered in a post-pandemic era and for other post-hospitalization clienteles. To maximize efficiency, the areas for improvement and the issues identified should be considered in a patient-centered manner.

Keywords: Covid-19, remote-monitoring, telehealth, telemonitoring, user experience, evaluation, survey.

Introduction:

Background:

The coronavirus disease (Covid-19) pandemic, caused many tragic effects and has been seriously testing the response capacity of the health systems around the world in times of crisis [1,2,3,4]. During the first wave that started early in March 2020, and with the absence of effective vaccines and therapies to treat SARS-CoV-2 infections, lockdown, physical distancing, and quarantine measures have been adopted and generalized to minimize the impact and slow the spread of the disease waiting for the vaccine to be developed, approved, and effective at the end of 2020. [1,2,3,4]. However, these measures have generated certain negative impacts on healthcare users [1,2,4,5]. These effects include difficulty in accessing care, isolation, anxiety, and depression, which affect both patients and their loved ones but also healthcare professionals, having a negative impact on health outcomes and the quality of care provided [1,4.5]. To counter these effects and maintain a high level of quality of care services, health systems had to innovate and develop new models and intelligent remote care strategies through the use of technological platforms [2,6,7,8,9,10,11,12,13]. In fact, early during the first wave of Covid-19, various mobile health (mHealth) apps were rapidly developed tackling the virus. Telehealth platforms, mobile health apps, and several digital telemonitoring devices and telecare programs have been presented as promising solutions and reliable technological methods in several studies [6,7,8,9,10,11,12,13]. Thus, it is been suggested that telehealth platforms, thanks to their telemonitoring/telecare capacities and remote monitoring modalities can provide patients with practical and timely access to care [6,7,8,9,10,11,12,13].The telehealth operational modalities and thanks to the specific design of their features may offer asynchronous communication, collecting and tracking data, but also obtaining real-time clinical feedback which is well suited for patient remote monitoring process [6,7,8,9,10,11,12,13,14]. Thus, health technology experts and healthcare leaders suggest that the telehealth platforms can help to facilitate the continuity of the care process and provide considerable support for the organization and administration of care services in the current pandemic circumstances [6,7,8,9,10,11,12,13,14]. In

this context, the University of Montreal Hospital Center (CHUM), a major public University Hospital in Canada through its Center of Network Flow Optimization (CNFO) has developed and adapted two technological platforms to monitor remotely patients with Covid-19 after a visit or hospitalization discharge [15,16].

The first platform of this program is the "TELECARE calls platform" that we will be calling in this paper (Telecare-Covid). The second platform is a telemonitoring phone app called "TACTIO Platform" and we will be calling in this paper (Tactio-Covid). Depending on patients' wishes and preferences, the program offers to patients with Covid-19 when obtaining their discharge, the choice to be remotely monitored through the services of the telecare calls platform (Telecare-Covid) or the services of the Tactio platform (Tactio-Covid). The Telecare-Covid platform is a clinical follow-up system made of 24/7 phonecalls lines dedicated to Covid-19 patients to communicate their clinical symptoms to the nurses who assess the patients' clinical information received through the follow-up calls. Whereas the Tactio-Covid platform is a telemonitoring phone app downloadable on Android and iOS smartphone systems. Over the Tactio-Covid platform, patients can enter and submit twice a day their symptoms and clinical information. Then Patient's symptoms are gathered, processed, and assessed automatically by the platform system. If the platform system identifies a deterioration in the patient's health condition, a nurse will be directly notified and calls the patient to check their symptoms and further evaluate the situation with the doctor and the medical team members. For both platform systems, if the situation requires an urgent intervention, a transfer to the hospital is offered by the call center staff dedicated to the platform and made up of nurses, residents, and doctors accessible by phone and working 24/7 [15,16]. Before referring patients to the remote monitoring platforms, certain selection criteria are considered including the health condition of patients and its evolution with Covid19 disease, ability to use the platform, as well as their preferences, and motivation to use the platform. Therefore, on the basis of these criteria that CNFO’s nurses involved in the management of the remote monitoring program identifies potential users among the patients with Covid19 discharged from the hospital. Then, a CNFO’s nurse presents and explains the modalities of the functioning of the two platforms to the patient, and when a patient confirmed their interest in using one of the platforms the care team provides patients with the necessary tools and information on how to use the chosen platform.

Although the operating methods of the two remote monitoring platforms are different, they have nevertheless been developed and adapted to achieve the same goals to provide: 1) Safer return home to patients who are medically stabilized but at risk of decompensation by guaranteeing their regular clinical follow-up and continuous remote monitoring during 14 days; 2) Emotional support to reduce the isolation and anxiety of patients by connecting them to clinical teams, but also to their loved ones; 3) Medical safety net to reduce the risk of SARS-CoV-2 eclosions within the care services; 4) Improve workflows and reduce congestion of care services exacerbated by the pandemic through better control of unnecessary visits to healthcare facilities; and 5) eventually, to maintain a good level of quality and safety of care.

Objectives:

The objectives of this study are 1) to evaluate the capacity of the two platforms to guaranty a high level of quality and security of care, to engage patients with the platforms, and the capacity of utilization and platforms conviviality; 2) to identify the differences between the platforms and the factors that lead patients to choose one platform more than another; 3) to explore the patients' perception of the added value of those platforms; 4) to identify the necessary improvements related to the use of the platforms from patients perspectives.

This study received ethical approval from the Research Ethics Committee (ECR) of the University of

Montréal Hospital Research Center (CRCHUM) (CER-CHUM: 20.040).

Method

Study design:

A retrospective cross-sectional study [17,18,19,20,21,22] was conducted using a survey with Covid-19 patients remotely monitored through the two platforms. In order to achieve the study objectives, and assess the aimed dimensions, we used three validated questionnaires [23,24,25] that we adapted to the Covid19 context t to evaluate patient perception on the following dimensions:

1) Quality and safety of care (access, safety, relevance, timeliness, etc.) [23];
2) Patient engagement and partnership (participation, collaboration, trust, empathy, recognition, relationship with the care team, etc.) [24];
3) Telehealth platforms utilization capacity (conviviality, usefulness, problems encountered, etc.) [25];
4) And, also to specify the socio-demographic characteristics of Covid19 patients using the two platforms. [24].

A questionnaire of twenty questions categorized into 5 sections, made of questions rated through a 5-point Likert scale (1 - strongly disagree to 5 - strongly agree), and multiple-choice questions, and a general comments section was administrated to the patients (see table 1). Through the general comments section, participants were invited to share perspectives about their experience with the platform. In fact, the General comments helped us identify what participants appreciated or not when using the platform. This also allowed us to identify certain important stakes and factors that lead patients to choose one platform more than another one. Certain suggestions for improving the platform users' experience have been formulated through the general comments section.

Table 1: Dimensions and elements studied by the questionnaire

Sections / Dimensions	Questionnaire Items / Attributes
Demographic characteristics of users [24]	Gender
	Age
	Geographic area
	Situation at home (living alone or with another person)
Perceptions of the quality and safety of care [23]	Availability and access to a member of the care team at all times
	Pertinence and frequency of the care received
	Consideration of the psychological impacts of the care received by the care team

	Support and consideration of the patient by the care team
	Satisfaction with the quality and safety of the care received through the platform
Perception of engagement in care and the relationship with the medical team [24]	Information received on the health condition and care
	Information given and communicated to healthcare teams on the health condition
	Engagement in care and partnership with the care team
	Patient participation in decision-making related to care
	Decision making according to the patient's needs and preferences
	Trust link with the health care team
	Importance of the information received and shared between the care team and the patient
	Empathy expressed between patient and healthcare team
	Recognition of the patient's experience with the disease by the healthcare team
Perception of platforms utilization capacity (usefulness, conviviality, problems) [25]	Services offered by the platform are useful and meet the needs of users
	Conviviality and problems encountered while using the platform
General comments (Optional)	Additional comments and suggestions on utilization experience in general (improvements, issues, concerns, etc.)

Recruitment of participants:

The selection criteria to recruit the participants were all patients infected with SARS-COV2 registered on the CNFO remote monitoring program who used at least one of the two platforms for 14 days after their hospital discharge between April to June 2020.

Data collection:

The data were collected remotely between May and August 2020. After their consent, participants were invited to complete the questionnaire through a scheduled phone call with a member of the research team. Then, the data collected were entered and recorded in the CHUM's secure “REDCAP” computer system [26] designed specifically for surveys and quantitative data collection and processing.

Data analysis:
Data collected through questionnaire were subject to descriptive and t-test statistical analysis using SPSS (Statistical Package for the Social Sciences) information processing software [17,18,19,20,21,22]. We used descriptive statistics in order to describe in a summative and complete way the data of the 4 evaluated dimensions and to identify the real positive or negative trends of the results [17,18,19,20,21,22]. Through this analysis technique, we arrived at a description of some central trends (mean, median, standard deviation (SD)) of the participants' perspectives on certain aspects of using the platforms. In order to examine if there are significant differences in user experience perspectives between the two platforms, the comparison between patients' responses on each dimension of each platform has been conducted using a t-test. Thus, this processing allowed us to extract and structure the results in a synthetic form associated with certain figures and descriptive tables to facilitate results reading and comprehension.

General comments collected in the last section of the questionnaire were transcribed verbatim and analyzed using content analysis through the QDA Miner qualitative data analysis software [21,22]. Overall, we used a quantitative design approach of the study with only general comments being processed from a qualitative perspective [19].

In sum, data analysis was conducted concurrently with data collection to allow for an iterative approach. Also, the data analysis was jointly conducted by all the research team members to ensure a high level of validity using inter-researcher's triangulation strategy [17,18,19,20,21,22]. Interim reports and presentations were also communicated to participants and actors involved in the development, deployment, and use of the platform (clinicians, managers, volunteers, etc.). These exchanges, helped us to strengthen the validity of the analysis allowing our interpretations to be compared to those of the participants.

Results

The details regarding the number and rate of participation in the study are presented in Table 02.

A total of 85 patients with Covid19 diagnosed or hospitalized at the CHUM during the period of April to June 2020 agreed to register and use the remote monitoring program proposed by CNFO after their hospital visit or discharge. 65 patients (76.4%) used the Telecare-Covid platform services and 20 patients (23.5%) used the Tactic-Covid telemonitoring platform services.

In total, 51 patients (participation rate 58,8%) participated in the study: 18 participants have used the telemonitoring app Tactio-Covid (participation rate 90%) and 33 participants have used the Telecare-Covid platform (participation rate 53%) (See table 2).

Table 2: Number and rate of use and participation

	Platform users			***Survey participants***		
	Total	*Telecare-Covid*	*Tactio-Covid*	***Total***	*Telecare-Covid*	*Tactio-Covid*
Number (n)	**85**	65	20	**51**	33	18
Rate (%)	**100**	76,4	23,5	**60**	53	90

Users Demographic:
Overall, the average age of the participants was 52 years (SD = 13.5) and ranged from 24 to 90 years old. 28 participants were female (54.9%) and 23 were male (45.1%). The majority of users live in Montreal (76.4%) and live with at least one person (72.5%) (See table 3). By comparing the two

platforms users' demographic characteristics, even though there is a numerical difference, statically no significant difference was recorded considering t-test (p-value <0.05) for independent samples. We found no significant differences in users' demographic characteristics distribution between the two platforms at a confidence level of 95%.

Table 3: Users Demographic

Characteristics	Total	*Tactio-Covid*	*Telecare-Covid*	*P-value*
Patient gender n, (%)	**n=51, (%)**	**n=18, (%)**	**n=33, (%)**	
Female	28 (54,9)	9 (50,0)	19 (56,0)	0,746
Male	23 (45,1)	9 (50,0)	14 (44,0)	0,746
Age groups n, (%)	**n=51, (%)**	**n=18, (%)**	**n=33, (%)**	
20 - 39	10 (19,6)	4 (22,2)	6 (18,1)	0,957
40 - 59	28 (54,9)	8 (44,4)	20 (60,6)	0,515
60 or +	13 (25,4)	6 (33,3)	7 (21,2)	0,475
Mean	52	52	52	0,950
Median	52	56	50	-
Minimum	24	35	24	-
Maximum	90	65	90	-
SD	13,5	10,9	15,4	-
What region do you live in n, (%)	**n=51, (%)**	**n=18, (%)**	**n=33, (%)**	
Montreal	39 (76,4)	13 (72,2)	27 (88,8)	0,203
Lanaudière	6 (13,2)	4 (22,2)	2 (4,0)	0,126
Laval	3 (5,8)	1 (5,5)	2 (4,0)	0,490
Montérégie	2 (3,9)	0 (0,0)	2 (4,0)	-
Composition of your household n, (%)	**n=51, (%)**	**n=18, (%)**	**n=33, (%)**	
I live alone	14 (27,4)	4 (22,2)	10 (30,3,)	0,625
I live with someone	37 (72,5)	14 (77,2)	23 (69,7)	0,625

Perceptions of the quality and safety of care:

More than 80% of the participants completely agreed that their perception of satisfaction with the dimension of the quality and safety of care of the services provided on the two platforms was very positive (see figure 1). Overall, participants were satisfied with the quality and safety of care received through both platforms (M = 4.65 / 5, SD = 0.78). The majority of participants agreed that they: received care at the prompt time on both platforms (M = 4; 60/5, SD = 1.00); had access to a member of the care team at all times (M = 4.26/5; SD = 1.17); that medical staff was available to support them with their health condition (M = 4.77/5; SD = 0.72). They also declared that on both platforms the medical team has considered the impact of the provided treatments and services on their psychological state (M = 4.32 / 5, SD = 1.23) (see table 4).

Besides the overall response rate, when comparing participants' responses' means specific to each platform, two attributes show statistically significant differences when considering the t-test for independent samples (p-value <0.05). For two items, "Overall I am satisfied with the quality and safety of the care I received" and "I feel like I received care at the right time", responses' mean were significantly higher on the Tactio-Covid platform than on the Telecare-Covid platform (See table 4).

Figure 1. Perception of the quality and safety of care

Table 4: Mean and SD relative to the perception of quality and safety of care (overall and specific to each platform)

Attributes	Total		*Tactio-Covid*		*Telecare-Covid*		*p-value*
	Mean	SD	Mean	SD	Mean	SD	
One or more health professionals are available to support me regarding my health condition	4,77	0,72	5,00	0	4,80	0,50	0,057
Overall and generally, I am satisfied with the quality and safety of the care I received	4,65	0,78	5,00	0	4,44	0,96	0,008*
I feel like I received care at the right time	4,60	1,00	5,00	0	4,44	1,26	0,003*
The care team considered the psychological impact of the treatments I received	4,32	1,23	4,70	1,42	4,52	1,33	0,724
I had access at all time to a member of the care team	4,26	1,17	4,80	0,63	4,20	1,15	0,059

*Difference statistically significant ($p < 0.05$)

Perception of engagement in care and the relationship with the medical team:

The perception of engagement in care and the relationship with the medical team was also very well rated by the participants (see figure 2). The attribute "I gave important information about my condition or my care to the care team" can be considered the attribute which received the highest rating with 83.7% and without any participant in disagreement, as shown in figure 2. Overall participants reported, feeling confident with the medical team through the two platforms (M = 4.67 / 5, SD = 0.75) and have participated in decision making related to their care (M = 4.29 / 5, SD = 1.09). They believe that through the two platforms, they were able to communicate important information on their health condition (M = 4.85 / 5, ET = 0.42) and they also received important information on their health condition and on the provided treatments (M = 4.24 / 5, SD = 1.14). For the rest of the attributes of this dimension, they all got an average greater than 4.24 and an SD that is between 0.90 and 1.02 as seen in Table 5.

When comparing responses' means specific to each platform, only one attribute showed statistically significant differences when considering the t-test for independent samples (p-value <0.05). In fact, the attribute "The care team showed empathy towards me" responses 'mean was significantly higher on the Tactio platform than on the Telecare platform (See table 5).

Figure 2. Perception of engagement in care and the relationship with the medical team

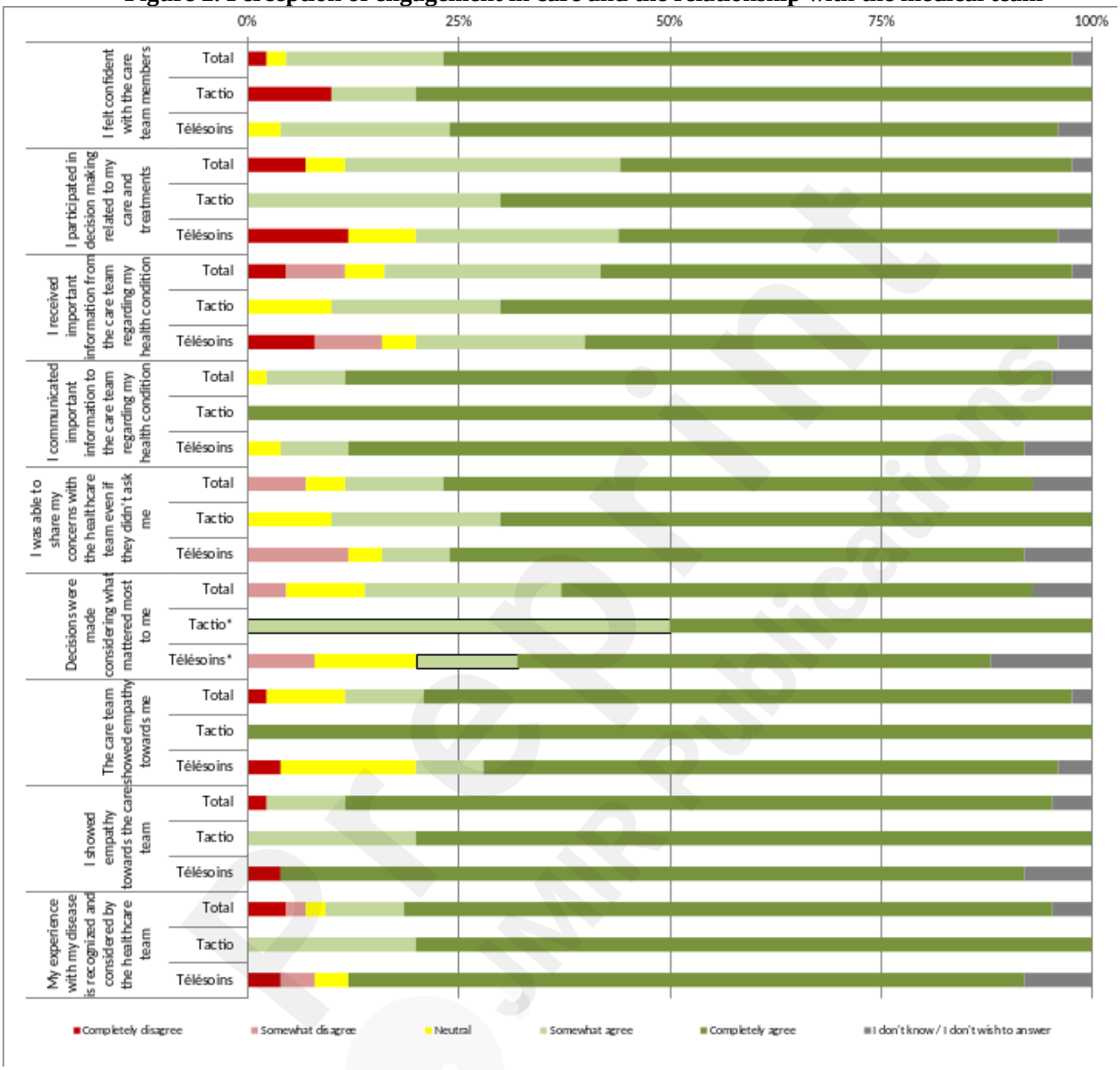

Table 5: Mean and SD relative to perception of engagement in care and medical team (overall and specific to each platform)

Attributes	Total		*Tactio-Covid*		*Telecare-Covid*		p-value
	Mean	SD	Mean	SD	Mean	SD	
I felt confident with the care team members	4,67	0,75	4,50	1,27	4,76	0,60	0,412
I participated in decision making related to my care and treatments	4,29	1,09	4,70	0,48	4,16	1,37	0,095
I received important information from the care team regarding my health condition	4,24	1,14	4,60	0,70	4,20	1,35	0,384
I communicated important information to the care team regarding my health condition	4,85	0,42	5,00	0	4,92	0,57	0,664
I was able to share my concerns with the healthcare team even if they didn't ask me	4,55	0,90	4,60	0,70	4,56	1,12	0,917
Decisions were made considering what mattered most to me	4,40	0,87	4,50	0,53	4,52	1,12	0,958
The care team showed empathy towards me	4,62	0,85	5,00	0	4,48	1,08	0,025*

I showed empathy towards the care team	4,80	0,68	4,80	0,80	4,92	0,86	0,679
My experience with my disease is recognized and considered by the healthcare team	4,59	1,02	4,80	0,42	4,72	1,10	0,826

*Difference statistically significant ($p < 0.05$)

Perception of the usefulness and conviviality of the platform:

Overall, the results of this dimension's evaluation show that 90.9% of participants who use the Telecare platform and 88.9% of those who use the Tactio platform consider that the services offered by the two platforms are useful and respond to their needs (see figure 3).

Moreover, 87% of users of the Telecare platform say they have encountered no problem while using it, while this was reported by 61% of participants who used Tactio platform services. The main problems that were encountered include the difficulty of using technology and the lack of training (16.7%), the fear of lack of confidentiality (11.1%), and the difficulty of access to smartphones (5.6%) (see Figure 4).

Besides the overall response rate, we did not identify any statistically significant differences when considering the t-test for independent samples (p-value <0.05) when comparing the type of problems encountered on each platform (Table 6).

Figure 3. Perception of the usefulness and usability of the platform

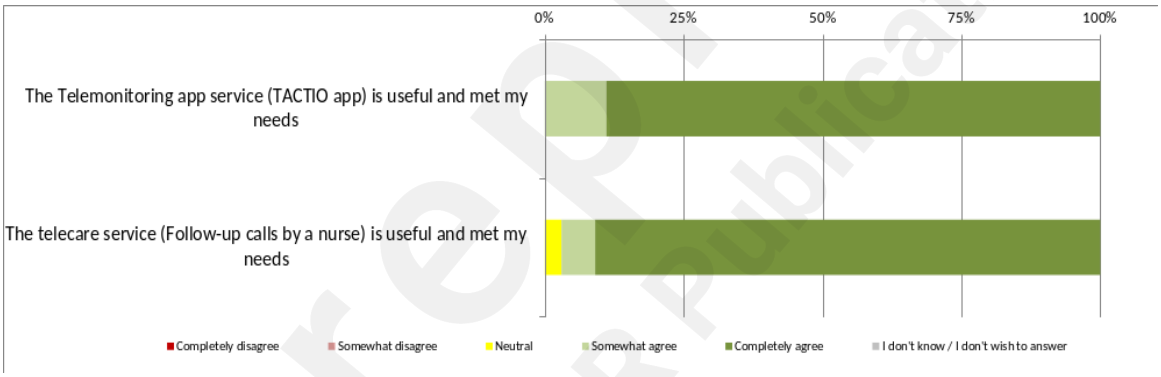

Figure 04. Type of Problem encountered in using the platform services

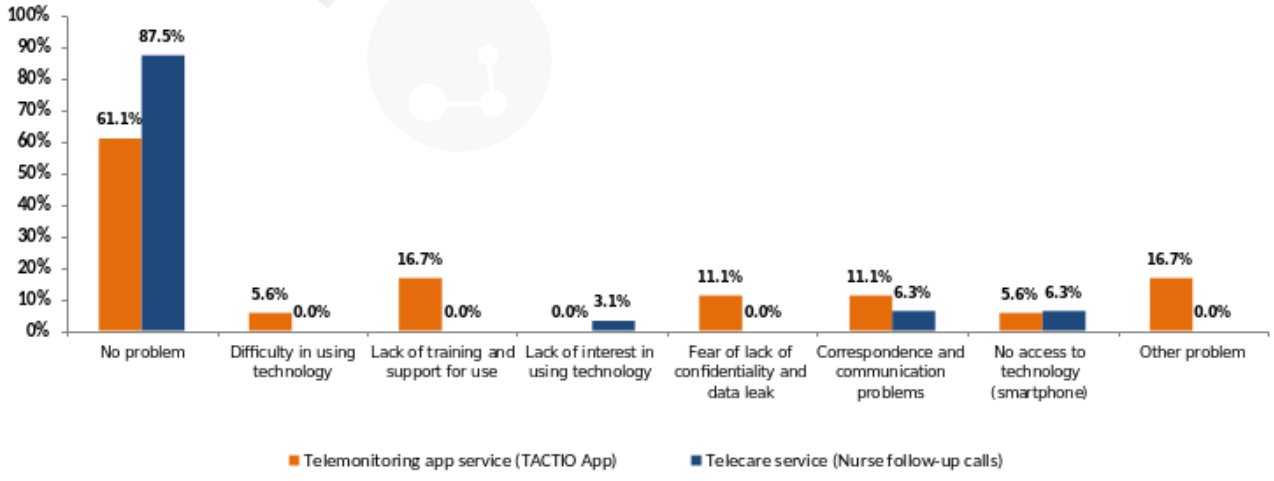

Table 6. T-test result and comparison of the types of problems encountered when using the two platforms (no

significant statistical difference recorded)

Problem Type	p-value
No problem	0,078
Difficulty in using technology	-
Lack of training and support for use	-
Lack of interest in using technology	-
Fear of lack of confidentiality and data leak	-
Correspondence and communication problems	0,625
No access to technology (smartphone)	0,941
Other problem	-

Note: (-) means no comparison possible i.e., this category is not used in the comparisons because its proportion is equal to zero.

General comments results:

Among the 43 participants who have completed the general comments section of the survey, 27 participants have used the telemonitoring platform Tactio-Covid and 15 participants have used the Telecare-Covid platform. The analysis of the content of the comments allowed us to identify: what the patients liked when using these platforms; what needs improvement; and what are the concerns or stakes.

What is appreciated?

Whether for users of the Tactio-Covid platform or for users of Telecare-Covid, we identified four main features as very appreciated by the majority of participants. The first appreciated feature is the ease of access to services and proximity to medical team members. The second identified is the continuity of care and clinical monitoring from the hospital to the home. According to some participants, the monitoring of the evolution of patients' health conditions in a continuous process and even if it is done remotely gave them a great serenity to face the concerns about the deterioration of their health condition once they get home. The third appreciated feature identified relates to the practicality and conviviality of the two platforms, in particular, the dynamism and playfulness of the Tactio-Covid platform. The fourth theme identified is the multitude of services offered over the two platforms, in particular psychological support services. The participants highly appreciated that both platforms have psychological support services. Certain participants especially those who live alone, consider that the availability of the psychological support service through the remote monitoring platforms reassured them and help them reduce their feeling of isolation and anxiety due to the collateral effects of the quarantine.

What needs improvement?

Although most of the feedback and comments were generally positive, nonetheless, some participants identified areas in which actions should be taken knowing that these are roughly the same areas presented earlier in figure 4. The difficulty of accessing or possessing smartphones and the lack of training on their use was emphasized by a small number of participants who used the Tactio-Covid platform. As for people with chronic health problems and/or a particular medical history, they wish to see platforms' services better suited to their realities and their clinical profiles. Finally, some participants request services that are a little faster and more responsive in terms of waiting time during their communication, correspondence, and remote interaction process with the care team over the two platforms.

What are the stakes?

The general comments and feedback also allowed us to identify certain issues with the two platforms, particularly a couple of ethical dilemmas. Participants shared with us their concerns regarding humanization of care i.e. maintaining human contact in care, data security, and confidentiality. Indeed, some participants mentioned that despite the competence of the medical teams and the good quality of care offered through both remote monitoring platforms, the human

aspect was sometimes missing. Some participants consider that the monitoring has been provided to them in an innovative, virtual, and even sophisticated manner but less traditional and with low human contact, which has reduced its human property. As for the issue of data security, some participants mentioned they feared for their confidentiality and required more clarity and guarantees regarding their data transmitted and shared via virtual platforms so that they can feel completely secure.

For each domain identified above, some participants' quotes are illustrated in the following table (see table 7).

Table 7: Examples of comments relative to the identified domains

		Comments
Domains appreciated	1	*“I had quick access to the nurse through the telecare service”. P*17* *“The follow-up services over the app were easily accessible and I felt very close to the Medical team”. P**21*
	2	*"It's wonderful the continuity of services even after hospitalization”. P*11* *“on the TACTIO app we have the impression of having a doctor or a nurse by our side constantly and continuously, which reassured me a lot". P**23*
	3	*"I found the nurse follow-up calls (the telecare platform) very easy to use." P*34* *"The concept of the Tactio platform is great and the app is very easy to use." P**43*
	4	*"Telecare services was fantastic, it was really beyond my expectations and II had access to several services including psychological follow-up, and I even had access to psychiatrist through this platform." P*10* *“On the Tactio I had access to a whole team, a nurse, neurologist, and even psychiatric”. P**38*
Domains for improvement	1	*“The app was on my daughter's phone, I had a lot of trouble using the service, especially since I don't have a smartphone and I'm not trained on how to use the app. My daughter used to enter my data on her phone”. P39***
	2	*"sometimes, there were long response times". P**03* *"the waiting time for my request to be processed after I entered my data was very long." **P24*
	3	*“I received information about my health condition and symptoms with COVID19 but I didn't receive information related to my clinical history and my other health problems”. P*27* *"It would be interesting to integrate more specific functionalities for monitoring COVID patients with specific clinical profiles such as those who have undergone surgery, pregnancy, immunosuppressants, etc. ". **P15*
Domains of stakes	1	*"I really would have liked the doctor to be closer to the patient, and not just on the phone". P*06* *"The care team was competent but honestly I believe it lacked human contact, sometimes I would have liked to speak directly with the nurse or medical team member rather than using the TACTIO app." P16*
	2	*"It is not very comfortable and reassuring to share certain information through a phone call". P*36* *"I am worried about my confidentiality and I fear the lack and leak of data." P**28*

P*: Participant who used Telecare-Covid platform.
P**: Participant who used the Tactio-Covid platform.

Discussion

Principle findings:

In the era of Covid-19, hospitals have become testing grounds for innovation to reconnect Covid-19 patients with care teams, while improving patient flow and minimizing healthcare providers' exposure facing a serious pandemic and difficult work circumstances. We have chosen a survey approach to study the contribution of two different platforms designed and adapted for the remote monitoring of patients with Covid19. From the point of view of the users, we evaluated the user experience of certain dimensions and aspects on both platforms. Overall, the study findings were encouraging and the dimensions evaluated have shown a very remarkable level of appreciation on both platforms. The questionnaire inquiry suggests that users' perception of the quality and safety of care offered through the remote monitoring platforms, in general, was very positive. Therefore, we assume that the two platforms have contributed to maintaining a satisfactory level of quality and safety of care provided remotely. Likewise, users' perceptions of their relationship with the medical

team and their engagement in care, and despite being offered remotely, was still favorable. Moreover, the majority of the participants of the two platforms affirmed that the remote monitoring services meet their needs and they have not encountered any problems during use which demonstrates the usefulness and conviviality of both platforms.

The general comments corroborate these conclusions and, they have allowed us to identify and better understand the most valued and appreciated areas of both platforms. The fact that the majority of participants appreciated the ease of access and the proximity of care teams, the continuity of care, the features' conviviality, and the multitude of services offered through the platforms, illustrates the concrete and undeniable positive contribution of the two remote monitoring platforms.

Regarding the interpretation of the results specific to each platform, it should be noted first that the remote monitoring program shows a clear preference for using the Telecare-Covid Platform over the Tactio-Covid platform. Although the two platforms use two different remote monitoring modalities, the survey results did not show a lot of significant differences in participants' perceptions of the dimensions assessed on each platform. Nevertheless, there are a few differences in users' perceptions regarding a couple of aspects of each platform. More specifically, the results suggest that perception of the quality and safety of care as well as of engagement in care and relation with the medical team was slightly better among the users of the Tactio-Covid than among those who used the Telecare-Covid platform. In contrast, the users' perception of the usefulness and conviviality was slightly better among participants who used the Telecare-Covid platform than among participants who used the Tactio-Covid platform. In addition, participants who used the Telecare-Covid platform declared encountered fewer problems compared to participants who used the Tactio-Covid platform.

Although the feedback on the experience of using the two platforms' services was generally positive and favorable, some domains need improvement such as training and access to technology but also the customization of the platforms with further clinical profiles. Above all, there are also a couple of ethical dilemmas to consider. The first ethical dilemma identified in this study is the importance of maintaining human contact when providing care according to certain participants. Secondly, data leaks risks and the question of confidentiality remain a real concern to some users. In order to maximize efficiency and optimize the users' experience on the platform, the recommendations provided by the participants and issued from our analysis would be useful in this regard.

In sum, the results of this retrospective study represent the platforms’ contribution during the first wave of the pandemic. Those results provide new information on how we can use technological platforms to support health systems in the continuity of their services but also in maintaining the quality and safety of care even in extraordinary health contexts. Finally, it should be noted, that those platforms were not initially designed for the monitoring of Covid19 patients. It was, in reality, a multidisciplinary virtual platform that existed long before the pandemic. But to quickly respond to the need to intervene and support care services and maintain good quality and safety of care, it was decided to develop and adapt the existing platforms in a very short timeframe to remotely monitor Covid19 patients. So, besides the encouraging results that we recorded, we also would like to highlight at the end of this discussion the success of the decision-making and technical transformation process which allowed us to better exploit the two platforms in order to quickly respond to urgent needs in a short time.

Suggestions for improving:

Regarding the improvement of the technical and practical aspects of the platforms, we suggest: 1) Promote access to smartphones by offering, for example, telephone loan services and formally training patients in the use of the platforms through the introduction of simplified tutorials or

demonstrative capsules; 2) Develop an administrative mechanism to boost responsiveness and reduce the waiting time to correspondences and requests of patients; 3) Develop and adapt the platforms' content to covid19 patients with chronic diseases and integrate more clinical profiles on the platforms to provide a specific, more customized, and less generic follow-up process.

We believe, that the most important aspect of improvement is not technical or practical, but ethical. In fact, the aspect of maintaining human contact in care and the issue of confidentiality and data security seems to be real ethical dilemmas that we don't have much certitude about how we should deal with. Nevertheless, on this particular aspect, we recommend opening discussions and consultations with patients, the public, experts in public health, ethics, technology, and politics in order to address these issues in a transparent and democratic deliberative process. Finally, research should be promoted and studies that focus on those particular issues should be facilitated and supported.

Comparison with prior work:

This study contributes modestly to enrich and deepen the knowledge already available in the literature in the field of telemedicine and telemonitoring in general but in particular on the impacts and the challenges of using such modalities in an extraordinary context such as that of the Covid19 pandemic.

In the literature, we find several studies that suggest the positive impact of the use of telehealth platforms, in particular on the aspect of the quality and safety of care [6,7,8,9,10,11,12,13,14]. The positive impact on the aspect of acceptability, the usefulness, and conviviality of technological tools and devices used in telehealth platforms have been also demonstrated in several clinical fields, notably in long-term care, mental health, oncology, etc. And of course, recently and since the beginning of the 2020 pandemic, this is more and more studied, tested, and demonstrated in the Covid19 clinical context [27,28,29,30,31,32]. Therefore, our study comes to align with those multiple studies to corroborate their findings especially those related to the two aspects highlighted earlier. However, what is special about our study and what distinguishes it apart from other studies that we may find in the literature on this particular topic, is the innovative aspect of patient engagement and the partnership with the medical team that we have assessed. In fact, the dimension of patient engagement and partnership with the care team through remote monitoring platforms so far has not been evaluated in any study in the context or clinical setting of Covid19.

Finally, the ethical dilemmas and stakes that we raised in our study have been often highlighted in several studies related to telehealth, and telemonitoring of patients, whether in studies linked or not to the context of covid19 [33,34,35,36,37].

Strengths and limitations:

The current study has certain advantages. Several stakeholders, researchers, and experts in the field supervised or were involved in the study. Our intervention has been rigorously developed and innovative by nature. There is also the very original character of this study, knowing that the program of remote monitoring platforms and its evaluation were quickly planned and conducted early during the first wave of the Covid19 pandemic. However, we assume that we have caught some limits in our study. First, the study was a single-center, and our design did not include a control group, i.e. patients with Covid19 who were not monitored remotely. Studying the perspectives of patients who did not use the remote monitoring platforms would have been very interesting and this could have supported much more our main findings. Also, we did not study all the 85 users registered on the two remote monitoring platforms. So, we consider that 51, the size of the whole sample that we were able to study on the two platforms was kind of average. Thus, the two sub-samples specific to each platform

that we studied were not equal and that may be resulting in an additional source of bias, and limitation to the generalizability of our study findings.

Conclusion

The feedback and participants' perspectives explored were positive. This study provided preliminary evidence suggesting that the two remote monitoring platforms evaluated were useful, convivial, and well-received by users with no significant difference between users' experience over the two platforms. The two modalities of follow-up can be used for other post-hospitalization clienteles. Therefore, this type of program can be considered even in a post-pandemic era. Finally, to maximize efficiency, improve usability, and achieve results that are even greater than those recorded, the areas for improvement and the issues identified need to be considered in a patient-centered manner.

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Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.
Conflicts of Interest: None declared.

Conflicts of interests: The authors declare that they have no competing interests.

Abbreviations:
CHUM: University of Montreal Hospital Center
CRCHUM: Research Center of the University of Montreal Hospital Center
CNFO: Center of Network Flow Optimization
ECR: Research Ethics Committee

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