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CASE REPORT

Follow-up consultations through telerehabilitation for wheelchair recipients with paraplegia in a developing country: a case report

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Abstract

Introduction Persons with disability (PWD) in the Philippines find it difficult to attend regular face-to-face rehabilitation due to distance, transportation and food expenses, disability, and time constraints. Being a developing country, Filipino rehabilitation doctors have to be resourceful to overcome these barriers and try alternative ways to reach out to their patients, such as through telemedicine, specifically telerehabilitation.

Case presentation After receiving free wheelchairs, two patients with paraplegia secondary to spinal cord disease were unable to report for in-clinic wheelchair reassessment. Telerehabilitation was attempted for the first time to conduct wheelchair follow-up using a commonly available social media application through synchronous and asynchronous methods. During the teleconsultation, the rehabilitation doctors used the wheelchair follow-up form from the World Health Organization translated into Filipino. There were apprehensions at first, especially from the side of the patients, regarding the method, effectiveness, and safety of telerehabilitation. In the end, the patients found telerehabilitation easy, safe, and convenient, and were satisfied with the practical wheelchair modifications and exercise recommendations.

Discussion Telerehabilitation is a viable alternative to provide universal access to rehabilitation care and overcome the barriers to in-clinic visits among indigent PWD in a resource-limited country. Unlike in developed countries, we do not have readily available customized telemedicine platforms and telemonitoring equipment to conduct telerehabilitation. Nonetheless, we can make use of what is locally available, affordable, and convenient to our patients.

Introduction

The Philippine General Hospital (PGH) is the largest government hospital in the Philippines and serves more than 600,000 patients every year [1]. Being the only national referral center for tertiary care, it caters to the needs of thousands of indigent Filipinos coming from all regions of the archipelago [1]. Composed of 7641 islands and located in southeast Asia, the Philippines is classified as a lower-middle-income country, wherein technology advancements and adoption may be expected to be far behind its western counterparts [2, 3]. Despite having limited resources, Filipinos have learned to maximize available low-cost technologies, such as the internet and social media. In fact, the Philippines ranks first in social media use for the past four consecutive years worldwide [4].

Currently, PGH and the Church of the Latter-Day Saints (LDS) Charities have a joint program that provides free wheelchairs to indigent Filipinos with mobility problems. Since 2018, there have been over 700 recipients [5]. After receiving the mobility device, each patient is expected to bring the wheelchair to PGH for reassessment and follow-up with the rehabilitation doctor, who is a certified wheelchair provider and assessor. However, many of the recipients had poor compliance to face-to-face follow-up consultations due to various reasons, such as distance, difficulty in arranging ambulance transfers, travel and food expenses, loss of day's income for the patient or caregiver, time constraints, disability, and social stigma, which are

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recognized barriers to face-to-face wheelchair follow-up [6]. Nonetheless, follow-up is imperative for three reasons: (1) to ensure that the donated wheelchair is being used properly and that the wheelchair was not sold by the patient or family as in our past experience, (2) to address any wheelchair defect or wheelchair-related concerns limiting its use, and (3) to provide advice on safety precautions, wheelchair adjustments, and therapeutic exercises, if needed.

A feasible solution to address the barriers to face-to-face treatment and follow-up for patients with spinal cord injury (SCI) is telehealth or telemedicine, which refers to the use of electronic means to evaluate, monitor and manage patients remotely [7]. Knowing that Filipinos primarily use the internet for social networking, the rehabilitation doctors found a way to connect to their patients through social media [8]. To our knowledge, telerehabilitation using common low-cost social media applications in the Philippines has never been reported in international literature. We hereby report our telerehabilitation experience, including how we addressed the apprehensions and data security concerns of two adults with paraplegia, who had difficulties complying to in-clinic follow-up despite living relatively near PGH.

Case presentation

Among the ten most recent wheelchair recipients who were unable to follow-up face-to-face and were attempted to get in touch with through text message, phone call, and/or social media, two patients consented to try telerehabilitation. The others did not reply to the message, did not answer the call despite three separate attempts, or did not consent despite being informed briefly about telerehabilitation. Certain socioeconomic and technical characteristics of the included patients are summarized in Table 1, along with their reasons for inability to follow-up in PGH and initial perceptions on telerehabilitation.

Patient A was a 28-year-old female, single, unemployed, from an urban city 32 kilometers away from PGH, renting a one-story house with her father and sisters. She was diagnosed with systemic lupus erythematosus in 2016 with good compliance to medications (prednisone and hydroxychloroquine), and developed paraplegia secondary to transverse myelitis (neurologic level: T12) in May 2017. Since then, she remained mostly in bed due to dependence in transfers and mobility. She eventually developed sacral pressure ulcers (stage 3 based on the National Pressure Ulcer System). In August 2019, she was admitted to the Rehabilitation Medicine ward of Philippine General Hospital, wherein she had daily physical and occupational therapy for one month and regular wound care for her pressure ulcers. Her lower limb myotomal motor scores bilaterally were as follows (using the Medical Research Council or MRC grading system): L2: 2/5, L3: 2/5, L4: 1/5, L5: 1/5, and S1: 2/5. She was evaluated and was given an active, rigid, non-foldable wheelchair with gel seat cushion. Prior to discharge, she was instructed on proper transfers and wheelchair propulsion. To follow-up in PGH, she had to be accompanied by her father and sister, who had to take

Table 1 Patients' background information and perceptions on telerehabilitation.

Patient	Reasons for inability to follow-up face-to-face	Household monthly income	Technology ownership, Mobile phone operating system, Social media applications used	Internet source, Speed[a]	Pre-telerehabilitation perceptions	Post-telerehabilitation perceptions
A	Long queue to borrow ambulance from municipal office or rent a multi-purpose van in which the wheelchair can fit; traffic; time conflict; family has to work; hassle of transferring patient to and from PGH	PhP 20,000 or USD 385	Smartphone, android, Facebook™ and Viber™	Cellular data, 1.86 Mbps	Worth trying given the constraints to face-to-face follow-up; might only be useful for simple cases due to lack of in-person examination	Useful; convenient; no need to wake up early to travel and wait in the long line of patients in the outpatient clinic; good reminder to exercise; could be difficult with slow or no internet
B	Nobody to accompany patient as wife is at work every day; wife is the only other adult at home to provide for the family; transportation and food expenses; long distance; traffic	PhP 20,000 or USD 385	Smartphone, android, Facebook™ and Viber™	Cellular data, 0.28 Mbps	Could save us money, time and effort; might be difficult to use	No stress unlike face-to-face follow-up; practical; fast; process was easy to follow; flexible amidst technical glitches

PhP Philippine peso, *USD* United states dollars, *Mbps* megabits per second.

[a]Upload speed based on https://www.speedtest.net/ obtained before the start of the telerehabilitation follow-up.

a day off from work. The family either had to wait in a long queue to borrow an ambulance from the municipal office or had to rent a private multi-purpose van to transport the patient and wheelchair.

Patient B was a 28-year-old male, married, unemployed, from a rural area 37 kilometers away from PGH. After sustaining a SCI (neurologic level: T9) from a motor vehicular accident in March 2019, he spent most of his time in bed. In May 2019, he was admitted to the Rehabilitation Medicine ward of PGH, wherein he was assessed to have 0/5 MRC motor score from L2-S1 myotomes bilaterally and complete dependence in moving from supine to short-sitting and from bed to chair. For two months, he underwent daily functional retraining. He was provided a basic, foldable wheelchair, which came a few days before discharge. He continued outpatient physical therapy in a nearby rehabilitation center three times a week. He could not make it to PGH due to transportation and food expenses, traffic, distance, and loss of day's income for the family every time the wife, who worked from home as online food vendor, brought him with their only child to the hospital.

Interventions

In late September 2019, telerehabilitation was done using the patients' own telecommunication devices (i.e., android smartphone) and the social media applications (i.e., Facebook Messenger™ and Viber™) they were familiar with. As an effort to maintain data security, we proceeded with Viber™ due to its end-to-end encryption [9]. Through a phone call, we informed each patient about the telerehabilitation procedure (i.e., synchronous and asynchronous options), benefits (i.e., delaying need for face-to-face follow-up), risks (i.e., related to data privacy and safety), and limitations (i.e., lack of hands-on assessment). Following the advice of the National TeleHealth Center in the National Institutes of Health at the University of the Philippines Manila, we obtained verbal voluntary informed consent through a videocall, wherein each patient read the consent form sent to them through Viber™. The patients were allowed to withdraw from the teleconsultation at any time, assuring them that the care they used to receive from their rehabilitation doctors at PGH would not be affected.

Prior to the agreed videocall schedule, each patient answered an open-ended survey and Telepractice Questionnaire sent through Viber™ to obtain baseline perception regarding telerehabilitation [10]. Meanwhile, we checked the internet speed and audio-video clarity from each side. To observe privacy, we ensured that only the patient and one family member on one side and two rehabilitation doctors on the other side could see and hear the virtual consultation.

During the telerehabilitation session for each patient, one rehabilitation doctor trained to conduct telemedicine served as moderator, who introduced the participants from both sides, set ground rules (i.e., no taking of photo or recording of video, safety precautions), and ensured smooth discussion. Another rehabilitation doctor, who was the patient's wheelchair assessor, then conducted the follow-up consultation using the World Health Organization Wheelchair Follow-Up Form, translated into Filipino by a linguistics professor solely for this purpose [11]. The form screened for wheelchair use, condition, problems, and satisfaction. Each item in the form was read to the patient, who was given ample time to respond and demonstrate, as needed.

Towards the end of the visit, the wheelchair assessor provided verbal and written recommendations to address pertinent wheelchair and clinical problems observed during the follow-up. Specific home instructions were given on proper wheelchair care and use (i.e., transfer, propulsion, and pressure-relief techniques), strengthening exercises, and follow-up schedule either face-to-face or via telerehabilitation, depending on the physiatric evaluation. Towards the end of each approximately 30-minute videocall, the patient was surveyed again on telerehabilitation perceptions through open-ended questions (i.e., experience, perceived benefits, and limitations) and the Telepractice Questionnaire repeated after the telerehabilitation session to determine if perceptions changed.

Outcomes

Clinical outcomes

On follow-up through telerehabilitation, patient A had no new neurologic symptoms and her sacral pressure ulcers had partially resolved based on pictures that were sent to the wheelchair assessor. It was learned that patient A seldom carried out the home exercise program taught to her during her inpatient rehabilitation at PGH as she admitted to have forgotten some of the exercises and did not want to bother her family to assist her in the exercises. It was observed that she continued to have difficulty in transferring to and from the wheelchair due to improper technique. Hence during the telerehabilitation session, the wheelchair assessor demonstrated the step-by-step process of transferring from bed to wheelchair using a sliding board. Practical home exercises, such as seated push-ups and strengthening of upper limb muscles with make-shift weights, were also demonstrated real-time on video. To ensure accurate understanding and safe execution of the exercises, the patient was asked to return the demonstrations, as necessary corrections and precautions were re-emphasized. In terms of wheelchair propulsion, the patient initially had difficulty negotiating it

through the limited space at home. Hence, environmental modifications, such as the removal of clutter and rearranging the furniture, were recommended to help her navigate more easily within the limited home space. She was then scheduled for another follow-up through telerehabilitation after one month.

Meanwhile, patient B had no new deficits, and he continued to be functional at home and in the community with his wheelchair. He demonstrated effective pressure-relief techniques and had no problem in maneuvering the wheelchair inside the house. However, it was observed through telerehabilitation that his current foldable wheelchair already had worn-out non-removable pneumatic tires, which made wheelchair propulsion particularly on uneven terrains outside the house difficult. Hence, an advanced wheelchair (i.e., active wheelchair consisting of welded rigid frame with fewer movable parts, anti-tippers, and quick-release removable pneumatic tires) was recommended. He was advised to follow-up face-to-face at PGH once the new wheelchair was available.

Telerehabilitation acceptance

Prior to telerehabilitation sessions, the patients expressed mixed feelings about the method of follow-up, as reflected in their survey responses (Table 2). In addition, patient A expressed that telerehabilitation might only be applicable for "mild" or "easy" cases due to lack of face-to-face examination, while patient B thought that the system might be technically difficult to use (Table 1). Although they had apprehensions as it was their first time to consult a physician through videocall, both patients agreed to give it a try.

During telerehabilitation, the session went smoothly with patient A, while we encountered technical difficulties with patient B due to slow internet speed, for which we resorted to other techniques, such as phone call, text messaging, and online asynchronous techniques like chat messaging.

Post-telerehabilitation, however, their perceptions seemed to have improved based on their qualitative feedback (Table 1), even though numerically their responses to the Telepractice Questionnaire were mostly "3" or "neutral" (Table 2).

The patients relayed an overall positive telerehabilitation experience. Their perceived benefits included no fatigue from travel, no stress in waking up early and waiting in line outside the clinic, reduced expenses, instant and direct communication with a doctor, and less burden on the family.

Table 2 Telepractice questionnaire scores pre- and post-telerehabilitation.

	Patient A		Patient B	
	Pre	Post	Pre	Post
I am comfortable with teleconsultation.	3	3	3	3
I think consultation using telerehabilitation is as the same quality as face-to-face consultation.	2	3	2	2
I am comfortable using my mobile phone for medical consultation.	2	3	2	3
The visual signal in videocall is satisfactory.	4	4	4	4
Telerehabilitation is convenient for me.	3	5	3	3
I would recommend telerehabilitation to a friend.	3	3	2	3
Overall score	17	21	16	18

Legend: 5—strongly agree, 4—agree, 3—neutral, 2—disagree, 1—strongly disagree.

Discussion

The two wheelchair recipients with paraplegia were able to do a follow-up consultation with their wheelchair assessor, overcoming the barriers of distance, costs, time, and transportation issues. They received appropriate medical and rehabilitation recommendations through telerehabilitation. Additionally, the wheelchair assessor was able to re-evaluate the patient and ensure that the assistive device was being used. To our knowledge, this is the first time telerehabilitation specifically for persons with SCI has been reported from the Philippines.

Telerehabilitation using low-cost resources that are available and convenient for patients can be leveraged to access rehabilitation services, especially when compliance to face-to-face consultation is difficult. It is recommended that telerehabilitation be offered to former and future wheelchair recipients to ensure follow-up, provided they have the technical capacity and resources to do so. Upon receiving the wheelchair in PGH, each patient may also receive orientation on the benefits and process of telerehabilitation, and exact schedule of telerehabilitation follow-up if patient consents. In this way, we could minimize the number of patients who were lost to follow-up.

Wheelchair follow-up provides a mechanism to check if a patient has been using the assistive device properly, if at all. Ideally, follow-up is scheduled regularly to re-evaluate the patient, and to identify the usefulness of the assistive device and need for its modification, preventive maintenance, or replacement either due to wear and tear or change of wheelchair type to a more applicable one [12]. New medical conditions, such as pressure sores or musculoskeletal injuries from improper wheelchair use or inadequate fit, should be addressed to prevent complications [13, 14].

Usually, new wheelchair recipients in PGH are advised to come back for face-to-face follow-up after 1 month, and as needed thereafter depending on the assessment of the

wheelchair provider. Unfortunately, many patients are unable to show up in the outpatient department of PGH. In this case report, telerehabilitation was proven to be a feasible alternative for patients and healthcare providers to communicate health-related concerns at their convenient time and virtual space. Clinical evaluation and wheelchair assessment by visual inspections and demonstrations through internet-based electronic media enabled the delivery of rehabilitation care. Through synchronous and asynchronous telerehabilitation with patient A, the physician was able to reassess the pressure ulcers, evaluate the home environment, and reinforce the home exercise program and proper use of the wheelchair. For patient B, telerehabilitation allowed the physician to inspect the wheelchair and upgrade it according to the patient's current needs and environment.

Telerehabilitation cannot replace face-to-face rehabilitation [15]. However as seen in this report, the appropriate use of telerehabilitation can bridge gaps in service delivery and potentially address health-related concerns more promptly than face-to-face encounters, especially when the latter method is difficult or not feasible. Using telecommunications technology, telerehabilitation can provide rehabilitation and long-term support to persons with disability (PWD) coming from resource-limited families and geographically isolated and disadvantaged areas, which are evident in developing countries like the Philippines. To ensure relevance, effective implementation, and sustainability of telerehabilitation service programs, there should be collaboration with different stakeholders, such as but are not limited to patient advocate groups, healthcare providers, and decision-makers [16].

Unlike in developed countries, we do not have readily available customized telemedicine platforms and telemonitoring equipment for indigent patients. Nonetheless, we can make use of what is available locally, similar to the report by Tyagi et al. in India, wherein they used a combination of telephone calls, video chat, and WhatsApp™ [17]. As the world's social media capital, the Philippines has the fastest-growing population of internet users, who primarily use it for social networking [8]. Nowadays, the relatively lower cost of internet and smartphones locally can support the promotion of mHealth, which is the use of mobile and wireless technologies to achieve health objectives [18]. However, the emergence of telerehabilitation-related endeavors in the Philippines has yet to overcome several challenges, such as stakeholders' apprehensions [19]. Nonetheless, after trying telerehabilitation for one session, our patients somehow gained better perception of how it could be an economical and practical solution to difficulties in complying with face-to-face follow-ups. With more experience with telerehabilitation, acceptance of this technology might improve among patients and other stakeholders.

As take-away message, telerehabilitation using locally available low-cost technology is feasible in the background of limited resources in a developing country. Rehabilitation providers should be aware of how telerehabilitation can be tailored to the needs and technical capacities of their healthcare staff and patients, while being creative with available resources and compliant with ethical principles of telemedicine at the same time.

Data availability

The datasets generated and analyzed during this study are available from the corresponding author upon request.

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Compliance with ethical standards

Conflict of interest The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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