

# Remote Post-operative Rehabilitation during the COVID-19 Pandemic in a Resource-limited Country: A Case Report

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## ABSTRACT

The suspension of facility-based rehabilitation services and restricted mobility at the onslaught of the coronavirus disease 2019 (COVID-19) pandemic forced healthcare workers to explore new methods of providing patient care. This case report presents a 40-year-old female who underwent osteotomy with iliac crest bone graft and intramedullary nailing with quadricepsplasty to correct the leg length discrepancy and knee extension contracture that developed secondary to multiple bone injuries sustained in a vehicular accident 17 months before admission. The in-hospital postoperative rehabilitation was prematurely terminated due to the COVID-19 lockdown. The client was discharged with pain and swelling of the right lower limb, knee flexion of 0–25°, and an ankle plantar flexion contracture. She had moderate to severe difficulty in walking, bathing, toileting, and lower garment dressing, needing assistance to complete these tasks. Telerehabilitation was done over three months using both synchronous and asynchronous methods. Gains from the remote program were independence in all the self-care activities with no difficulty in performing them. The patient was able to return to work. Gains in knee and ankle mobility were minimal. Telerehabilitation using available technologies can be used to continue patient care amidst barriers to face-to-face rehabilitation in a low-resource country.

*Key Words: telerehabilitation, telehealth, telemedicine, COVID-19, fracture, osteotomy, case report*

## INTRODUCTION

On March 15, 2020, the Philippine government placed Metro Manila on lockdown and community quarantine to control the coronavirus disease 2019 (COVID-19) outbreak.<sup>1,2</sup> The University of the Philippines - Philippine General Hospital (UP-PGH) was designated as a COVID-19 referral center. Non-essential services, including the Department of Rehabilitation Medicine (DRM) ward, were closed. All in-patients undergoing rehabilitation therapy were immediately discharged. Thus, the DRM explored the use of telerehabilitation to continue the program of care of their clients.

Telerehabilitation is a form of telehealth that allows the remote delivery of rehabilitation services to the place of choice of the patient.<sup>3</sup> While there is little evidence on its use in the Philippines and other low-to-middle income countries, there are numerous studies done abroad that document the benefits of telerehabilitation.<sup>4,5</sup> Continued access to rehabilitation services, time flexibility, lesser direct costs of healthcare (i.e., consultation/ therapy fees), elimination of indirect costs of rehabilitation (i.e., transportation and meal expenses) and empowerment of the patient and family to actively engage in the rehabilitation program are some of the benefits of telerehabilitation during a pandemic.<sup>6</sup>

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We present a case of a woman who underwent quadricepsplasty at the UP-PGH just before the COVID-19 lockdown. Good to excellent outcomes for this procedure require at least six weeks of a highly supervised, facility-based post-operative rehabilitation program.<sup>7-12</sup> The patient was compelled to go home with significant disability at one week post-operatively. This article aims to share the advantages and challenges of the client's telerehabilitation program as a replacement for traditional onsite rehabilitation.

## CASE

A 40-year-old female, high school graduate, and factory worker without known co-morbidities was admitted at the UP-PGH Orthopedics service unit for surgical correction of bony impairments secondary to old injuries in the right lower extremity (RLE) sustained in a motor vehicle accident 17 months before admission. The discharge diagnosis at the time of the accident was: 1) Open subtrochanteric fracture S/P ORIF with intramedullary nailing, 2) floating knee injury, and 3) tibial fracture S/P closed reduction and external fixation. The orthopedic evaluation in UP-PGH showed a malunion of the right femur, a shortened right lower extremity with a leg length discrepancy of 6 cm and a knee extension contracture. Functionally, the patient walked without an assistive device, used a 4–5 cm shoe lift in the right foot, and performed all activities of daily living (ADL) without difficulty. She underwent corrective osteotomy with iliac crest bone graft, removal and replacement of the intramedullary nail in the femur and quadricepsplasty. On the fifth post-op day, the patient was transferred to the rehabilitation medicine ward for non-weight bearing ambulation and ADL training, mobilization

of the RLE joints and general conditioning. Table 1 shows the rehabilitation goals and pertinent clinical findings from admission to the rehabilitation ward until discharge from the telerehabilitation program. The in-hospital program was prematurely terminated when UP-PGH transitioned to a COVID-19 referral center. The patient accepted the invitation to join the UP-PGH DRM telerehabilitation program because rehabilitation therapy facilities in her area were closed.

## Intervention

The patient was contacted via text messaging to obtain consent for telerehabilitation and to confirm the availability of internet access, a smartphone with video-conferencing capabilities and a relative who will be able to assist during the teleconsultations and teletherapy sessions. Informed consent was secured with a Google Meet™ videocall. She was asked to read the document out loud, which was videotaped for documentation. To ensure privacy, the patient and the resident in charge were alone in their respective locations. The informed consent was stored in a private, password-locked external hard drive and was not uploaded online to ensure data security.

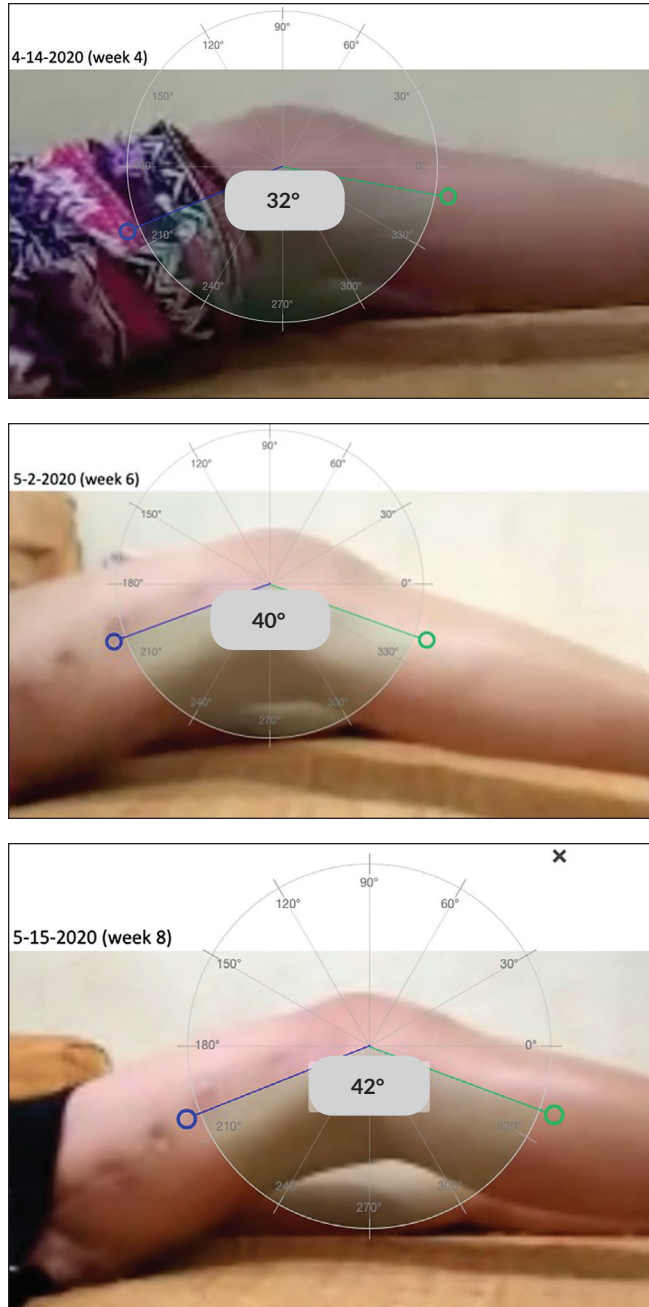
A technical dry run was first done. Before every teleconsultation and teletherapy session, the appointment was confirmed and the client was reminded to wear comfortable clothes, prepare needed equipment and ensure the presence of a relative. Specific instructions on positioning the camera during exercises were given during the session.

The patient had 11 teleconsultations with the rehabilitation doctor that were 10 to 30 minutes long. Every teleconsultation began by checking for new problems and inspecting the RLE. Whenever the image quality in

**Table 1.** Treatment goals and clinical findings of the onsite and remote rehabilitation programs

Rehabilitation goal	Initial evaluation (1-day post-op)	Post-onsite rehab discharge status (1 week post-op)	Post-remote rehabilitation discharge status (16 weeks post-op)
1. Full weight-bearing ambulation in all terrains without assistance at 6 weeks post-op	Bedridden	Non-weight bearing walker ambulation	<ul style="list-style-type: none"> <li>Ambulation goal achieved at 3 months post-op but with mild difficulty</li> <li>Mild to moderate difficulty in stair-climbing and steep inclines</li> </ul>
2. Return to remunerative employment in 2 months	Unemployed	Status quo	<ul style="list-style-type: none"> <li>returned to full-time work 4 months post-op</li> <li>assists in the family business at 4 months post-op</li> </ul>
3. No difficulty in performing all self-care and domestic tasks with no assistance	Moderate to severe difficulty in washing oneself, toileting, and lower garment dressing, needing assistance	Mild to moderate difficulty needing assistance	Goal achieved at 3 weeks post-op
4. No difficulty in doing domestic tasks without assistance	Not evaluated	Not evaluated	Goal achieved at 3 weeks post-op
5. Pain-free active knee flexion of at least 0-90° by 6 months with no extension lag	<ul style="list-style-type: none"> <li>6/10 right knee pain with marked swelling</li> <li>0-25° flexion</li> </ul>	<ul style="list-style-type: none"> <li>3/10 pain with moderate swelling</li> <li>0-25° flexion</li> </ul>	<ul style="list-style-type: none"> <li>Pain and swelling resolved at 2 weeks post-op</li> <li>Pain-free, active ROM 0-45°</li> </ul>
6. Active dorsiflexion of 0-10° by 6 weeks	(+) right ankle plantarflexion contracture	Foot fixed at 5° of plantarflexion	Active and passive dorsiflexion of 0-10°

video calls was poor, the client was asked to send pictures asynchronously via email. The online assessment of the joint ROM was done by viewing the patient's right side in a supine position. The patient was first asked to move each joint actively, and then a relative would assist the motion to get the passive ROM. Figure 1 shows how the knee ROM was measured. The lateral aspect of the right knee was centered in the frame and a screenshot was taken. The ROM was measured using the Google Chrome Extension, Protractor™. Gait was assessed in both the sagittal and coronal planes



**Figure 1.** Range of motion for right knee flexion obtained through telerehabilitation at different time intervals.

by having the patient walk to and from the camera to ensure no weight bearing on the right lower extremity. An environmental assessment was also done to ensure no barrier limited the patient's mobility and to reduce the risk of falls. Clutter around the house was kept to a minimum. The furniture was rearranged to optimize home ambulation with the walker. Postural analysis was done by having the patient take photos of herself in standing. Multiple attempts were required because the verbal instructions were often misinterpreted. Instructions were better understood when photos demonstrating the desired testing positions were sent as a visual guide.

A total of thirteen 60-minute teletherapy sessions were completed in 17 weeks either through Google Meet™ or Zoom™. The remotely supervised treatment program focused on ambulation and functional training, ROM and stretching exercises to increase knee flexion and ankle dorsiflexion. An experienced tele-therapist facilitated the sessions through virtual demonstration and supervision of the client doing the prescribed activities. The caregiver was instructed on how to ensure the patient's safety. ROM and functional gains were monitored and documented every two weeks. A home program augmented the teletherapy sessions.

### Outcomes

The clinical status of the patient at the end of the telerehabilitation program is summarized in the last column of Table 1. The functional goals were successfully achieved except for independent ambulation. The transition to full weight bearing was delayed because x-ray facilities were inaccessible during the lockdown. The follow-up radiographs were sent at 3 months post-op. The gain in knee flexion (Figure 1) exceeded the intraoperative range of 0–30°. We were unable to achieve the functional range needed for walking (70°) and sitting (90°).<sup>7,9</sup> The patient was able to return to work and no adverse events occurred throughout all telerehabilitation sessions. The patient asked to end the telerehabilitation to attend to family matters and was given a home exercise program.

### Patient Perspective

The patient expressed satisfaction with the telerehabilitation process, health care providers, equipment used and quality of care during the teleconsultation and teletherapy sessions. She believed many patients could benefit from tele-rehabilitation because it is a better option compared to having no rehabilitation therapy at all, thus giving patients a chance to recover faster. She found the Google Meet™ and Zoom™ platforms to be user-friendly.

### DISCUSSION

There are published reports from developed countries on the use of telerehabilitation for the post-operative care of orthopedic patients, but none are available locally. Remote

programs with comparable outcomes to the traditional face-to-face approach were highly structured. Clients were enrolled and thoroughly oriented before the planned surgery. In several studies, a customized platform or kit was installed in each participant's home including exercise and monitoring equipment. In contrast, the UP-PGH telerehabilitation program was an unpremeditated response to the lockdown. A customized encrypted, Health Insurance Portability and Accountability Act (HIPAA)-compliant telemedicine platform and telemonitoring equipment were not available.<sup>13</sup> There was no dedicated staff for telerehabilitation. The team was unprepared for the shift to remote communications and patient care. Procedures were systematized and guidelines were developed during program implementation. Since the hospital's resources were directed towards combatting COVID-19, the department had to make do with available technologies, often relying on personal communication devices and applications with free access. Patients also used their devices and make-shift exercise equipment present in their homes. Despite these challenges, the department was still able to implement a safe program of care. This exhibits the benefits of telerehabilitation in terms of flexibility in scheduling and usability.

Quadricepsplasty aims to restore knee flexion in persons with extension contractures. It was essential for our patient to resume a post-op program because studies on the outcome of quadricepsplasty showed the need for at least six weeks of a facility-based knee exercise program by a physiotherapist.<sup>7-12</sup> Based on Judet's criteria, a post-rehabilitation knee flexion of less than 50° is a poor outcome.<sup>9-11</sup> In the studies, most patients achieve good outcomes with 80° to 100° flexion six months to a year after surgery.

The use of physical modalities is very limited in telerehabilitation because of its cost and need for a trained provider. Joint mobilization strategies are also difficult to teach, even face-to-face. Improper exercise techniques and aggressive stretching in the subacute stage of a surgically repaired limb can lead to overuse injury and delayed healing. These disease-related factors together with the low intra-operative ROM, unstructured program and priority placed on patient safety constrained the prescription of more aggressive knee ROM exercises for the patient. A highly supervised, facility-based program could have resulted in a wider range of knee flexion.

Despite the minimal improvement in knee ROM, the patient quickly regained independence in self-care and domestic activities and resumed gainful employment. Managing the disabilities in her real environment gave telerehabilitation an edge over traditional facility-based management. The team easily saw barriers to mobility and function during the teleconsultations and were able to modify the environment. The patient's satisfaction with the functional gains despite the lack of significant improvements in the knee ROM supports the importance of quality of life for persons who have challenging impairments.

Presently, telerehabilitation continues to be a safer option than onsite rehabilitation. It reduces the risk of spreading COVID-19<sup>14</sup> and spares the client from the inconveniences caused by the required safety protocols. Patients can save on transport and meal expenses and the travel and waiting time. Online platforms, policies and guidelines on telehealth have improved as its use has become more widespread.

Even after the pandemic, telerehabilitation can remain as a service delivery option. The limited space and resources of rehabilitation centers can be prioritized for patients who need a highly supervised program of care. Like our client, hospitalized patients can be discharged early and continue to get clinical support, have follow-up consultations, therapy sessions and receive prompt medical and rehabilitation advice remotely. Telerehabilitation can facilitate networking across the three levels of health care.

Barriers to the use of telerehabilitation include the e-health literacy of a patient, technically-challenged staff, resistance to change, costs, reimbursement of telerehabilitation consultations or therapy sessions and internet speed.<sup>5,6</sup> The case presented proves that telerehabilitation is possible even with existing simple technologies. Sending sample photos and infographics resolved the difficulty in understanding complicated evaluation procedures and poor internet connections. All rehabilitation personnel adapted well to doing telerehabilitation regardless of their inexperience. However, the team can benefit from training on the use of diagnostic software to facilitate the evaluation of outcomes online.

A structured patient care program that combines onsite and remote services can be a cost-efficient alternative to traditional facility-based rehabilitation for clients in the early postoperative period of a complicated orthopedic procedure. A client's need for skilled therapy and complex evaluations limit the use of telerehabilitation. The key advantage of managing clients in their actual environment is an early return of function. Even with minimal resources, telerehabilitation can improve quality of life and help attain the goal of Universal Health Care through increased access to rehabilitation services.

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### Statement of Authorship

Both authors contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising and approved the final version submitted.

### Author Disclosure

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