

CHALLENGES IN REHABILITATION DURING COVID-19 PANDEMIC: A TELE-REHABILITATION APPROACH

IZZIVI REHABILITACIJE MED PANDEMIJO COVID-19: TELEREHABILITACIJSKI PRISTOP

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Povzetek

Vsaj polovica pacientov po bolezni zaradi okužbe s SARS-CoV-2 utрпи blago ali resno oslabelost, utrujenost, mišične bolečine, vrtoglavico, zelo hitro utrudljivost, depresijo ali tesnobo, lahko pa celo nevrološke motnje in periferne nevropatije. Rehabilitacija je odvisna od faze bolezni. Pandemija COVID-19 je močno otežila ambulantno pomoč takim bolnikom in njihovo oskrbo na domu, zato številni strokovnjaki kot možno rešitev priporočajo telerehabilitacijo. V ta namen smo marca 2020 vzpostavili prosto dostopno spletišče z navodili za terapevtske vaje v italijanskem in angleškem jeziku, namenjeno bolnikom, odpuščenim domov po hospitalizaciji zaradi koronavirusne bolezni, bolnikom v karanteni na domu zaradi COVID-19 in zdravstvenim delavcem. Spletišče spremlja obiske in ogled vseh vsebin, vsebuje pa tudi vprašalnik o zadovoljstvu uporabnikov. Zabeležili smo 220 obiskovalcev in 623 ogledov strani, večino v prvem obdobju epidemije do konca maja 2020. Vprašalnik je izpolnilo 50 oseb in njihovi odgovori večinoma pričajo o zmanjšanju simptomov in izboljšanju zdravja po izvajanju programa ter o zadovoljstvu s ponujenimi vsebinami. Zato ocenjujemo, da je rehabilitacija na daljavo cenjena, varna in potencialno uporabna za bolnike po preboleli koronavirusni bolezni.

Ključne besede:

telerehabilitacija; telemonitoring; COVID-19.

Abstract

At least half of the survivors after SARS-CoV-2-caused disease suffer from a mild to severe deconditioning syndrome, fatigue, muscle wasting and pain, dizziness, very low tolerance to minimal efforts, depression and anxiety, or even from post-critical neurological syndrome and peripheral neuropathies. Rehabilitation changes according to the disease phase. The COVID-19 pandemic has severely hampered outpatient and home-based care, so many experts have suggested telerehabilitation as a possible solution. For this purpose, we established a publicly accessible web platform in March 2020 with an original therapeutic education program in Italian and English. The platform is intended for the patients discharged home after hospitalisation due to coronavirus disease, patients in isolation at home because of COVID-19 infection, and health care professionals. The platform monitors the number of visits and page views, and includes a user-satisfaction questionnaire. We have recorded 220 visitors and 623 page views, mostly during the first phase of the epidemic until the end of May 2020. The questionnaire was filled in by 50 persons; their mainly reported reduced symptoms and improved health after following the therapeutic program, and satisfaction with the offered contents. Hence, we believe that telerehabilitation is appreciated, safe and possibly useful for patients after coronavirus disease.

Key words:

telerehabilitation; telemonitoring; COVID-19.

INTRODUCTION

The current pandemic due to SARS-CoV-2 is characterized by acute respiratory failure leading to the need for hospital care in up to 20 % of cases. According to recent scientific literature, at least 50 % of the survivors shall suffer from a mild to severe deconditioning syndrome, fatigue, muscle wasting and pain, dizziness, very low tolerance to minimal efforts, depression and anxiety, or even from post-critical neurological syndrome and peripheral neuropathies (1, 2). The rehabilitation assistance changes according to the disease phase: in the acute phase, the involvement of the rehabilitation team is invoked by many, but the indications are not fully shared and access to facilities is complicated. Subsequently, in relation to the possible high incidence of residual disabling respiratory, cardiovascular and neurological complications, there is the need for resources dedicated to promote the recovery of autonomy and the management of disabilities in the long term. In any case, the COVID-19 pandemic is determining several degrees of confinement that will continue until a SARS-CoV-2 vaccine is made available for the greatest part of the world population. Currently, the pandemic represents a barrier to the implementation of adequate outpatient and home-based care (2). Rehabilitation providers will serve as an important link in the continuum of care, helping to move the patients from acute wards back to the community.

Rehabilitation may be effective for recovering from post-COVID-19 syndrome and widespread experience and expert opinions suggest potentiating tele-health systems and home-based care services in order to improve health-care (3, 4) and to overcome the barriers determined by the need for social distancing and reorganisation of clinical care. Innovative approaches to care, such as virtual rehabilitation, are likely to become common in this environment. The use of technology for telemonitoring and telerehabilitation seems desirable to optimise the time of intervention delivery (4).

We will discuss the feasibility and level of users' satisfaction of a tele-health service that provides therapeutic exercise protocols for people who are recovering after COVID-19.

MATERIALS AND METHODS

An original therapeutic education program, available for free in Italian and English language, was published online on March 31, 2020 by a multidisciplinary team. The education program is hosted on a web platform that is accessible from any device (smartphone, tablet, laptop) and any operating system (Android, Windows, iOS) at the URL <https://www.rehab-univpm-it/public/#/covid>. The web platform was developed as a standard client-server architecture, where the client was implemented as an Angular application and the server through a Microsoft Net Framework. The educational program can be accessed for free without the need of login or credentials.

User interfaces and web pages were developed to enhance usability and accessibility, given the wide range of possible users. In particular, Web Content Accessibility Guidelines were followed for a

correct design of web pages (5). The training interface shows the exercise progression within the session of the current day; the user is free to consult the video and pass to the next exercise whenever he/she is ready. A text box is always present to provide a resume of the current exercise together with notes that are important for a correct execution of the exercise.

The target users are rehabilitation professionals and people recovering from the acute phase of COVID-19 infection. The educational material is composed of a selection of 28 footages displaying as many exercises for the respiratory and limb muscles, with an audio tutorial giving specific instructions on how to perform correct movements. These educational contents are stored on the web platform and organized in different educational courses (scenarios) that users can follow to correctly and effectively train themselves.

The scenarios fit different needs on the basis of the COVID-19 severity. The user can choose among

- Scenario 1: people discharged home after hospitalisation due to COVID-19 disease;
- Scenario 2: people quarantined at home due to COVID-19 infection;
- There is also a custom educational scenario, allowing people to select exercises from the library.

Contraindications to the training are symptoms or signs (i.e. fever) of pneumonia or concomitant diseases contraindicating exercise (ischemic cardiomyopathy; heart attack in the last three months; cardiac arrhythmia; uncontrolled hypertension; heart failure; severe chronic ventilatory failure). A booklet, available online on the platform, provides detailed information about the use of the health system. The users are invited to apply the Borg scale and Barthel dyspnea scale before and during the training in order to monitor their performances.

The usefulness, feasibility, impact, and effectiveness of this telemedicine approach has been evaluated through

- web platform visits and page views;
- a customer satisfaction questionnaire.

The questionnaire has been made available on the platform to be completed on a voluntary and anonymous basis. A preliminary data analysis was conducted on the platform use during the first wave of the pandemic, i.e., between March 31st and September 30th, 2020.

RESULTS

The web platform registered an average of 220 visits and 623 page views per day in the target time period. Most page views were recorded before May 31st.

The users' satisfaction questionnaire was answered by 50 people: 40 % were male, 68 % aged between 40 and 60 years; 63 % of them used the platform to perform the training, 16 % were phys-

iotherapists who supervised people performing the training, the remainder only downloaded the booklet.

Among the patients, 33 % performed the training after hospital discharge, 12 % did it during their hospital stay in a post-acute ward, while 28 % started it during their quarantine at home. The questionnaire also revealed that 80 % of the users were still suffering from fatigue during routine activities and rated the symptom 6.5 on average on a 1-10 Numeric Rating Scale (NRS). The perceived average improvement after the training was 6.5 (SD 2.4; Median 7.5; range 1-9). About 64 % of the responders suffered from moderate to severe anxiety symptoms and 54 % perceived improvement after training. On a 1-5 NRS, the average level of satisfaction with the project was 4.4 (median 5, range 2-5). No side effects were reported.

DISCUSSION AND CONCLUSION

The platform was first published online in March 2020 to cope with the consequences of COVID-19 and to overcome the barriers created by the need of social distancing in the pandemic era.

The number of web platform visits and page views demonstrates the importance and usefulness of a tele-health approach to integrate rehabilitative management of subjects recovering from COVID-19. The trend of platform accesses reflects the trend of SARS-CoV-2 contagions. The questionnaire data highlight the persistence of fatigue and anxiety in the medium term.

Due to the unique circumstances of providing transitional care in a pandemic, post-discharge providers must adapt to specific needs and limitations identified for the care of COVID-19 patients. The questionnaire responses indicate a perceived usefulness of this tele-education service as indicated by the high percentage of respondents that accessed the platform to follow the educational scenarios, as well as the high perceived improvement of the post infection syndrome and the high satisfaction.

Some limitations exist in this kind of tele-rehabilitation implementation that cannot be proposed to severely disabled people in the absence of professional supervision. Finally, specific regulation is warranted to manage privacy issues and face the cyber-security challenges in an effective way.

In conclusion, tele-health is appreciated, safe and possibly useful to integrate rehabilitative management of people recovering from COVID-19. Controlled studies are warranted to confirm these preliminary results.

References:

1. De Sire A, Andrenelli E, Negrini F, Patrini M, Lazzarini SG, Ceravolo MG. Rehabilitation and COVID-19: a rapid living systematic review by Cochrane Rehabilitation Field updated as of December 31st, 2020 and synthesis of the scientific literature of 2020. *Eur J Phys Rehabil Med.* 2021 [v tisku]. Doi: 10.23736/S1973-9087.21.06870-2.
2. Grabowski DC, Joynt Maddox KE. Postacute care preparedness for COVID-19: thinking ahead. *JAMA.* 2020;323(20):2007-8.
3. Iannaccone S, Castellazzi P, Tettamanti A, Houdayer E, Bruggiera L, de Blasio F, et al. Role of rehabilitation department for adult individuals with COVID-19: the experience of the San Raffaele Hospital of Milan. *Arch Phys Med Rehabil.* 2020;101(9):1656-61.
4. Negrini S, Donzelli S, Negrini A, Negrini A, Romano M, Zaina F. Feasibility and acceptability of telemedicine to substitute outpatient rehabilitation services in the COVID-19 emergency in Italy: an observational everyday clinical-life study. *Arch Phys Med Rehabil.* 2020;101(11):2027-32.
5. Web Content Accessibility Guidelines (WCAG) Overview. Web Accessibility Initiative WAI; 2021. Dostopno na: <https://www.w3.org/WAI/standards-guidelines/wcag/> (citirano 28. 3. 2020).
6. Observational Everyday Clinical-Life Study. *Arch Phys Med Rehabil.* 2020 Nov;101(11):2027-2032. doi: 10.1016/j.apmr.2020.08.001. Epub 2020 Aug 12. PMID: 32800748; PMCID: PMC7422840.
7. WCAG, "Web Content Accessibility Guidelines (WCAG) Overview," Web Accessibility Initiative (WAI). <https://www.w3.org/WAI/standards-guidelines/wcag/> (accessed Mar. 28, 2020).