Case Report

Emergence of Tele-rehabilitation during COVID-19: A Case Report of a Survivor with Multiple Co-morbidities

Shruti Prabhakaran Nair, Vrushali P. Panhale[1], Panchami Nair

Departments of Cardiovascular and Respiratory Physiotherapy and [1]Musculoskeletal Physiotherapy, MGM College of Physiotherapy, Vashi, Navi Mumbai, Maharashtra, India

Abstract

Coronavirus disease 2019 (COVID-19) survivors experience impaired pulmonary function, reduced muscle strength, and exercise intolerance affecting their activities of daily living. Literature has demonstrated a need for multi-disciplinary approach for their faster recovery. In a pandemic like situation where maintaining social distancing to reduce the risk of transmission had become a norm, telerehabilitation services came to a great rescue of both the patients and health-care providers. At present, there are not any established guidelines for rendering pulmonary rehabilitation through telerehabilitation (TR). Besides, it's effective implementation depends on numerous patient-centric factors such as age, hemodynamic stability, presence of comorbidities, availability of resources, and cognitive level of the patient. We hereby present the case of a 69-year-old female diagnosed with COVID-19 with prolonged hospital stay, having a history of multiple co-morbidities, focusing on the role of 12 weeks of TR in improving her functional outcomes.

Keywords: Comorbidity, coronavirus disease 2019, tele-rehabilitation

Introduction

Coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory coronavirus 2 has caused a global pandemic. The clinical presentation begins within 14 days of exposure, with most patients presenting with fever, cough, dyspnea, bodyache, fatigue, and loss of smell and taste after about 5 days.[1] Patients with comorbid conditions including diabetes, hypertension, heart ailments, chronic respiratory illnesses, chronic liver and kidney disease, and cancer patients with compromised immune status are at higher risk for complications.[2] At the start of the pandemic, there were not many established guidelines demonstrating effective ways to deliver physiotherapy (PT) services without the fear of getting exposed to the virulent strain. Physical therapist all over largely followed the preliminary guidelines formulated by Thomas *et al*.; to develop treatment strategies for COVID-19 patients in acute set-up[3] With time as the role of PT to reduce the disease burden got strengthened, therapist started exploring the model of tele-rehabilitation (TR) which simply meant delivering rehabilitation services by using technology such as video calls and web-based exercise prescription. A recent systematic review by Suso-Martí has ascertained an equally effective benefit of TR in reducing pain, improving physical function, and quality of life (QOL) in various medical conditions when compared to the traditional face-to-face approach.[4] We thereby tried to explore further and formulate rehabilitation strategies that could be effectively delivered through TR for our COVID-19 survivor.

Case Report

Presenting to you a 69-year-old lady, known case of hypertension, COPD (chronic obstructive pulmonary disease), sleep apnea who came with a history of fever, breathlessness, and exertional desaturation on 15 July 2020.After being tested positive for COVID-19, she was admitted to an in-patient unit of a dedicated COVID-19 hospital. Her investigation reports, medical management, and details of oxygen (O_2) support

Access this article online

Quick Response Code:

Website: www.ijrc.in

DOI: 10.4103/ijrc.ijrc_93_22

Address for correspondence: Dr. Shruti Prabhakaran Nair, Department of Cardiovascular and Respiratory Physiotherapy, MGM College of Physiotherapy, Vashi, Navi Mumbai, Maharashtra, India.
E-mail: shrutinair2008@gmail.com

How to cite this article: Nair SP, Panhale VP, Nair P. Emergence of Tele-rehabilitation during COVID-19: A Case Report of a Survivor with Multiple Co-morbidities. Indian J Respir Care 2022;11:277-80.

Received: 30-04-2022 **Revised:** 06-06-2022
Accepted: 07-06-2022 **Published:** 28-07-2022

are presented in Table 1. Attempts for early weaning from O_2 therapy were unsuccessful considering her abrupt drop in saturation (SpO_2), breathlessness, symptoms of fatigue, and difficulty to even walk 10 m without O_2. Since the hospital did not have in-patient PT services, she performed self-supervised basic mobility exercises and incentive spirometry during her 1 month of hospital stay. She was discharged on August 18, 2020 and advised home quarantine on four liters per min (L/min) of O_2 using a portable oxygen concentrator. In addition, she also had a past surgical history of bilateral total knee replacement (TKR) in 2013 and hernioplasty in 2018.

Pulmonary rehabilitation (PR) via TR was started 3 weeks post discharge. It primarily focused on patient education, breathing re-training, optimizing ventilation-perfusion ratio, maintaining joint mobility, improving functional capacity and peripheral muscle strengthening. The patient was advised about task modification, activity pacing, taking adequate rest pauses, breathing control with activities, and dyspnea relieving positions. Table 2 demonstrates the 12 weeks TR protocol. Two supervised sessions were conducted weekly via Whatsapp video call, with each session lasting for 60 min. Exercise intensity was decided based on the maintenance of Rate of Perceived Exertion at 3/10 on a modified Borg's scale and post-exercise saturation (monitored using finger pulse-oximeter) not dropping to more than 3%. On other days of the week, she was advised to do self-monitored breathing exercises, general mobility exercises and ambulation (ensuring SpO_2 maintained above 92%). She was taught to monitor her SpO_2 with every activity and also take rest pauses whenever she felt breathless and fatigued. Her O_2 was gradually tapered to one L/min by fourth week of rehabilitation when she started maintaining SpO_2 above 95%. Effect of rehabilitation on patient's health was documented through pre- and post-assessment of functional outcomes such as fatigue, functional status, QOL, and functional capacity [Table 3].

Table 1: Laboratory investigations and medical management

Investigations with dates	Remarks
RT-PCR	
July 15, 2020	Positive
August 3, 2020	Negative
HRCT chest	
July 13, 2020	Radial bands with consolidation in segments of left upper lobe, few fibrous bands in the medial segment of right middle lobe
July 23, 2020	Mosaic lung pattern is noted in either lung parenchyma, radial bands with consolidation in the lingular segment of left upper lobe, fibroatelectatic bands in medial segment of right middle lobe
Chest radiographs	
August 14, 2020	Focal consolidation of the right middle zone
September 08, 2020	Left basal haziness at periphery, cardiomegaly is seen
2D echo and colour Doppler	
September 08, 2020	Normal LV systolic function, LVEF 60%, mild pulmonary hypertension, small pericardial effusion
Arterial blood gas analysis	
September 09, 2020	pH - 7.43, PCO_2-46 mm Hg, PO_2-53 mm Hg, HCO_3-30.7 mmol/L
D-Dimer	
November 21, 2020	0.21 - Elevated
Medical management	
Injection piptaz 4.5 g, injection remdesvir, tablet calaptin, tablet amlodipin 5, tablet prednisolone 40 mg, multivitamins, zinc supplement, probiotics and antacid	
Supplemental O_2 therapy: Oxygen therapy was started on 7-8 L/min through face mask for almost 1 week to gradually reducing the flow rate to 6 L/min via nasal cannula followed by 4 L/min toward the 4th week of hospital stay depending on her SpO_2 maintained at 97%-98%	

RT-PCR: Reverse transcription polymerase chain reaction, HRCT: High-resolution commuted tomography, LV: Left ventricular, LVEF: LV ejection fraction, O_2: Oxygen, SpO_2: Oxygen saturation, 2D: Two dimensional

Discussion

Our case report elucidates the effect of home-based TR commenced post-hospital discharge in a COVID-19 survivor with multiple co-morbidities. Inaccessibility to PR during hospital stay and being referred after 8 weeks of acquiring COVID-19 infection, it was a challenge to devise a rehabilitation program considering her age and co-morbidities. The rationale for TR was to optimize respiratory function, reduce her need for supplemental oxygen, and to make the patient functionally independent. TR brought about an improvement in the patient's health at the end of 12 weeks as observed by her reduced need for supplemental O_2, reduced fatigue as seen in Fatigue Assessment Scale (FAS) score, improved functional capacity revealed by 30 s chair rise test and better QOL as reflected in 12-Item Short-Form Survey (SF-12) score. Prvu Bettger and Resnik has supported similar findings of TR to improve health outcomes, physical and mental function, QOL, patient adherence and to promote early return to work.[5]

The therapies included in this TR protocol were in accordance to the guidelines published by Thomas *et al*.;[3] and Alawna *et al*.[6] Breathing exercises have been known to improve the lung expansion, improve the oxygen saturation thus helping in early weaning from oxygen therapy.[7] Concurrent endurance and strength training has been proven to be a preferred treatment for lung diseases to improve peak pulmonary oxygen uptake, muscle strength, muscle size, functional capacity, and QOL.[8] Minimal dose resistance training protocols involving two sets of 3–4 exercises performed twice per week are recommended for adults recovering from COVID-19.[9]

Post-TR also demonstrated a change in her Post- COVID Functional Status (PCFS) and Functional Activity Questionnaire (FAQ) score which indicated that she was more independent in her activities. The 30 s chair rise test repetitions increased marginally by a count of two. This could be attributed to her

Table 2: Oxygen saturation response to 12 weeks' telerehabilitation protocol

Week	Oxygen support	Pre SpO_2 (%)	Exercise protocol	Post SpO_2 (%)
1st week-3rd week	4 L/min via nasal prongs		Patient education	
		98	Breathing exercises in semi-Fowler's position (5 reps)	97
		96	Thoracic expansion exercises (5 reps, 2 sets)	94
		95-98	General mobility exercises of UE and LE in EOB sitting position (5 reps of each, 2 sets with rest pauses)	92-93
		95	Spot marching (10 reps)	98
		97	Room ambulation (10-15 steps)	96
		97	Incentive spirometer (<400 cc, 5 reps)	95
4th week	1 L/min	96	Breathing exercises (5 reps, 2 sets)	95
		94	Mobility exercises (10 reps, 2 sets)	98
		95	Resistance training (quadriceps, hip flexors, abductors, deltoid, shoulder flexors, biceps, and triceps) (resistance as per tolerance)	94
		94	Spot marching (10 reps, 3 sets)	94
		94	Side walking (10 steps)	95
		95	Room ambulation (30-40 steps)	95
		95	Incentive spirometer (600 cc, 10 reps with 3 sec hold)	95
5th week	1 L/min	96	Same protocol as above	95
		96	Stepping (10 reps, 2 sets)	90
6th week	1 L/min	95	Same protocol as above	97
		97	Spot marches with hand raises (10 reps, 2 sets)	97
		95	Walking in outdoor spaces (3 rounds-approximately 100 m)	89
7th week	1 L/min	96	Same protocol as above	96
		96	Stair-climbing (3-4 steps, 3 sets)	95
8th week	1 L/min	99	Same protocol as above	97
		98	1 flight of stairs	96
		96	Walking in outdoor spaces (30 min, 10 rounds)	93
12th week	Intermittent O_2 during staircase climbing	96	Same protocol as above	94
		94	Incentive spirometer (700 cc, 10 reps with 3 s hold)	95

O_2: Oxygen, SpO_2: Oxygen saturation, Reps: Repetitions, EOB: Edge of the bed, UE: Upper extremity, LE: Lower extremity

Table 3: Baseline and post-rehabilitation assessment

Assessment	Baseline	6th week	12th week
Outcome measures	September 14, 2020	November 01, 2020	January 11, 2021
FAS score	27	13	12
PCFS	2	1	1
FAQ	7	6	6
SF-12 score	28	26	18
30 s chair rise test (repetitions)	5	6	7

FAS: Fatigue Assessment Scale, PCFS: Post-COVID functional status, FAQ: Functional activity questionnaire, SF: 12-Item Short-Form Survey

history of TKR as patients post knee surgery are known to generate insufficient knee angular velocity during rising which could probably be the reason for the marginal improvement in her chair rise repetitions post TR.[10]

TR came to the rescue during COVID-19 pandemic, aiding in patient recovery and making her functionally more independent. It had its own advantage wherein performing exercises in the home setting facilitated better adherence, helped patient adapt to the real-life environment and improved self-reliability[11] However, there was a need to have a full - time caregiver around the patient during the rehabilitation to ensure safety while performing exercises. Also,we had to rely on self-reported measures of assessment to check the effectiveness of TR due to limited resources in terms of availability of equipments and therapist in-person. Other important factors such as nutrition levels, medical therapy, motivation, and family support would have also been a part of her recovery but were not extensively studied.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal her identity.

Acknowledgment

We would like to acknowledge the patient for her co-operation in patiently giving the history and being compliant to physiotherapeutic regimen. We would also like to express our heartfelt gratitude to her caregiver for his constant support and assistance rendered throughout the tele-rehabilitation sessions.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Verma CV, Arora RD, Patil MR, Desouza R. Physiotherapy management of COVID-19 patients in acute set up of government tertiary care hospital: A case series. J Soc Indian Physiother 2020;4:101-6.
2. Rombolà G, Brunini F. COVID-19 and dialysis: Why we should be worried. J Nephrol 2020;33:401-3.
3. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, *et al.* Physiotherapy management for COVID-19 in the acute hospital setting: Clinical practice recommendations. J Physiother 2020;66:73-82.
4. Suso-Martí L, La Touche R, Herranz-Gómez A, Angulo-Díaz-Parreño S, Paris-Alemany A, Cuenca-Martínez F. Effectiveness of telerehabilitation in physical therapist practice: An umbrella and mapping review with meta-meta-analysis. Phys Ther 2021;101:pzab075.
5. Prvu Bettger J, Resnik LJ. Telerehabilitation in the age of COVID-19: An opportunity for learning health system research. Phys Ther 2020;100:1913-6.
6. Alawna M, Amro M, Mohamed AA. Aerobic exercises recommendations and specifications for patients with COVID-19: A systematic review. Eur Rev Med Pharmacol Sci 2020;24:13049-55.
7. Kachpile ST, Lohakare PK, Jiandani MP, Salagre SB. Physiotherapy interventions in COVID-19 patient with multiple comorbidities: A case report. Int J Health Sci Res 2020;10:96-101.
8. Gentil P, de Lira CA, Coswig V, Barroso WK, Vitorino PV, Ramirez-Campillo R, *et al.* Practical recommendations relevant to the use of resistance training for COVID-19 survivors. Front Physiol 2021;12:637590.
9. Gentil P, De Lira CA, Souza D, Jimenez A, Mayo X, de Fátima Pinho Lins Gryschek AL, *et al*. Resistance training safety during and after the SARS-Cov-2 outbreak: Practical recommendations. Biomed Res Int 2020;2020:3292916.
10. Boonstra MC, Schwering PJ, De Waal Malefijt MC, Verdonschot N. Sit-to-stand movement as a performance-based measure for patients with total knee arthroplasty. Phys Ther 2010;90:149-56.
11. Fjeldstad-Pardo C, Thiessen A, Pardo G. Telerehabilitation in multiple sclerosis: Results of a randomized feasibility and efficacy pilot study. Int J Telerehabil 2018;10:55-64.