

**A POSSIBLE USE OF SIMPLE TELEREHABILITATION PROGRAM AS AN  
ALTERNATE FORM OF TRADITIONAL HOME-BASED EXERCISE PROGRAM FOR  
PATIENTS WITH SOCIALLY SIGNIFICANT DISEASES: A PRELIMINARY STUDY**

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**Abstract:** Telehealth is growing rapidly and has the potential to transform the delivery of health care for millions of persons (Sarsak, 2020). Telerehabilitation (TR) is a relatively new and developing field of telehealth. TR is the use of telecommunication technology to deliver and support rehabilitation services and it is the clinical application of consultative, preventative, diagnostic, and therapeutic services via two-way or multi-point interactive telecommunication technologies (Wakeford, 2005), such as telephone, internet and videoconference (Frederix, 2015). Consequently, home-based TR programs, are becoming increasingly common as an alternative mode of “homecare” rehabilitation, which requires the treating therapist or clinician to travel to the patient’s home since they can be delivered at a distance, thus reducing the travel costs and difficulties both for the patients and the therapists. Using technology to deliver rehabilitation services has many benefits (Zonneveld, 2019) for not only the clinician but also the patients themselves. In general, telerehabilitation reduces the costs of both health care providers and patients compared with traditional inpatient or person-to-person rehabilitation (Peretti, 2017). It provides the patient with a sense of personal autonomy and empowerment, enabling them to take control in the management of their condition. In recent years TR has expanded dramatically as a result of advances in technology, increases in speed of telecommunication, and decreases in costs of computer hardware and software. Telehealth can be an appropriate service delivery model for occupational therapy, and may improve access to occupational therapy services (WFOT, 2014). In general, TR can be divided in two major types of delivery (Pat, 2018). The first mode is remote and/or web-based rehabilitation and the second mode of telerehabilitation involves real-time interaction via video-conferencing or similar communication. There are a number of different types of videoconferencing systems. This approach enabled the physiotherapist to watch participants performing the exercises and provide real-time feedback and modification, as required. During these video-conferencing appointments, the physical therapist can give all their attention to the patient. This approach helps build a positive relationship between the patient and the physical therapist, which is of great importance when it comes to patient adherence and positive outcomes. In contrast many traditional rehabilitation assessment and therapy techniques make use of paper-based materials. Traditionally a home-based rehabilitation program includes a set of easy to perform exercises specifically selected for the needs of the patient. This type of treatment offers a practical, economic, and long-term effects but also require patient enthusiasm and regular follow-up to yield positive outcomes. Both supervised exercise and unsupervised exercise programs have been able to increase physical fitness (Creasy, 2017). However, there are mixed results of whether supervised or unsupervised exercise is more effective. One of the biggest challenges and probably the most important factor for the effectiveness of home-based unsupervised rehabilitation is adherence. There are many factors that influence adherence, including age, motivation, pain level, believing in the benefits of the exercise, observing its benefits, adopting a healthful course of action, insufficient time to complete the exercise, social differences, supervision, follow-ups, the communication of the physiotherapist with the patient, the dosage of the program, and the features of exercise prescription (Chan, 2010, Medina-Mirapeix, 2009). In addition, the factors affecting adherence are different between the periods of pain and remission. In a view of this TR may be an alternative approach that could alleviate some of these barriers and to propose more effective treatment. The present study was designed to investigate the possibility of implementation of a simple videoconference- based telerehabilitation exercise program in rehabilitational treatment of patients with socially significant diseases. We propose a telerehabilitation protocol with real-time interaction via video-conferencing platform which will replace the use of traditional paper-based exercise prescriptions.

**Keywords:** telerehabilitation, homecare rehabilitation, exercise program, paper-based exercise prescriptions.

## 1. INTRODUCTION

Telehealth is growing rapidly and has the potential to transform the delivery of health care for millions of persons (Sarsak, 2020). Telerehabilitation (TR) is a relatively new and developing field of telehealth. TR is the use of telecommunication technology to deliver and support rehabilitation services and it is the clinical application of consultative, preventative, diagnostic, and therapeutic services via two-way or multi-point interactive telecommunication technologies (Wakeford, 2005), such as telephone, internet and videoconference (Frederix, 2015). Consequently, home-based TR programs, are becoming increasingly common as an alternative mode of “homecare” rehabilitation, which requires the treating therapist or clinician to travel to the patient’s home since they can be delivered at a distance, thus reducing the travel costs and difficulties both for the patients and the therapists. Using technology to deliver rehabilitation services has many benefits (Zonneveld, 2019) for not only the clinician but also the patients themselves. In general, telerehabilitation reduces the costs of both health care providers and patients compared with traditional inpatient or person-to-person rehabilitation (Peretti, 2017). It provides the patient with a sense of personal autonomy and empowerment, enabling them to take control in the management of their condition. In recent years TR has expanded dramatically as a result of advances in technology, increases in speed of telecommunication, and decreases in costs of computer hardware and software. Telehealth can be an appropriate service delivery model for occupational therapy, and may improve access to occupational therapy services (WFOT, 2014). In general, TR can be divided in two major types of delivery (Pat, 2018). The first mode is remote and/or web-based rehabilitation and the second mode of telerehabilitation involves real-time interaction via video-conferencing or similar communication. The potential uses for video conferencing in healthcare and telerehabilitation became apparent in the 1990s with many projects being carried out in physiotherapy. There are a number of different types of videoconferencing systems. This approach enabled the physiotherapist to watch participants performing the exercises and provide real-time feedback and modification, as required. During these video-conferencing appointments, the physical therapist can give all their attention to the patient. This approach helps build a positive relationship between the patient and the physical therapist, which is of great importance when it comes to patient adherence and positive outcomes. In contrast many traditional rehabilitation assessment and therapy techniques make use of paper-based materials. Traditionally a home-based rehabilitation program includes a set of easy to perform exercises specifically selected for the needs of the patient. This type of treatment offers a practical, economic, and long-term effects but also require patient enthusiasm and regular follow-up to yield positive outcomes. Both supervised exercise and unsupervised exercise programs have been able to increase physical fitness (Creasy, 2017). The primary objective is to maximize people's ability to live, work, and learn as much as possible, improving functionality and quality of life. The impact extends to the community, society, and even the economy. However, there are mixed results of whether supervised or unsupervised exercise is more effective. One of the biggest challenges and probably the most important factor for the effectiveness of home-based unsupervised rehabilitation is adherence. There are many factors that influence adherence, including age, motivation, pain level, believing in the benefits of the exercise, observing its benefits, adopting a healthful course of action, insufficient time to complete the exercise, social differences, supervision, follow-ups, the communication of the physiotherapist with the patient, the dosage of the program, and the features of exercise prescription (Chan, 2010, Medina-Mirapeix, 2009). In addition, the factors affecting adherence are different between the periods of pain and remission. In general, tele-rehabilitation appears to be an effective method by which to deliver therapy, and many studies demonstrate positive outcomes in terms of improving physical functioning (Burdea, Popescu, Hentz, & Colbert, 2000, Lai, Woo, Hui, & Chan, 2004, Piron et al., 2004). In a view of this TR may be an alternative approach that could alleviate some of these barriers and to propose more effective treatment. The present study was designed to investigate the possibility of implementation of a simple videoconference-based telerehabilitation exercise program in rehabilitational treatment of patients with socially significant diseases. We propose a telerehabilitation protocol with real-time interaction via video-conferencing platform which will replace the use of traditional paper-based exercise prescriptions.

## 2. TELEREHABILITATION PROGRAM PROTOCOL FOR PATIENTS WITH SOCIALLY SIGNIFICANT DISEASES

The socially significant diseases are those classes of diseases and separate illnesses, which rank the highest in defining the morbidity and death rate profile in a country (Aleikova, 2010). A large number of patients with chronic and subacute diseases may need physical and cognitive rehabilitation treatment at home. Most of them will suffer from neuromuscular weakness, reduced functional capacity, exercise tolerance, health related quality of life and social function. Systematic rehabilitation programs in home can positively influence the course of physical problems associated with patient disease. Home-based rehabilitation programmes without supervision of the therapist have several limitations compared to hospital-based or exercising in physiotherapy centers. The first problem is the

exercise program intensity and patient's hemodynamic monitoring. Limitations in such form of therapy may be related also to the severity of disease, cognitive impairments, lack of support from a family member or a therapist. Home-based rehabilitation is carried out mainly in two ways. In the first the therapist conducts the activity and directly monitors the patient's performance. There are situations in which the therapist determines a set of exercises and methodological instructions for their implementation and provides it to the patient in the form of paper-based materials. The prescription of exercises encourages patients to take responsibility for their rehabilitation and self-manage their conditions over the long term. In this case the most important factor is the patient adherence, but majority of the patients do not perform the exercises as prescribed and the adherence tends to decline over time. Therefore, solutions to improve adherence and better utilize physiotherapy resources are needed. A possible solution to this problem may be the application of telerehabilitation tools and especially the real-time interaction via videoconferencing platform. However, the use of videoconferences has obvious limitations because it may not always be easy to define the dosing and pattern of replacement therapies based upon remote images. On the other hand, the cost of video equipment, limited network connectivity from home, complexity and cost of hardware may complicate the use of videoconferencing telerehabilitation tools. So there must be an appropriate protocol with requirements for the use of such therapy. In a view of this it is of great importance to set a specific demand both for the patient and the program itself.

Demands for the patient:

- Access to a phone or videoconference platform with own device and reliable internet connection.
- Ability to operate phone or videoconferencing platform independently or with family member or care assistance.
- Adequate hearing to participate in telehealth conversations.
- Using an external webcam
- Able to get on and off any home exercise equipment independently and safely.
- Willingness to participate in a home-based exercise training program.
- Able to provide informed consent.

The use of videoconferencing allows verbal and visual interactions between the participants, providing consultations, diagnostic evaluations and also therapeutic interventions. Most of the components of a standard rehabilitation assessment can be conducted via videoconference.

Patient assessment components:

- General medical history
- Subjective symptoms and measure
- Objective measures

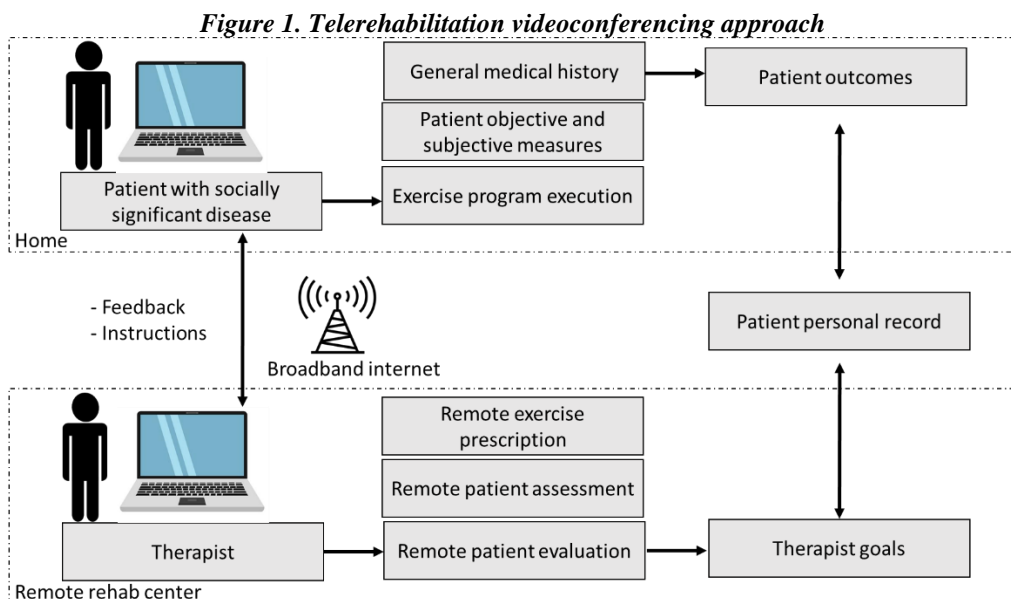
Real time remote monitoring is another advantage and important step during the home-based telerehabilitation program and it allows collection of the important patient objective measures like blood pressure (BP), heart rate (HR) and oxygen saturation (SpO<sub>2</sub>). This includes:

- Wearable devices
- Mobile equipment and devices that include peripherals
- Smartphone apps that are used to collect patient measures

One of the main advantages of the videoconferences over the traditional paper-based materials is the possibility to apply more complex exercises in programs and to correct the patient if necessary. In order to be effective and to surpass traditional therapy as much as possible, the videoconference program must meet several requirements

- Should be presented in the interactive form (demonstrations of the exercises via pictures or videos)
- Should include the exercise description, intensity, duration, type, length and frequency
- Should include option for recording of the exercise session in order to allow own monitoring of implementation and reporting of progress

In general, the telerehabilitation videoconferencing approach (fig. 1) shows promise in many fields and in summary we can say that if the videoconferencing telerehabilitation program meets the above mentioned characteristics it can easily replace the traditional paper based exercise materials, but compelling evidence of benefit and of impact on routine rehabilitation are needed.



### 3. CONCLUSIONS

Home based telerehabilitation programs are under development and may be a future option for a large groups of patients. We strongly believe that telerehabilitation should become a more widely used tool in the broad management of patients with socially significant diseases, thus helping to reduce the time and costs needed to reach the rehabilitation centers and allowing a better adherence to the prescribed treatments. Among the various tools of telerehabilitation, videoconferencing can provide therapists with a faster and more focused assessment of patients with different socially significant diseases. Nevertheless, keeping people with disease out of hospital or rehabilitation center over the period of the pandemic is vital to reduce the burden on the health system at a time when resources are stretched.

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