The Acceptance of Stroke Telerehabilitation among Rehabilitation Providers and Consumers in Two Tertiary Hospitals in the Philippines

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ABSTRACT

Background and Objective. Telerehabilitation is the remote delivery of rehabilitation services using telecommunication technologies. Its local adoption was catalyzed by the COVID-19 pandemic, prompting the need to assess user acceptance. This study aimed to determine the acceptance of stroke telerehabilitation among patients, carers, and rehabilitation providers in the Department of Physical Medicine and Rehabilitation at St. Luke's Medical Center – Global City and Quezon City.

Methods. This descriptive cross-sectional study used purposive sampling to recruit 73 rehabilitation providers and 10 consumers. Data were collected using a self-administered survey based on the Technology Acceptance Model, covering perceived ease of use, usefulness, and behavioral intent. Descriptive and inferential statistics were used for analysis.

Results. Most providers (94.4%) were familiar with telerehabilitation, while only half of the consumers were aware of it. Acceptance was moderate among providers (mean score: 35.75 ± 8.67) and high among consumers (mean score: 31.6 ± 7.52). Female providers were less likely to accept telerehabilitation (p=0.049). Consumers identified financial constraints and lack of a companion as key barriers, while providers cited internet issues and technology use. Both groups viewed telerehabilitation positively for teleconsultation, teletherapy, and telemonitoring. Smartphones were the preferred device; Viber and Facebook Messenger were the most commonly chosen platforms.

Conclusion. Stroke telerehabilitation was moderately to highly accepted by rehabilitation stakeholders in two tertiary private hospitals in Manila. Findings may guide institutional planning for telerehabilitation services. Training, infrastructure support, and awareness campaigns can help address implementation barriers.

Keywords: telehealth, telemedicine, telerehabilitation, acceptance, stroke, COVID-19, rehabilitation

eISSN 2094-9278 (Online)
Published: April 30, 2026
https://doi.org/10.47895/amp.vi0.13081

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INTRODUCTION

As information and communications technology continues to evolve, telerehabilitation is gaining more popularity than ever before, especially amid the Coronavirus Disease 2019 (COVID-19) pandemic. Telerehabilitation refers to the use of telecommunication devices by a rehabilitation professional to provide support, evaluation, and intervention over a distance to persons with disability.[1,2] Prior studies abroad have documented the feasibility and effectiveness of stroke telerehabilitation. A systematic review done by Sarfo et al. included 22 publications from 1980 to 2017.[1] In their results, telerehabilitation was linked with positive improvements in recovery from motor dysfunctions, higher cortical deficits, and depression in all studies assessed.[1] However, key to the success of telerehabilitation lies on how it is well accepted by end-users. One theory that can be used to predict the acceptance of people on the use of a new technology is the Technology Acceptance Model (TAM) developed by Davis in 1985.[3] TAM suggests that when an individual is presented with a new technology, different variables affect their decision on how or when they will use it.[3] TAM asserts that an individual's intention to use a technology is influenced by two key variables: perceived usefulness (the belief that using the technology will improve performance) and perceived ease of use (the belief that using the technology will be effortless). The user's behavioral intention is influenced by these factors which in turn implicate the actual use of the system. TAM has been extensively used to evaluate the adoption of technology in a variety of health and rehabilitation settings.

The use of telehealth, which is defined as the use of telecommunication technologies to provide healthcare services at home, in the context of TAM has been explained in numerous studies.[3,4] The dimensions of TAM, including ease of use, usefulness, and behavioral intent (Figure 1), have been applied and validated in a psychometric testing conducted by Almojaibel et al. to assess the level of acceptance of telerehabilitation.[4] According to TAM, perceived usefulness and perceived ease of use are the major determinants of one's positive intention to use technology.[3] Rehabilitation providers perceived that telehealth was useful when it increased their productivity and improved patient care, access to care, documentation, and relationships with their patients. Telehealth could also improve the feeling of control over the patients' situations at home.[3,5] Meanwhile, Dinesen et al. reported the following telehealth benefits from the patients' perspective: better understanding of home-based rehabilitation, better relationship with the healthcare team, and increased feelings of security at home.[6]

Currently, determinants of positive intention to use telerehabilitation in stroke are still not well studied. A current search of literature showed limited studies about the intentions or perceptions of healthcare practitioners on the use of telerehabilitation. There are only a few studies in the acceptance of telerehabilitation for stroke, and they mainly evaluated patients' satisfaction. Since most of the studies published are focused on the feasibility and outcomes of telerehabilitation programs, there is limited knowledge on the acceptance of providers (physicians and allied health professionals) and consumers (patients and carers) on the use of telerehabilitation for stroke, especially in the Philippines. Studying it will not only guide future telerehabilitation endeavors, but it will also help direct solutions to appropriately address potential barriers to telerehabilitation. Learning how telerehabilitation may be adapted in the local setting is important in order to help address the perennial challenges to the usual face-to-face or in-person set-up, such as the following: missed therapy sessions and non-adherence to the rehabilitation regimen because of varied reasons; distance between house and rehabilitation center; logistics and transportation concerns for non-ambulatory patients; time constraints; financial constraints; and the lack or unavailability of carers to bring the patient to the rehabilitation center. The perceived usefulness of telerehabilitation, whether stakeholders believe it can meaningfully address these limitations and improve the delivery of stroke rehabilitation, may be influenced by these contextual challenges which directly impact patients' access to care and within the TAM may influence perceived usefulness. On top of these, the COVID-19 crisis has even further limited the access to in-person rehabilitation care because of travel restrictions, temporary closure of some rehabilitation centers, limited number of persons allowed in a center at a time, and apprehensions of persons with comorbidities to leave the house.[7]

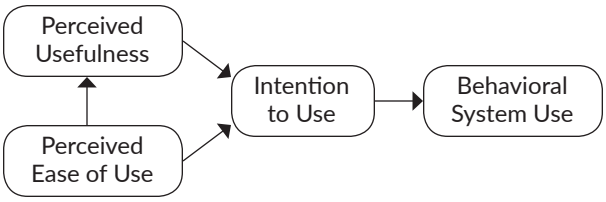

Figure 1. Study framework adopted from the Technology Acceptance Model.

St. Luke's Medical Center is a world-class, internationally recognized hospital committed to deliver state-of-the-art healthcare to a wide reach and demographic of patients. As such, it should be at the forefront of incorporating innovative solutions, such as telemedicine-related programs, among its services. However, the need to evaluate stakeholder acceptance is imperative to guide the implementation of any new endeavor. Therefore, this study generally aimed to determine the acceptance of stroke telerehabilitation among patients, carers, Rehabilitation Medicine physicians, and allied rehabilitation professionals in the Department of Physical Medicine and Rehabilitation at St. Luke's Medical Center – Global City and Quezon City (SLMC-GC and QC) at the height of the COVID-19 pandemic. The following were the specific objectives of the study:

1. To determine the level of acceptance for stroke telerehabilitation among the stakeholders (rehabilitation providers and consumers) based on their mean scores in the Technology Acceptance Model in terms of:
   a. Perceived ease of use
   b. Perceived usefulness
   c. Behavioral intent
2. To determine the association of stroke telerehabilitation acceptance with age, years of clinical experience (for rehabilitation providers), prior experience with telemedicine, and use of mobile device
3. To determine the need for stroke telerehabilitation based on:
   a. Perceived problems with in-person follow-up consultations
   b. Perceived benefits from telerehabilitation
   c. Perceived need for training in using telerehabilitation
   d. Perceived uses of telerehabilitation
   e. Perceived barriers to telerehabilitation
4. To determine which device/s and application/s would be acceptable for stroke telerehabilitation

MATERIALS AND METHODS

This study was registered and approved by the Research and Biotechnology Group, St. Luke's Medical Center – Quezon City, with registration number SL-20137.

Study Design, Period, Population, and Sampling

This descriptive and analytical cross-sectional study was conducted between two groups of participants: (1) stroke rehabilitation providers (physicians, physical therapists, occupational therapists, and speech and language pathologists in the Department of Physical Medicine and Rehabilitation at St. Luke's Medical Center – Global City and Quezon City); and (2) stroke rehabilitation consumers (patients with stroke, family members or legal guardians). This design was used to assess acceptance levels and explore associated factors among rehabilitation providers and consumers during a specific period of the COVID-19 pandemic when telerehabilitation services were emerging. The study implementation was initially planned to run for only a period of six months after obtaining scientific and ethical approval from the study institution's research board. However, data collection period was extended due to recruitment difficulties during the pandemic and took place from August 2020 to December 2021. This study employed purposive sampling with a target sample size of at least 76 patients, 76 patient's carers, and 77 rehabilitation professionals (physiatrists and therapists) to achieve the minimum sample size. To identify statistically significant associations in categorical variables, the minimum sample size was determined using OpenEpi™, with parameters set at a 95% confidence level and a 5% margin of error, based on the estimated annual outpatient stroke caseload and the number of active rehabilitation providers at the two hospitals.

Eligibility Criteria

The research encompasses rehabilitation providers and consumers according to defined inclusion and exclusion criteria. Rehabilitation providers include rehabilitation medicine physicians and allied health specialists, such as physical therapists, occupational therapists, and speech-language pathologists. Physicians qualify if they are presently affiliated as consultant staff in the Department of Physical Medicine and Rehabilitation at St. Luke's Medical Center – Global City (SLMC-GC) and Quezon City (SLMC-QC), whereas therapists must be currently employed as staff in the same department at these facilities. Individuals lacking consent are precluded from participation.

Rehabilitation clients encompass patients who had a stroke and their caregivers. Eligible patients for the study must be adult outpatients (at least 18 years old) who can complete the questionnaire, irrespective of stroke etiology, lesion location, or previous surgical procedures. They must also be arranged for in-person and/or telerehabilitation follow-up consultations or be actively receiving rehabilitation at SLMC-GC and SLMC-QC. Data collection took place during the COVID-19 pandemic, specifically from August 2020 to December 2021, when healthcare access and outpatient rehabilitation were affected by public health restrictions. Exclusion criteria encompass anyone lacking consent, those incapable of completing the survey owing to physical or psychological impairments such as inability to read, write, or comprehend, and persons who do not possess proficiency in English or Filipino. Caregivers of patients with stroke qualify if they are the legal guardians of the patient and are at least 18 years of age. Individuals are excluded if they do not give consent or are incapable of responding to the survey due to physical or psychological constraints. Both the patient and their caregiver were included in the study if they met the inclusion criteria and granted consent. Only a single caregiver per patient was included.

Outcomes Assessment

The acceptance for stroke telerehabilitation was measured using a 17-item, Likert-scale tool (based from the Telerehabilitation Acceptance Scale from Almojaibel et al.) for the rehabilitation providers (Appendix A), and a 13-item, Likert-scale tool (adapted from Technology Acceptance Model) for the rehabilitation consumers (Appendix B).[4] The Telerehabilitation Acceptance Scale used in this study for rehabilitation providers was adapted from Almojaibel et al. in the context of tele-pulmonary rehabilitation. The scale content validity indexes for each of the subscales (perceived usefulness and perceived ease of use) and (behavioral intention) were 0.84 and 0.80, respectively and demonstrated evidence of content validity and face validity. Although this is not yet considered a universal gold standard for telerehabilitation

acceptance, it remains one of the few psychometrically tested tools specific to telerehabilitation and grounded in the TAM framework. The adaptation involved contextualizing item wording to reflect stroke rehabilitation scenarios (e.g., motor recovery, teletherapy). Acceptance was based on the total summative score categorized into low, moderate, or high level of acceptance.

Perceived usefulness of stroke telerehabilitation refers to the degree to which a potential user believes that using telerehabilitation is associated with clinical and other benefits. This was measured in the following items: items 1-9 in the Stroke Telerehabilitation Acceptance Scale; and items 1-7 in the adapted Technology Acceptance Model questionnaire.

Perceived ease of use of stroke telerehabilitation refers to the degree to which a potential telerehabilitation user believes that using telerehabilitation would be free of effort. This was measured in the following items: items 10-13 in the Stroke Telerehabilitation Acceptance Scale; and items 8-11 in the adapted Technology Acceptance Model questionnaire.

Behavioral intent to use stroke telerehabilitation refers to the extent to which a potential user is ready to use telerehabilitation, or the likelihood of using it. This was measured in the following items: items 14-17 in the Stroke Telerehabilitation Acceptance Scale; and items 12-13 in the adapted Technology Acceptance Model questionnaire.

Data Collection Procedure

Informed consent was obtained from each participant. Participants were informed that their responses will be kept confidential and anonymous, and that the data will be aggregated and reported in summary form only. Their participation was voluntary and they were free to withdraw at any time. The study posed minimal risk, with the primary concern being the inconvenience of completing the questionnaire. To mitigate potential bias, data collection was facilitated by researchers who were not involved in the clinical care of the participants. No conflicts of interest were declared and no financial incentives were included in the study's implementation. Data were collected using both online and pen-and-paper self-administered survey. Upon completion and explanation of the study through the informed consent form, participants completed the survey questionnaire for at least 5 to 10 minutes. The informed consent form was submitted and approved by the ethics review committee.

When the questionnaires were submitted, a research assistant screened for missing data and vague answers. Responses with erasure were clarified with the participants. Missing data, if any, were not included in the statistical analysis.

Data Analysis

In either questionnaire, responses per item were scored with numerical values as follows: 3=strongly agree, 2=agree, 1=disagree, and 0=strongly disagree. Thus, the highest possible summative score was 51 for the 17-item Stroke Telerehabilitation Acceptance Scale and 39 for the 13-item adapted Technology Acceptance Model questionnaire. The total sum of the scores was divided by 51 for the rehabilitation providers and 39 for the rehabilitation consumers. The analysis for the level of acceptance was based on the study conducted by Hennemann et al., wherein they used the following parameters of measurement: low (1–2.34), moderate (2.35–3.67), and high (3.68–5.00).[8]

Chi-squared test or Fisher's exact test was used to determine the association between participant characteristics and acceptance level (low, moderate, high), while ordinal logistic regression was used to determine the effect of age, years of clinical experience, experience with telemedicine, and use of technological device on acceptance (low, moderate, high). Brant test was used to check if the proportional odds assumption for the ordinal logistic regression was satisfied in the model. A needs assessment questionnaire was also administered to both rehabilitation providers and consumers. This form consisted of items on challenges in follow-up and outpatient rehabilitation, what specific factors hinder compliance, explored perceived benefits of telerehabilitation, willingness to attend future training on its clinical applications, areas where telerehabilitation could be helpful (e.g., teleconsultation, teletherapy, telemonitoring), and barriers to its implementation. Responses were reported as frequencies and percentages.

RESULTS

A total of 73 rehabilitation providers and 10 consumers (patients or carers) participated in the study. The consumer group included both patients with stroke and their carers, who were analyzed as a single group, given their shared involvement in rehabilitation decisions and use. The low response rate of the consumer group could be attributed to a low turnout of out-patient consultations and rehabilitation, and limited in-person visits during the period of the study which took place from August 2020 to December 2021, given the COVID-19 pandemic, hence the researchers were not able to interview enough participants for the said population. The rehabilitation provider group was composed of physical therapists (70.8%), physicians (20.8%), occupational therapists (6.9%), and a speech and language pathologist (1.4%) (Table 1), while most family members composed the consumer group (70%) (Table 2). In terms of clinical experience, 84.5% of the rehabilitation providers had more than three years working in stroke rehabilitation. Meanwhile, most of the patients had their stroke diagnosis within less than a year ago (80%).

The rehabilitation providers have mostly heard of telerehabilitation (94.4%), while half of the consumer group reported to be familiar of its concept. Ninety-three percent of the rehabilitation providers and 70% of the consumer group perceived telerehabilitation as an alternative to the usual in-person physical, occupational, and speech therapy sessions. The majority have noted that their idea of telemedicine or

Table 1. Characteristics of Rehabilitation Providers (N = 73)

Characteristic	n (%)
Age, years	
<35	50 (68.5)
35-45	16 (21.9)
≥46	7 (9.6)
Sex	
Male	35 (47.9)
Female	38 (52.1)
Years of experience in providing stroke rehabilitation (n=71)	
<3	11 (15.7)
≥3	60 (84.5)
Heard of telemedicine or telerehabilitation before (n=72)	
Yes	68 (94.4)
No	4 (5.6)
Idea of telerehabilitation	
Phone consult (n=67)	51 (76.1)
Video consult (n=72)	72 (100)
Alternative to in-person follow-up (n=68)	68 (100)
Alternative to physical, occupational, and speech therapy (n=69)	64 (92.8)
Others (n=1)	1 (100)
With experience in telemedicine	
Yes	34 (46.6)
No	39 (53.4)
Profession (n=72)	
Physicians	15 (20.8)
Physical therapists	51 (70.8)
Occupational therapists	5 (6.9)
Speech and language pathologists	1 (1.4)
Type of telecommunication device owned	
Mobile phone	62 (84.9)
Laptop/ desktop computer	61 (83.6)
Tablet	64 (87.7)
Others	0 (0)

Table 2. Characteristics of Rehabilitation Consumers (N = 10)

Characteristic	n (%)
Age, years	
<35	3 (30)
35-45	0 (0)
≥46	7 (70)
Sex	
Male	5 (50)
Female	5 (50)
Years elapsed since diagnosed with stroke	
<2	8 (80)
2-4	0 (0.0)
>4	2 (20)
Relationship to patient	
Caregiver	0 (0)
Family member	7 (70)
Friend	0 (0)
Not applicable, patient is the respondent	3 (30)
Heard of telemedicine or telerehabilitation before	
Yes	5 (50)
No	5 (50)
Experience with telemedicine	
Yes	4 (40)
No	6 (60)
Idea of telerehabilitation	
Phone consult (n=6)	5 (83.3)
Video consult (n=7)	6 (85.7)
Alternative to in-person follow-up	10 (100)
Alternative to physical, occupational, and speech therapy (n=7)	7 (100)
Others	0 (0)
Type of telecommunication device owned	
Mobile phone	10 (100)
Laptop/ desktop computer	3 (30)
Tablet	6 (60)
Others	0 (0)

telerehabilitation involved either phone or video consultation. Less than half of both groups had prior telemedicine-related experience (46.6% of rehabilitation providers and 40% of consumers). All participants had access to a least one telecommunication device (e.g., mobile phone, laptop, desktop computer, tablet).

For stroke telerehabilitation acceptance, the mean score of the rehabilitation providers was 35.75 (SD = 8.67, 95% CI = [33.73, 37.78]), equivalent to a moderate level of acceptance (Table 3). Among the 73 rehabilitation providers, four had low level of acceptance (5.48%), 41 had moderate level of acceptance (56.16%), and 28 had high level of acceptance (38.36%). Fisher exact test showed a significant association between sex and level of acceptance (p=0.049), with female rehabilitation providers demonstrating lower acceptance levels compared to male counterparts. On the other hand, no association was found with age groups, years of experience in providing stroke rehabilitation, familiarity with telemedicine or telerehabilitation, experience with telerehabilitation, profession, and types of telecommunication device owned (p>0.05).

The ordinal logistic regression results showed that sex was associated with stroke telerehabilitation acceptance level (odds ratio = 0.3969; p=0.057; 95% CI = [0.1532, 1.0284]), suggesting that the odds of stroke telerehabilitation to be acceptable to female rehabilitation providers was 60% lower compared to male rehabilitation providers. The model, with sex as a significant factor, accounted for 3% in the explained variability of stroke telerehabilitation acceptance level (pseudo R^2 = 0.0308; chi-square p-value = 0.0533). Checking for the assumption of ordinal logistic regression, the model did not meet the proportional odds assumption (Brant test p-value = 0.000).

There was a high level of stroke telerehabilitation acceptance among rehabilitation consumers (patients and carers), as evidenced by the mean score of 31.6 (SD = 7.52,

Table 3. Association of Characteristics of Rehabilitation Providers with Stroke Telerehabilitation Acceptance

Characteristics	Low acceptance	Moderate acceptance	High acceptance	*p*-value
Age, years				0.817
<35	4 (8)	26 (52)	20 (40)	
35-45	0 (0)	11 (68.8)	5 (31.2)	
≥46	0 (0)	4 (57.1)	3 (42.9)	
Sex				0.049
Male	0 (0)	18 (51.4)	17 (48.6)	
Female	4 (10.5)	23 (60.5)	11 (28.9)	
Years of experience in providing stroke rehabilitation				0.473
<3	1 (9.1)	5 (45.5)	5 (45.5)	
≥3	3 (5)	35 (58.3)	22 (36.7)	
Heard of telemedicine or telerehabilitation before				0.317
Yes	4 (5.9)	36 (52.9)	28 (41.2)	
No	0 (0)	4 (100)	0 (0)	
With experience in telemedicine				0.260
Yes	3 (8.8)	16 (47.1)	15 (44.1)	
No	1 (2.6)	25 (64.1)	13 (33.3)	
Profession				0.449
Physicians	0 (0)	7 (46.7)	8 (53.3)	
Physical therapists	3 (5.9)	29 (56.9)	19 (37.3)	
Occupational therapists	1 (20)	3 (60)	1 (20)	
Speech language pathologists	0 (0)	1 (100)	0 (0)	
Type of telecommunication device owned				
Mobile phone	4 (6.5)	32 (51.6)	26 (41.9)	0.227*
Laptop/ desktop computer	4 (6.6)	34 (55.7)	23 (37.7)	0.842*
Tablet	4 (6.2)	35 (54.7)	25 (39.1)	1.000*
Others	0 (0)	0 (0)	0 (0)	N/A

**Type of telecommunication device owned versus not owned; N/A: None of the participants identified other devices, hence Fisher exact test was not applicable.*

95% CI = [26.22, 36.97]) (Table 4). However, this result should be interpreted with caution given the small sample size (n=10). The results are exploratory in nature and serve as preliminary insights into consumer perspectives. Sixty percent of the participants had high level of acceptance. Only one and three participants had low and moderate levels of acceptance, respectively. No association was found between stroke telerehabilitation acceptance and the following variables: age, sex, years of undergoing stroke rehabilitation, familiarity with telemedicine or telerehabilitation, and types of telecommunication device owned ($p>0.05$) using Fisher exact test. On the other hand, prior experience with telemedicine was significantly associated with stroke telerehabilitation acceptance ($p=0.033$). When ordinal logistic regression was performed in measuring the effect of patient characteristics on level of acceptance, no variable was found significant and had high p-value to be retained in the model ($p>0.10$).

Both providers (72.6%) and consumers (50%) reported that patients who sustained a stroke have problems with their follow-up and outpatient rehabilitation. Providers identified that transportation difficulties (94.5%) are the most significant factor that hinders patients from follow-up and complying with their rehabilitation program after discharge. Meanwhile, financial difficulties (100%) and the absence of a companion (100%) are both major reasons reported by consumers. Both groups have noted that telerehabilitation could be beneficial for stroke patients (79.5% for rehabilitation providers; 90% for rehabilitation consumers). Most of the participants noted that telerehabilitation could be helpful in areas, such as teleconsultation, teletherapy, and telemonitoring. Both groups also noted that they would most likely attend future trainings on telerehabilitation and its various clinical applications (86.3% for rehabilitation providers; 80% for rehabilitation consumers) (Table 5). Internet connection (98.6%) was the most commonly seen barrier perceived by rehabilitation providers, while use of telecommunication device (85.7%) was the most perceived barrier among rehabilitation consumers (Table 5). Among rehabilitation providers, other perceived barriers to telerehabilitation included patient and carer acceptance, compliance with instructions, difficulty in demonstrating exercises or techniques, challenges in assessment and therapy guidance, concerns about confidentiality, and issues related to billing or reimbursement. Meanwhile, rehabilitation consumers most frequently cited barriers such as difficulty using telecommunication devices,

Table 4. Association of Characteristics of Rehabilitation Consumers with Stroke Telerehabilitation Acceptance

Characteristics	Low acceptance	Moderate acceptance	High acceptance	*p*-value
Age, years				1.000
<35	0 (0)	1 (33.3)	2 (66.7)	
35-45	0 (0)	0 (0)	0 (0)	
≥46	1 (14.3)	2 (28.6)	4 (57.1)	
Sex				1.000
Male	1 (20)	1 (20)	3 (60)	
Female	0 (0)	2 (40)	3 (60)	
Years of undergoing stroke rehabilitation				0.267
<2	0 (0)	3 (37.5)	5 (62.5)	
2-3	0 (0)	0 (0)	0 (0)	
>3	1 (50)	0 (0)	1 (50)	
Heard of telemedicine or telerehabilitation before				0.167
Yes	0 (0)	3 (60)	2 (40)	
No	1 (20)	0 (0)	4 (80)	
With experience in telemedicine				0.033
Yes	0 (0)	3 (75)	1 (25)	
No	1 (16.7)	0 (0)	5 (83.3)	
Type of telecommunication device owned				
Mobile phone	1 (10)	3 (30)	6 (60)	N/A
Laptop/ desktop computer	0 (0)	3 (50)	3 (50)	0.286
Tablet	0 (0)	1 (33.3)	2 (66.7)	1.000
Others	0 (0)	0 (0)	0 (0)	N/A

N/A: All participants used mobile phones and none of them identified other devices, hence Fisher exact test was not applicable.

unstable internet connections, and lack of familiarity with online platforms.

In terms of the preferred device for telerehabilitation among rehabilitation providers, tablets (82.2%), smartphones (79.5%), and computers (79.5%) were the most preferred. Rehabilitation consumers preferred smartphones (90%) and computers/ laptops (80%). The most acceptable applications were Viber (68.5% for rehabilitation providers; 80% for rehabilitation consumers), Facebook Messenger (41.1% for rehabilitation providers; 80% for rehabilitation consumers), and a customized secure telemedicine software (32.9% for rehabilitation providers; 40% for rehabilitation consumers). Twenty-two rehabilitation providers (30.1%) also preferred other video teleconferencing applications, such as Zoom or Google Meet (Table 6).

DISCUSSION

It has been evident that we shifted from the in-person consultations to doing transactions mainly online, when applicable, to mitigate the imminent health threat brought about by the COVID-19 pandemic. The participants of this study were able to indicate their experiences in terms of the idea of telerehabilitation as an alternative solution in case offered in the study institution. It is important to understand that the potential intentions of the users are viable factors in ensuring that the use of stroke telerehabilitation will be successful and sustainable in our local setting.

Telerehabilitation is a new field in telemedicine which is rapidly growing and developing. It has been considered to be cost-effective in the end of both the health providers as well as the patients in comparison to the traditional check-ups.[9] In the Philippine setting, since telemedicine is already being implemented, telerehabilitation is feasible, but there has been identified lack of acceptance of telehealth among stakeholders in addition to the lack of skills and knowledge in relation to e-health.[10] Due to this paucity, this research aimed to identify the acceptance of telerehabilitation amongst the rehabilitation consumers, as well as the rehabilitation providers in order to see the actual situation of its implementation as well as identify the needs and challenges it faces.

According to the survey done, it has been identified that 93% of the health care professionals and 100% of the rehabilitation consumers identified telerehabilitation as an alternative mode of delivery to physical, occupational, and speech therapy. Having telerehabilitation as an alternative to in-person rehabilitation was found to be clinically effective and better than having no rehabilitation at all for physical therapy.[11] It is the same in the situation of occupational therapy wherein it is identified as an alternative way of conducting therapy in the convenience of the patient and creating a treatment plan that can be adhered at home.[12] When it comes to speech therapy, Wales et al. found telehealth-delivered speech and language intervention for primary school-age children to be effective, and a study done in India as well as the Philippines, also identified that

Table 5. Needs Assessment for Stroke Telerehabilitation

	Rehabilitation providers (N=73), (n, %)	Rehabilitation consumers (N=10), (n, %)
Do stroke patients have problems regarding their follow-up and outpatient rehabilitation?		
Yes	53 (72.6)	5 (50.0)
No	6 (8.2)	3 (30.0)
Not sure	14 (19.2)	2 (20.0)
What are the problems or factors that hinder patients from following up and complying with their rehabilitation program after discharge?		
Financial	58 (86.6)*	9 (100.0)*
Transportation difficulties	69 (94.5)*	7 (77.8)*
Time schedule	57 (83.8)*	5 (71.4)*
No attendant/ companion/ relative	63 (91.3)*	6 (100.0)*
Travel restrictions because of COVID-19	60 (89.6)*	7 (77.8)*
Could telerehabilitation be beneficial for stroke patients?		
Yes	58 (79.5)	9 (90.0)
No	2 (2.7)	0 (0)
Not sure	13 (17.8)	1 (10.0)
If there is training to learn more about telerehabilitation and its various clinical applications, I will most likely attend.		
Yes	63 (86.3)	8 (80.0)
No	4 (5.5)	0 (0)
Not sure	6 (8.2)	2 (20.0)
In what areas could telerehabilitation be of help?		
Teleconsultation	67 (95.7)*	10 (100.0)
Teletherapy	51 (75.0)*	7 (87.5)*
Telemonitoring	62 (88.6)*	9 (100.0)*
What are the barriers to telerehabilitation for our local setting?		
Internet connection	71 (98.6)*	7 (77.8)*
Use of telecommunication devices	55 (82.1)*	6 (85.7)*
User-friendly	60 (84.5)*	5 (71.4)*

**Items with some non-responses, hence excluded from computing for percentages.*

Table 6. Preferred Devices and Applications for Stroke Telerehabilitation (N=83)

	Rehabilitation providers (N=73), (n, %)	Rehabilitation consumers (N=10), (n, %)	Total (N=83), (n, %)
Device			
Smart phones	58 (79.5)	9 (90.0)	67 (80.7)
Non-smart phones	9 (12.3)	3 (30.0)	12 (14.5)
Tablets	60 (82.2)	4 (40.0)	64 (77.1)
Computer/ laptops	58 (79.5)	8 (80.0)	66 (79.5)
Customized secure telemedicine equipment	28 (38.4)	3 (30.0)	31 (37.3)
Others	0 (0)	0 (0)	0 (0)
Application			
Viber	50 (68.5)	8 (80.0)	58 (69.9)
Facebook Messenger	30 (41.1)	8 (80.0)	38 (45.8)
Skype	23 (31.5)	1 (10.0)	24 (28.9)
Telegram	9 (12.3)	1 (10.0)	10 (12.0)
WhatsApp	8 (11.0)	2 (20.0)	10 (12.0)
Instagram	4 (5.5)	2 (20.0)	6 (7.2)
Customized secure telemedicine software	24 (32.9)	4 (40.0)	28 (33.7)
Others	22 (30.1)	1 (10.0)	23 (27.7)

telerehabilitation interventions in speech language pathology is useful and efficient.[13-15]

The composition of PTs, OTs, and SLPs offers a valuable perspective on the perspective of telerehabilitation as a viable alternative to traditional face-to-face therapy among these professions. According to international evidence, telerehabilitation is effective in supporting physical therapy objectives, facilitating home-based occupational therapy planning and adherence, and providing speech-language services efficiently, particularly when in-person access is restricted.[16] The high levels of agreement among respondents are consistent with these findings. This agreement aligns with the point that local practitioners perceive telerehabilitation as a sustainable adjunct or alternative in the delivery of stroke rehabilitation across disciplines rather than a temporary substitute.

Acceptance of Consumers

Upon statistical analysis of the survey, it determined that there is a high level of acceptance among the rehabilitation consumers group (60%). Although there is lack of studies in the patient's perspective of their acceptance towards the use of telerehabilitation, being able to identify the perception of the rehabilitation consumers group when it comes to telerehabilitation is important especially health professionals all over the world are starting to adapt to the COVID-19 pandemic, as well as develop new ways to optimally deliver health services post-pandemic.[7]

Acceptance of Providers

On the other hand, the group of the rehabilitation providers (56%) yielded having middle level of acceptance towards stroke telerehabilitation. This is coherent with the studies done by Movahedazarhougligh et al. in 2015 and Signal et al. in 2020 which shows positive attitude towards the use of telerehabilitation.[17,18] The health care professionals' result may have been influenced by the fact that majority of the participants in this group belong to the age of young adults although there is no statistical proof in the survey conducted to this claim. A research study conducted by Lupton in 2021 identified that many young people nowadays use digital health technology, social media platforms and YouTube, as part of their "health support resources." As much information is available online, Lupton noted that adolescents and young people still often seek guidance from adults regarding unclear information they may see online.[19]

Despite these positive results, certain obstacles impede the use of telerehabilitation by rehabilitation practitioners. A major challenge is the technical infrastructure necessary for efficient telerehabilitation implementation. Kringle et al. highlighted the significance of comprehending cost-effectiveness and technological accessibility, which are essential for sustainable telerehabilitation procedures.[20] O'Donoghue noted that although the use and acceptability of telerehabilitation are often high, challenges such as inaccessibility and the requirement for substantial training may hinder its adoption.[21] This suggests that providers may be reluctant to fully adopt telerehabilitation due to insufficient resources and training.

Association of Stroke Telerehabilitation Acceptance with Gender

In contrast to the age, a statistically significant relationship was identified between the gender and the level of acceptance with female providers showing approximately 2.5 times lower odds of high acceptance of stroke telerehabilitation compared to male providers. In a research study conducted by Gil-Lacruz, findings show that females identified their health as having higher priority when compared to males but males were reported to have an increased health-seeking behavior compared to females.[22] In a study done in Bangladesh, it was identified that women are less likely to have mobile phones and are less aware when it comes to the availability of online health services despite of having equal urge to use these services amongst males and females.[23] Conversely, women were found out to be more engaged towards health-related information searching than men. They found that women have positive attitude towards the use of internet rather than men but have this perception that they are less competent digitally. Women also have higher awareness when it comes to health and nutrition but men in this study are more open towards establishing a virtual patient-physician relationship, which may explain why females in this research study had higher odds of having low levels of acceptance.[24] While our study did not assess this specific relationship, this may offer a potential explanation for the observed lower acceptance of telerehabilitation among female rehabilitation professionals.

Need for Stroke Telerehabilitation

Perceived problems with in-person follow-up consultations

Transportation difficulties was reported by providers as a significant challenge with in-person follow-up consultations. Silva et al. emphasize that transportation challenges constitute one of the primary barriers encountered by stroke patients in Brazil, resulting in impediments to receiving essential rehabilitation treatments.[25] Mahak et al. highlighted the need of prompt access to rehabilitation services for stroke survivors, highlighting those logistical obstacles, such as transportation, can greatly affect recovery outcomes.[26] Guidetti et al. further substantiate this by examining how external obstacles, such as transportation, often impede the rehabilitation process, hindering patients' continuous attendance at rehabilitation sessions.[27] Transportation constraints have ramifications that surpass mere attendance; they might result in heightened weariness and diminished desire, hence compromising the rehabilitation process.[28] As such, the viability of home-based rehabilitation treatments has been suggested as a possible alternative to alleviate transportation

challenges. Bertomeu-Motos examines the potential of home-based neurorehabilitation systems, which can mitigate transportation challenges by enabling patients to participate in rehabilitation from their residences.[29]

Meanwhile, financial difficulties and the absence of a companion are both major reasons reported by consumers that hinder patients from follow-up with their stroke rehabilitation program. This finding is consistent with existing literature, including Teasell et al., who emphasize that the accessibility of stroke rehabilitation services is frequently restricted, compelling patients to pursue expensive private options or abandon therapy entirely, which can negatively impact their recovery prospects.[30] Financial limitations constitute a significant obstacle, since numerous patients encounter substantial expenses related to rehabilitation services, pharmaceuticals, and transportation to health facilities. This financial strain frequently results in diminished compliance with rehabilitation treatments, as patients may favor current financial necessities above long-term health advantages.[31] Jayasree-Krishnan et al. assert that patients undergoing early rehabilitation frequently encounter significant medical, financial, and psychosocial pressures, complicating the self-management of their rehabilitation.[32]

The absence of a supportive partner might result in feelings of loneliness and discouragement, hence reducing the probability of compliance with rehabilitation programs. Kim et al. emphasize that social support is vital for patients who sustained a stroke, as it aids in realistic self-assessment and promotes active participation in rehabilitation.[33] In the absence of a supportive carer, patients may find it challenging to continuously attend rehabilitation programs, resulting in suboptimal outcomes.

Perceived use, benefits, and need for training

The survey also provided information that both the groups of rehabilitation providers and rehabilitation consumers deem the telerehabilitation beneficial for stroke patients. It was also noted that these groups will most likely attend trainings conducted regarding telerehabilitation. Telerehabilitation can provide both continuous and appropriate therapy through the use of repetitive motor tasks since there are challenges to stroke care brought about by the pandemic.[34] The interaction between the rehabilitation consumers and rehabilitation providers through telerehabilitation ensures that tasks are performed correctly, and making the patient feel less isolated due to the pandemic.[34] But due to the lack of clinical trials, as well as small population of study participants, there is still lack of evidence when it comes to the efficacy of tele-rehabilitation.[35]

Perceived barriers to telerehabilitation

It was pointed out based on the study conducted that internet connection was the most seen barrier for the rehabilitation providers while use of telecommunication device was the perceived barrier among rehabilitation consumers. In a study done to compare the global ICT situation, the Philippines is behind other developing countries in Asia when it comes to internet connection. The average speed of internet in the Philippines is at 2.8 Mbps while the speed in Thailand, Sri Lanka, and Malaysia are 7.4 Mbps, 7.4, and 4.3 Mbps, respectively.[35] Having access to quality internet connection may help in conducting telerehabilitation as majority of the applications used require video conferencing and slow internet connection may cause lag and pixelated quality of picture during telerehabilitation sessions. Another barrier identified was user-friendliness for both groups. A study done on the use of technology, specifically tablet computers, found out that among older adults, there may seem to be eagerness to adopt the new technology and they are very much willing to learn but they have voiced out their apprehension regarding the lack of clarity in terms of instruction and support. This was very vital in order to help maximize the use of such technology.[36]

Other perceived barriers identified by the rehabilitation providers concern the acceptance among patients, compliance to instructions, possible difficulty in technique demonstration, difficulty in patient assessment and therapy guidance, and payment concerns. These are very much valid concerns that may be suggested for future research studies. These other perceived barriers may be the baseline on identifying possible interventions to help address such barriers. Further studies can explore how patients and rehabilitation providers have adapted to the use of telerehabilitation over the course of the COVID-19 pandemic and in the transition to the post-pandemic healthcare landscape. The adaptation of the health care system towards the new normal in terms of use of telerehabilitation is a broad area for future research in different aspects in order to create a learning health system to improve the practice post-pandemic.[7]

Devices and Applications Used

In addition, it was found that all participants have access to at least one telecommunication device, may it be a mobile phone, a laptop or computer, and tablets. In a study done by Statista Research Department, it is said that 82.3 million people uses their mobile phones in the Philippines alone and is said to reach 90 million users by the year 2025.[37] Access to telecommunication devices have provided health care practitioners ease and convenience in connecting with their patients as well as having the potential in providing health care information and services.[38,39]

Results of the survey also show that among rehabilitation providers, the use of tablets, smart phones, and computers, were highly preferred, as well as with the rehabilitation consumers group. The use of Viber and Facebook Messenger, in conjunction with customized secure telemedicine software has been identified as the acceptable application to conduct telerehabilitation with some suggesting the use of Zoom and Google Meet. The use of smartphones and tablets have been continuous as these devices are handy, capable of processing

information on the go, an easy access and use at the point of care, and provides the needs of many rehabilitation providers.[40] Rehabilitation providers are also on the verge of integrating health and patient care not only in the practice of medicine but as well as in education as these applications and software are continuously improving and enhancing which are beneficial to clinical practice.[41,42]

These applications, such as disease diagnosis, drug references, medical calculators, literature search, among many others, make the life of medical practitioners easier as the smartphone becomes a vital tool in evidence-based practice of medicine. The use of smartphones can also help in terms of the management and monitoring the patient remotely.[40] In addition to these, utilizing online video conference platforms such as Zoom and Google Meet, having similar functionality of Viber and Facebook Messenger in terms of "group chats," it was found to be more efficient especially in today's situation. These platforms have reduced the cost of having live conferences and meetings, thereby enabling anyone who has internet access to attend such meeting.[43] A study also shows that patients utilizing internet-based videoconferencing were satisfied but lack thereof evidence if it led to changes in their health outcomes.[44]

The survey also identified that a customized secure telemedicine software can be an acceptable application of use. This is where PTcircle may come in play, a new telerehabilitation platform. It was discussed in research done by Saaei et al. that this application is currently under development and is a customizable web-based platform to address the patients' need by tailoring educational materials and exercise videos based on the needs of the patients. Through this, the healthcare provider may also upload their own videos for collaboration with other healthcare providers granting ease of access to information.[45]

Recommendations

To improve the acceptance and implementation of stroke telerehabilitation, some important recommendations can be considered. Capacity-building programs can be established to educate rehabilitation practitioners on the technical and clinical dimensions of telerehabilitation, encompassing patient assessment, therapy advice, and compliance measures. Improving digital infrastructure is important, especially in resolving internet connectivity challenges that impede efficient remote rehabilitation sessions. The exploration of user-friendly and safe telemedicine platforms is essential to ensure a seamless experience for both clinicians and consumers. Public-private partnerships can be explored to facilitate funding for telehealth initiatives, ensuring that financial obstacles do not restrict patient access. Community awareness initiatives can be considered to inform patients with stroke and their caregivers about the advantages of telerehabilitation, while also addressing issues related to digital literacy and technology utilization. Future research can concentrate on assessing long-term patient outcomes, provider adaptability, and methodologies to address obstacles including patient compliance, technique demonstration, and financial sustainability.

Limitations

There are some limitations to the study conducted. This study was done at the height of the COVID-19 pandemic wherein it was prohibited to conduct face-to-face meetings and everything shifted to online platform. This affected the recruitment among the rehabilitation consumers group as there has been a low turnout of outpatient consultations during the COVID-19 pandemic when the study was conducted, hence the researchers were not able to survey enough participants and meet its sample size. This may have implications to the generalizability of findings and as such, the consumer findings should be interpreted as exploratory and indicative rather than definitive. As purposive sampling was employed in two tertiary-level private hospitals, participants may also not be a full representation of the broader stroke rehabilitation population in the Philippines given these sites may have stronger infrastructure, higher digital access, and better staffing resources than public or rural hospitals. As such, future studies involving larger and more diverse populations, including public hospital settings and rural communities are recommended to validate and extend these findings.

CONCLUSION

Stroke telerehabilitation is deemed acceptable among the rehabilitation consumers and rehabilitation providers, and can be a suitable alternative to the usual in-person care for stroke patients. This may have potential implications for the practice of telerehabilitation among other hospitals and stand-alone rehabilitation centers in the Philippines. Nevertheless, future studies should aim to increase consumer sample sizes through multi-center recruitment, longer data collection periods, expanded reach to cover diverse hospital settings, and the conduct of sensitivity analysis to ensure better representation and reduce sampling bias.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

None.

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APPENDICES

Appendix A. Stroke telerehabilitation acceptance among rehabilitation providers (N=73)

	Strongly Agree, (n, %)	Agree, (n, %)	Disagree, (n, %)	Strongly Disagree, (n, %)
Perceived usefulness				
1. Telerehabilitation will improve stroke patients' access to rehabilitation programs	22 (30.14)	37 (50.68)	13 (17.81)	1 (1.37)
2. Telerehabilitation will save me time	21 (28.77)	42 (57.53)	9 (12.33)	1 (1.37)
3. Telerehabilitation will improve stroke patients' attendance in the rehabilitation program	22 (30.14)	37 (50.68)	14 (19.18)	0 (0)
4. Telerehabilitation will facilitate monitoring of the patients' disease symptoms	23 (31.51)	40 (54.79)	9 (12.33)	1 (1.37)
5. Telerehabilitation could help healthcare professionals to provide care more quickly for patients at home	24 (32.88)	43 (58.90)	6 (8.22)	0 (0)
6. Telerehabilitation will be useful in the rehabilitation program for stroke	20 (27.40)	44 (60.27)	8 (10.96)	1 (1.37)
7. Telerehabilitation will improve healthcare professionals' communication with stroke patients	21 (28.77)	35 (47.95)	17 (23.29)	0 (0)
8. Telerehabilitation will facilitate monitoring of the patients' daily activities	25 (34.25)	40 (54.79)	8 (10.96)	0 (0)
9. Telerehabilitation will improve patients' adherence to the rehabilitation program	19 (26.03)	38 (52.05)	16 (21.92)	0 (0)
Perceived ease of use				
10. Learning to use the telerehabilitation equipment will be easy	29 (39.73)	38 (52.05)	6 (8.22)	0 (0)
11. Telerehabilitation will be easy to use	23 (31.51)	36 (49.32)	13 (17.81)	1 (1.37)
12. Providing stroke rehabilitation services by using telerehabilitation will be more convenient	18 (24.66)	35 (47.95)	18 (24.66)	2 (2.74)

Appendix A. Stroke telerehabilitation acceptance among rehabilitation providers (N=73) *(continued)*

	Strongly Agree, (n, %)	Agree, (n, %)	Disagree, (n, %)	Strongly Disagree, (n, %)
13. Patient education sessions will be easier when using telerehabilitation	17 (23.29)	39 (53.42)	15 (20.55)	2 (2.74)
Behavioral intent				
14. I feel positive about using telerehabilitation	17 (23.29)	42 (57.53)	13 (17.81)	1 (1.37)
15. I will use telerehabilitation when it becomes available in my rehabilitation center	19 (26.03)	44 (60.27)	9 (12.33)	1 (1.37)
16. I will use telerehabilitation to provide stroke rehabilitation services	15 (20.55)	43 (58.90)	15 (20.55)	0 (0)
17. I will use telerehabilitation to provide stroke rehabilitation services as often as recommended by the care team	18 (24.66)	42 (57.53)	12 (16.44)	1 (1.37)

Appendix B. Stroke telerehabilitation acceptance among rehabilitation consumers (N=10)

	Strongly Agree, (n, %)	Agree, (n, %)	Disagree, (n, %)	Strongly Disagree, (n, %)	Don't know, (n, %)
Perceived usefulness					
1. Telerehabilitation will improve stroke patients'/my access to rehabilitation programs	0 (0)	6 (60)	3 (30)	1 (10)	0 (0)
2. Telerehabilitation will improve stroke patients' attendance in the rehabilitation program	0 (0)	5 (50)	5 (50)	0 (0)	0 (0)
3. Telerehabilitation will eliminate transportation difficulties in getting to the rehabilitation center	0 (0)	7 (70)	3 (30)	0 (0)	0 (0)
4. Telerehabilitation could help stroke patients/me to provide care more quickly for patients at home	0 (0)	6 (60)	3 (30)	1 (10)	0 (0)
5. Telerehabilitation will be useful in the rehabilitation program for stroke	0 (0)	6 (60)	3 (30)	1 (10)	0 (0)
6. Telerehabilitation will improve my communication with stroke patients	0 (0)	5 (50)	5 (50)	0 (0)	0 (0)
7. Telerehabilitation will improve patients' commitment to the rehabilitation program	0 (0)	5 (50)	4 (40)	1 (10)	0 (0)
Perceived ease of use					
8. Learning to use the telerehabilitation equipment will be easy	0 (0)	4 (40)	5 (50)	1 (10)	0 (0)
9. Telerehabilitation will be easy to use	0 (0)	4 (40)	5 (50)	1 (10)	0 (0)
10. Receiving stroke rehabilitation services at home using telerehabilitation will be more convenient	0 (0)	5 (50)	4 (40)	1 (10)	0 (0)
11. Education sessions will be easier when using telerehabilitation	0 (0)	5 (50)	4 (40)	1 (10)	0 (0)
Behavioral intent					
12. I will plan to use telerehabilitation to receive stroke rehabilitation	0 (0)	4 (40)	5 (50)	1 (10)	0 (0)
13. I will use telerehabilitation to receive stroke rehabilitation services as often as recommended by the care team	0 (0)	4 (40)	5 (50)	1 (10)	0 (0)