ORIGINAL REPORT

HOME-BASED TELEREHABILITATION FOR COMMUNITY-DWELLING PERSONS WITH STROKE DURING THE COVID-19 PANDEMIC: A PILOT STUDY

Carl FROILAN D. LEOCHICO, PTRP, MD[1–4 *], Edgardo MIGUEL V. AUSTRIA, MD[1 *], Maribeth ANNE P. GELISANGA, PTRP[1], Sharon D. IGNACIO, MD[1,2] and Jose ALVIN P. MOJICA, MD, MHPEd[1]

From the [1]Department of Rehabilitation Medicine, Philippine General Hospital, University of the Philippines Manila, Manila, [2]Department of Physical Medicine and Rehabilitation, St Luke's Medical Center, Global City, [3]School of Medicine, St Louis University, Baguio City, Philippines and [4]Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ontario, Canada

**Joint primary authors*

Objectives: **To determine the feasibility and safety of use of asynchronous telerehabilitation for community-dwelling persons with stroke in the Philippines during the COVID-19 (SARS-CoV-2) pandemic, and to evaluate the change in participants' telerehabilitation perceptions, physical activity, and well-being after a 2-week home-based telerehabilitation programme using a common social media application.**

Design: **Pilot study.**

Participants: **Nineteen ambulatory, non-aphasic adult members of a national university hospital stroke support group in the Philippines.**

Methods: **Pre-participation screening was performed using the Physical Activity Readiness Questionnaire. The participants were medically cleared prior to study enrollment. They then engaged in telerehabilitation by watching original easy-to-follow home exercise videos prepared and posted by the study authors on a private group page on Facebook™ every other day for 2 weeks. Descriptive statistics was performed.**

Results: **All 19 participants (mean age: 54.9 years) completed the programme with no significant adverse events. The majority of subjects improved their telerehabilitation perceptions (based on the Telepractice Questionnaire), physical activity levels (based on the Simple Physical Activity Questionnaire), and perceived well-being (based on the Happiness Scale).**

Conclusion: **Asynchronous telerehabilitation using a common low-cost social media application is feasible and safe for community-dwelling persons with chronic stroke in a lower-middle-income country.**

Key words: healthcare delivery; telehealth; telerehabilitation; COVID-19; stroke; lower-middle-income country; social media.

Accepted Apr 20, 2023

J Rehabil Med 2023; 55: jrm4405

DOI: 10.2340/jrm.v55.4405

Correspondence address: Carl Froilan D. Leochico, MD, Department of Rehabilitation Medicine, Philippine General Hospital, University of the Philippines Manila. E-mail: cdleochico@up.edu.ph

LAY ABSTRACT

The COVID-19 (SARS-CoV-2) pandemic led us to find alternative ways to connect patients and healthcare providers despite physical distance. For instance, telerehabilitation via available telecommunication technologies can be used to provide consultation and therapy services to persons living with disability. In resource-limited countries, such as the Philippines, telerehabilitation was not widely practiced prior to the pandemic, due to several factors, such as lack of acceptance and high costs. This pilot study demonstrates the feasibility, effectiveness, and safety of telerehabilitation using a common low-cost social media application for patients with chronic stroke. Nineteen adult members of a stroke support group safely completed a 2-week telerehabilitation programme by watching original easy-to-follow home exercise videos posted on a private group page on Facebook™. The majority of subjects had positive experiences with the programme, and had improved perceptions of telerehabilitation, physical activity levels, and perceived well-being after 2 weeks.

Telerehabilitation remains an underutilized technology in the practice of rehabilitation medicine in the Philippines, a lower-middle-income archipelagic country in Southeast Asia, despite the potential of telerehabilitation to overcome the barriers of distance, costs, and limited healthcare resources (1, 2). Stakeholders (e.g. patients, healthcare providers, policymakers) have apprehensions about the use of telemedicine in general due to concerns about feasibility, data privacy, safety, cost-effectiveness, and evidence, among others (3, 4). To date, telerehabilitation has limited evidence for specific patient populations.

Studies show that stroke survivors are prone to recurrent stroke and cardiac disease (5). A modifiable risk factor common to these diseases is physical inactivity, which may be prevalent during the home quarantine period due to coronavirus disease 2019 (COVID-19) (SARS-CoV-2). The cornerstone of prevention of

cardiovascular events among stroke survivors is the combination of appropriate pharmacological and non-pharmacological treatment, including rehabilitation (6). However, during COVID-19 measures, outpatient centre-based rehabilitation was restricted for a time in many healthcare settings worldwide, especially in resource-limited areas.

As an alternative to centre-based rehabilitation, telerehabilitation could be used to promote physical activity among community-dwelling persons with stroke while at home, using a common social media application. According to a systematic review, home-based rehabilitation should be the trend in providing rehabilitation for people with stroke living in the community (7). However, the included studies used various interventions and lacked data on adverse events and experiences of stakeholders.

Mobile device ownership and internet use have increased in the Philippines in recent years (8). The Philippines is known as the social media capital of the world; Filipinos across different demographics primarily use the internet to access various, mostly free or low-cost, social media platforms (9). This pilot study leverages available and relatively inexpensive telecommunication technologies to support the health maintenance of community-dwelling persons with stroke, mainly through asynchronous (i.e. store-and-forward) telerehabilitation. The aim of this study was to determine the feasibility and safety of a short-course telerehabilitation programme for a stroke support group in the country's national university hospital. The study also determined any change in the participants' perceptions of telerehabilitation, physical activity level, and perceived well-being after the 2-week intervention, and their telerehabilitation experiences and recommendations. These data could potentially contribute to the growing body of evidence on the use of this emerging rehabilitation technology, especially in resource-limited countries, such as the Philippines, wherein telerehabilitation was neither accepted nor implemented widely pre-pandemic (2, 10).

METHODS

This was a pretest-posttest study approved by the University of the Philippines Manila Research Ethics Board (number: 2020-412-01). Inclusion criteria were: age $\geq$18 years; stroke survivor; members of the Rehabilitation Medicine Stroke Support Group at Philippine General Hospital; internet access at home; non-aphasic; community ambulant. Exclusion criteria were: unable to personally complete an online form to provide consent; no adult companion at home to ensure safety during exercises.

Pre-intervention

Individual pre-participation screening, using the Physical Activity Readiness Questionnaire and medical evaluation, was administered by a rehabilitation medicine resident and consultant through a video-based teleconsultation. Only participants medically cleared for exercise were deemed eligible and oriented to the study accordingly. They then provided their clinicodemographic information and baseline responses to the following: Telepractice Questionnaire, Simple Physical Activity Questionnaire (SIMPAQ), and Happiness Scale. Subsequently, each patient and their adult companion were taught simple self-monitoring and safety measures, such as obtaining the blood pressure (when a home device was available), heart rate, respiratory rate, and Borg's rate of perceived exertion.

Intervention

All participants commenced the telerehabilitation programme on the same day. They were asked to watch on Facebook™ using their available gadget and follow the same set of home exercises demonstrated in original videos, which were newly recorded and uploaded by the authors every other morning for 2 weeks. Adapting the recommendations of the American Heart Association for stroke survivors (5), the exercises consisted of flexibility (stretching), strengthening (using make-shift weights readily available at home), aerobic (involving large-muscle activities), and neuromuscular (balance) programmes. They were made simple and easy-to-follow, mostly consisting of calisthenic exercises. Appendix S1 contains more details about the exercises. Each video contained step-by-step exercise demonstrations, along with precautions and safety measures. The participants were instructed to perform the exercises on their own for 30 min every other weekday (for a total of 6 sessions) at their most preferred time (supervised as needed by an adult companion) and indicate their completion after each session in the private group chat. For clarifications regarding the exercises or any related untoward events, the participants could message or call the telerehabilitation team at any time. They could also utilize a private group chat to interact with them and their fellow participants.

Post-intervention

After 2 weeks, the participants were interviewed again using the same questionnaires they answered at baseline. In addition, they were asked about their telerehabilitation experience and recommendations.

Outcome measures and statistical analysis

To determine the telerehabilitation perceptions of participants and compare them at baseline and

post-intervention, we adapted the validated 6-item Telepractice Questionnaire (11), which we translated to Filipino in consultation with a language professor and telerehabilitation experts. Higher per-item and overall summative scores indicate better perception and acceptance of telerehabilitation.

The SIMPAQ is a short clinical physical activity measurement tool that can be administered within 3–8 min (12). It evaluates combined physical activities across different domains (e.g. sleep time; leisure time; home-related activities; walking/exercise and sedentary periods), providing a snapshot of a 24-h period in the past 7 days. The methods of asking and computing for the duration of each activity were standardized by adhering to the SIMPAQ instruction manual (12).

Lastly, well-being was assessed using the validated Happiness Scale, answerable with any number from 0 to 10, with 10 being the happiest (13). All data encoding and descriptive statistical analysis were performed on Microsoft Excel for Mac (version 16.70, Microsoft 365, Redmond, Washington, USA).

RESULTS

Nineteen out of 50 members of the Rehabilitation Medicine Stroke Support Group met the eligibility criteria. Table I shows a summary of their clinicodemographic profile. All participants had chronic stroke with ictus from 1999 to 2015 and were community ambulant.

Prior to the COVID-19 lockdown in Manila, the majority (58.8%) of subjects had attended centre-based physical therapy sessions at least once a week. Some (11.8%) had stopped attending their sessions due to travel and therapy expenses before the pandemic. Nonetheless, 82.4% performed some form of physical activity at home (e.g. walking, stretching, home chores/errands). During the COVID-19 lockdown, however, 76.5% continued exercising at home, while others did not, due to various reasons (e.g. not motivated; not supervised; did not know what exercises were safe).

The majority (82.4%) preferred to use Facebook™ to engage in telerehabilitation, due to availability and ease of use, while the remainder preferred to use YouTube™. None of the patients preferred using Telegram™, WhatsApp™, Viber™, Twitter™, Instagram™, or other platforms.

Prior to telerehabilitation, the participants generally felt neutral about the quality of virtual care compared with in-person care (Table II). After 2 weeks, however, the majority of subjects had highly favourable telerehabilitation perceptions. In terms of physical activity, improvements were observed in all 5 SIMPAQ domains post-intervention (Table III). Of note, the mean days per week that the participants exercised improved from 2.5 to 5.6 days per week, and their sedentariness decreased. Regarding their happiness level, the mean score of participants improved from 7.4 ± 2.1 to 8.8 ± 1.8. Even after the study period, some of the participants continued to perform the exercises and remained active in the group chat, motivating or reminding their fellow stroke survivors to exercise.

Furthermore, there was an increasing trend in the participants' adherence to the telerehabilitation programme over time. Only 14 participants were able to exercise during the first session, but there was complete attendance during the fifth and sixth sessions. The reasons for missing a session included: family problems; feeling unwell post-vaccine; knee

Table I. Characteristics of the participants (N = 19)

Characteristics	All participants Mean (SD)
Age, years	54.9 (11.6)
Sex	
Female	7 (36.8)
Male	12 (63.2)
Civil status	
Single	4 (21.1)
Married	9 (47.4)
Civil union	1 (5.3)
Separated	2 (10.5)
Widow/er	3 (15.8)
Place of residence	
Manila City	11 (57.9)
Outside Manila City	8 (42.1)
Current behaviours	
Smoking	0 (0.0)
Alcoholic beverage drinking	3 (15.8)
Number of stroke episode/s	
1	14 (73.7)
2	2 (10.5)
3	3 (15.8)
Duration of stroke (since first episode for multiple strokes), years	13.8 (6.0)
Type of cerebrovascular disease	
Haemorrhagic	3 (15.8)
Infarct	14 (73.7)
Unrecalled	2 (10.5)
Active comorbid conditions	
Arthritis	6 (31.6)
Bronchial asthma	2 (10.5)
Heart disease	3 (15.8)
Diabetes mellitus	5 (26.3)
Hypertension	17 (89.5)
Renal disease	3 (15.8)
Level of ambulation (based on Functional Ambulation Category)	
Category 4: independent ambulator on level surfaces only	2 (10.5)
Category 5: independent ambulator on all surfaces	17 (89.5)
Attendance to in-person physical therapy sessions prior to COVID-19 lockdown	
Compliant (< 2 absences)	15 (78.9)
Non-compliant (> 2 absences)	2 (10.5)
No physical therapy	2 (10.5)
Reason/s for not being able to go to in-person physical therapy sessions:	
Blood pressure spikes	1 (5.3)
Forgot schedule	1 (5.3)
Occasional headache	1 (5.3)
Limited fund for transportation	1 (5.3)
Rehabilitation centre was under renovation	1 (5.3)
Work	1 (5.3)
Not applicable (no difficulty at all)	13 (68.4)

SD: standard deviation.

Table II. Participants' perceptions on telerehabilitation based on the Telepractice Questionnaire before and after the 2-week telerehabilitation programme (N = 19)

Participants' perceptions	Before Mean (SD)	After Mean (SD)
1. I am comfortable with telerehabilitation.	4.3 (1.1)	4.7 (0.7)
2. I think consultation and exercises through telerehabilitation have the same quality as in-person.	3.4 (1.1)	4.3 (1.1)
3. I am comfortable using my preferred gadget (such as mobile phone) for telerehabilitation.	4.1 (1.2)	4.3 (0.7)
4. The audiovisual signal in telerehabilitation is satisfactory.	4.3 (0.7)	4.8 (0.5)
5. Telerehabilitation is convenient for me.	4.2 (0.8)	4.7 (0.6)
6. I would recommend telerehabilitation to a friend.	4.3 (0.7)	4.7 (0.6)

1.00–1.80: strongly disagree; 1.81–2.60: disagree; 2.61–3.40: neutral; 3.41–4.20: agree; 4.21–5.00: strongly agree.

SD: standard deviation.

Table III. Participants' physical activity level based on the Simple Physical Activity Questionnaire before and after the 2-week telerehabilitation programme (N = 19)

	Duration, mean (SD)	
Participants' physical activities	Before	After
1. Overnight time in bed, h	8.7 (1.8)	7.5 (1.7)
2. Daytime sedentariness or napping		
a. Sedentary time per day, h	7.1 (4.6)	6.8 (4.6)
b. Napping time per day, min	43.7 (59.6)	32.4 (43.3)
3. Time spent in walking		
a. Days per week with walking as exercise or leisure, day	5.1 (2.5)	5.7 (1.9)
b. Walking time per day, min	37.1 (27.5)	69.7 (52.1)
c. Walking time per week, h	3.1 (2.0)	6.8 (6.3)
4. Time spent in exercise		
a. Exercise days per week, day	2.5 (2.8)	5.6 (1.8)
b. Exercise per day, min	35.0 (50.3)	58.4 (38.2)
c. Exercise time per week, h	2.7 (4.6)	5.2 (4.8)
5. Time spent on vocational and domestic activities per day, h	4.0 (3.9)	3.5 (4.4)

SD: standard deviation.

pain; other commitments; hypertensive episode prior to exercise. Throughout the intervention period, only 1 participant had an untoward event (myalgia), which was mild and transient. No significant technical difficulties were reported. Table SI summarizes the participants' telerehabilitation experiences and recommendations.

DISCUSSION

Telerehabilitation is a feasible and effective service delivery model for providing ongoing rehabilitation care to persons with physical, cognitive, and/or social impairments (14). The use of telerehabilitation increased from necessity during the COVID-19 pandemic, leading various healthcare settings to be more resourceful and innovative. This study exemplifies how telerehabilitation using familiar low-cost technologies can positively impact persons living with stroke despite limited resources.

The Stroke Support Group of the Department of Rehabilitation Medicine in the national university hospital of the Philippines is a non-profit organization established nearly 2 decades ago, comprising > 50 stroke survivors, who assist each other to become healthy and productive individuals amid their disability. Their regular in-person activities, such as group therapy sessions and social gatherings, were suspended due to COVID-19. However, through telerehabilitation, the participants in this study were able to reconnect among themselves in an enjoyable and interactive way, despite their physical distance. The remote telerehabilitation team not only provided technical assistance when needed, but also acted as a virtual coach to each participant, ensuring their safety, progress, and motivation.

Stroke remains one of the leading causes of long-term disability worldwide. Survivors are often deconditioned in the acute phase of stroke and thereafter may be predisposed to a sedentary lifestyle. This situation worsened because of stay-at-home policies: the Philippines had one of the longest COVID-19 lockdowns, and, in addition, social isolation may negatively affect people's overall well-being.

Despite the increasing number of stroke telerehabilitation studies, including a Cochrane review suggesting that telerehabilitation is not inferior to in-person therapy, the field is still emerging (15). A recent systematic review identified different challenges influencing stroke telerehabilitation delivery and recommended strategies to overcome them, such as through: "adequate training and technical infrastructure; shared learning and consistent reporting of cost and usability and acceptability outcomes" (16). In the Philippines, wide-scale implementation of telerehabilitation is hampered by several human, organizational, and technical factors. Scepticism or resistance to overcoming the long tradition of in-person healthcare, a lack of clear national telehealth policies, and unstable internet connectivity were found to be the most common barriers that need to be considered when re-evaluating and rebuilding telerehabilitation capacities amid and beyond the pandemic (2). The current study found that participants generally improved their telerehabilitation perceptions after a 2-week trial, suggesting that the scepticism is reversible. Using a familiar mobile application that also does not entail too much internet cost and bandwidth may be a pragmatic solution. The caveat, however, is its inherent data privacy risk, making it unideal for telemedicine. Nonetheless, we minimized this risk in the current study by performing telerehabilitation asynchronously (i.e. watching recorded exercise videos) rather than synchronously (i.e. live videoconferencing), and by properly

orienting the participants on risk-mitigation measures (e.g. avoiding taking screenshots of chats and posting them on social media) and obtaining their consent.

This study had several limitations: small sample size; recruitment bias (i.e. participants who agreed to join the study were mildly impaired and probably the ones who were anyway motivated to exercise); lack of longer follow-ups (i.e. duration of intervention effects was uncertain); and lack of generalizability of findings. Nonetheless, the data that this study gathered will hopefully contribute to the limited evidence of low-cost telerehabilitation from resource-limited countries and catalyse larger-scale studies with more robust methodologies. Incorporating educational infographic materials, asynchronous exercise videos, and private group chats for social interaction and technical and clinical support seemed to yield positive results across different biopsychosocial health-related outcomes. Such preliminary findings appear to be consistent with those of a pilot test performed in the USA, wherein the authors found that a home-based telerehabilitation programme was a viable treatment for patients with chronic stroke (17). However, the methods employed in the current study were not as advanced or elaborate as in the US study, given that our pilot test was performed with limited resources and in the context of the COVID-19 pandemic. Large-scale studies on telerehabilitation are necessary to further explore the experiences of other stakeholders across various demographics and health conditions using more secure and standard telerehabilitation protocols. Based on the experiences and recommendations of the current study participants, we also suggest the following: individualized telerehabilitation programmes customized to each patient's needs; a mix of synchronous and asynchronous sessions (i.e. synchronous sessions can give real-time feedback on exercise performance); a telerehabilitation starter kit containing a user manual, vital signs monitoring equipment, and multi-purpose exercise gadgets.

In conclusion, the COVID-19 pandemic catalysed and continues to enhance the awareness of stakeholders (patients, families, carers, and healthcare providers) regarding the utility of telerehabilitation for various conditions, including stroke. Whether in high- or low-income countries, telerehabilitation can be feasible and safe in overcoming barriers to in-person rehabilitation, such as distance, time, costs, staffing, resources, and even viral spread. However, we have yet to address the various challenges hindering the full potential of telerehabilitation as we move beyond its mere necessity due to the pandemic.

ACKNOWLEDGMENT

The authors would like to thank the study participants from the Stroke Support Group of the Department of Rehabilitation Medicine, Philippine General Hospital, University of the Philippines Manila for their time and enthusiasm to engage in the project. They would also like to thank the Philippine General Hospital, University of the Philippines Manila for their full financial support towards the publication of this article.

The authors have no conflicts of interest to declare.

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