



## Stroke Survivors Physical Therapy in Post Covid-19 Pandemic Through Community Based Telerehabilitation: A Short Review

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### Abstract

**Objective-** The objective of this narrative review is to determine the effectiveness of Telerehabilitation in management of stroke patients. **Method-** A systematic search was conducted using PubMed, scopus, cocraine databases to identify review articles published in indexed journals from 2016-2021. The articles were chosen based on eligibility criteria, and then we included additional articles that we deemed were relevant to the topic of our research. **Result-** The search strategy identified 340 studies. After the removal of duplicate, 240 studies were screened for title and abstract. 120 studies progressed to the next stage and were reviewed in full text. Total 100 were then excluded. 20 studies were consequently included in this review. **Conclusion-** Telerehabilitaion methods have significant potential outcome in management of stroke patients and it can be a reliable and feasible method to deliver effective treatment during pandemic, where many measures are being taken to minimize direct contact between therapist and patient.

**Keywords:** Telerehabilitation, stroke, Aphasia, virtual reality, Home Based

### INTRODUCTION

Stroke is described as a sudden neurological outburst caused by inadequate blood vessel perfusion to the brain.<sup>(1)</sup> A stroke affects one out of every four persons at some point in their lives, and there are more than 80 million stroke survivors worldwide.<sup>(2)</sup> Stroke, which includes both ischemic and hemorrhagic strokes, affects 13.7 million people worldwide each year and is the second greatest cause of death, with 5.5 million deaths per year.<sup>(3,4)</sup> Ischemic stroke's incidence and prevalence have changed throughout time. In 2016, there were 9.5 million cases of ischemic stroke worldwide.<sup>(2,3)</sup>

Ischemic stroke (which occurs in 85 percent of cases) and hemorrhagic stroke are the two types of strokes (which occurs in the remaining 15 percent of cases)<sup>(5)</sup> Stroke risk rises with age, and in men and women over the age of 55, it doubles. Some stroke risk factors can

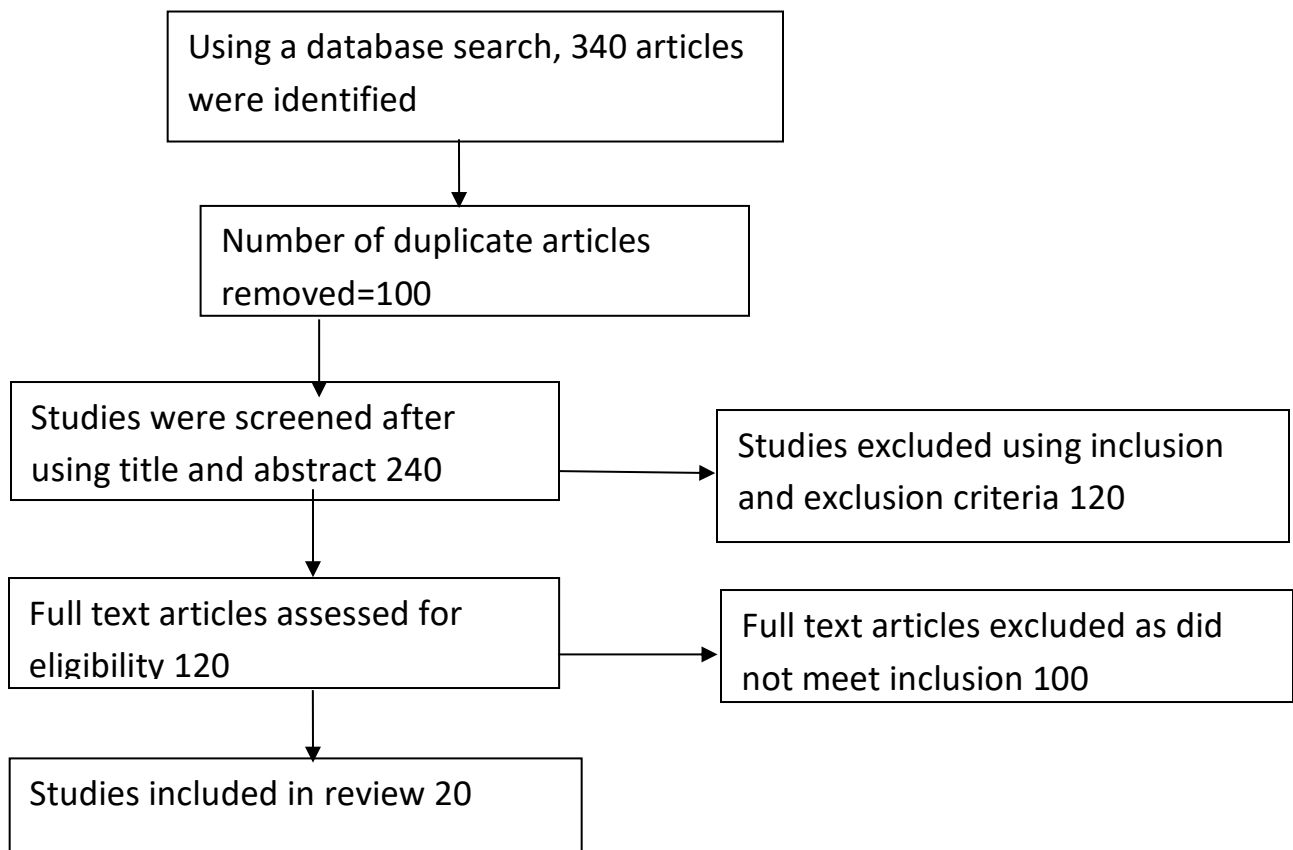
be changed, while others are unchanged. Age, gender, race/ethnicity, TIA, and heredity are all risk factors that cannot be modified. All modifiable risk factors include hypertension, obesity, alcohol and substance abuse, physical inactivity, hyperlipidemia, nutrition, diabetes mellitus, atrial fibrillation, and genetics.<sup>(1)</sup> Aphasia, a disturbance in language function that can damage the capacity to speak and involves difficulty with speech production, auditory comprehension, reading, and writing, is one of the most devastating consequences of stroke. It affects one-third of stroke survivors, with 60% of patients showing persistent communicative impairment one year after their stroke. Recovery from aphasia requires effective rehabilitation.<sup>(6)</sup>

Coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization in

March 2020. <sup>(7)</sup> According to certain mathematical estimates, the COVID-19 pandemic might extend until 2022, with the chance of a relapse of the disease as late as 2024. <sup>(8)</sup> COVID-19 is communicated from person to person, hence rehabilitation services that can be offered remotely (i.e. telerehabilitation) <sup>(9)</sup> without in-person contact are possible. While telerehabilitation provides certain major benefits, such as reducing the need for in-person contact and travel, as well as enhanced accessibility for persons in rural and isolated locations, the obstacles connected with it have been well-documented. <sup>(10)</sup> The inability to provide hands-on treatment and a lack of knowledge to troubleshoot communication technology were two common issues. <sup>(11,12)</sup> The distance between a client and a clinic is no longer an impediment to treatment. Clinicians' reach can be extended well beyond the physical walls of a healthcare centre, to local clinics, community health care facilities, and, in certain situations, directly to clients in their homes, using information and communication technologies (ICT). A wide range of diagnostic and therapy interventions can be offered to clients using remote monitoring systems, inertial sensors, robotic and haptic devices, and synchronised cooperation with internet content, in addition to basic videoconferencing. <sup>(13)</sup> Telerehabilitation (TR) and

virtual reality (VR) are two new and novel ways to provide stroke survivors with rehabilitation services. <sup>(14)</sup> Telerehabilitation is the use of communication technologies to give rehabilitation services to those who live far away. <sup>(15)</sup> "Use of interactive simulations built with computer hardware and software to give users with chances to engage in settings that appear and feel comparable to real-world objects and events" is how VR is defined. <sup>(14)</sup> Stroke rehabilitation is an important part of post-stroke care, and the sooner it begins, the better. Stroke rehabilitation therapy seeks to help patients improve their physical, cognitive, emotional, and social well-being. <sup>(16)</sup> In rehabilitation therapy, home-based technologies offer the flexibility of place and time, as well as the ability to get feedback from therapists remotely. <sup>(17)</sup>

**Methodology:** We conducted a systematic literature search in the following three electronic databases: PubMed, scopus, cocraine. The included articles were published between 2016 and 2021. The search strategy included keywords: stroke rehabilitation, home-based, telerehabilitation, virtual reality. These keywords had to appear together in the article's title, abstract, or complete text.



**Table 1: Inclusion and exclusion criteria**

INCLUSION CRITERIA	EXCLUSION CRITERIA
1) 18yrs and above both men or women	1) Patients with condition other than stroke
2) Diagnosis of ischemic or hemorrhagic stroke	2) Less than 18yrs
3) Impaired motor function after stroke limiting activities of daily living	3) Unstable medical condition, seizures or vertigo, or are unable to safely perform mild to moderate exercise.
4) Have sufficient preserved cognitive ability to learn VRT	4) Severe primary disease of heart, liver, kidney, or hematological system
5) Willing to perform exercises in home setting	5) Visual or cognitive deficits preventing use of the VR system
6) Patient with Aphasia	6) Complete Aphasia 7) Unstable hypertension 8) Glasgow Coma Scale (GCS) scores less than 15 9) Declined to participate

**Discussion:** The Aim of this review is to determine the effectiveness of telerehabilitation in management of stroke patients. Stroke is one of India's most common causes of death and disability.<sup>(18)</sup> due to uncertainty of covid 19 pandemic and to avoid person to person contact rehabilitation services can be provided via virtual reality (telerehabilitation). Time restrictions, resource limitations, geographic remoteness, compliance with rehabilitation, and a lack of understanding are just a few of the difficulties that stroke survivors experience while seeking regular face-to-face care.

Telerehabilitation uses technology to provide rehabilitation services to patients, allowing them to have more alternatives, offer services more efficiently, and remove geographic limitations to healthcare.<sup>(19)</sup> To obtain a comprehensive overview of the current approach, a wide range of telerehabilitation interventions were included. While telerehabilitation was a common mode of intervention delivery, the specific interventions given differed throughout the studies. The interventions were modified in terms of frequency and duration. A systemic review by Appleby Emma et al showed positive impact of telerehabilitation on motor function in stroke patients which included intervention like constraint induced movement therapy (CIMT), task specific training. The

lack of effect of telerehabilitation on balance was an interesting finding in this systematic review.<sup>(19)</sup> other study which had sitting up training, balance training, walking function training showed safe and effective improvement in rehabilitation of motor function and the quality of life of stroke patients<sup>(20)</sup> Home rehabilitation technology solutions have enormous potential for supporting the short- and long-term performance of motor cognitive rehabilitation plans in a highly engaging environment, thereby empowering the patient, increasing motivation, positive therapy compliance, and improved quality of life. Such advantages are especially essential for post-stroke patients, particularly those in the chronic phase, who are frequently affected by mobility issues (which can be linked to various levels of depression), making it difficult for them to get to clinics and participate in rehabilitation programmes.<sup>(21)</sup> With the introduction and increased affordability of telecommunication and interactive technologies, promising revolutionary rehabilitation treatment options incorporating TR as well as virtual reality (VR) are emerging. In between unsupervised sessions, the clinician can assess the patient's progress reports and make treatment changes using TR systems that work offline or asynchronously. Integrating off-line monitoring into VR-based TR systems could allow stroke survivors to continue training and progressing their training at home without

real-time therapist supervision, allowing for a higher intensity and duration of home-based rehabilitation with fewer resources, allowing for optimal functional recovery.<sup>(22)</sup> Individuals who have had a mild stroke and have been discharged from intensive care can use it to speed up their return to normal function. Maintaining or increasing therapy intensity after discharge from inpatient rehabilitation is also effective for patients with more severe strokes. Once a patient has been discharged from official rehabilitation, VRT can allow them to continue with therapeutic activity.<sup>(23)</sup>

A study by S. Tyagi et al. described how stroke patients, carers, and rehabilitation therapists in an Asian environment regarded the challenges and facilitators of telerehabilitation (TR). Patients identified affordability and accessibility as facilitators, whereas tele-therapists saw filling a service gap as a facilitator. Unexpected benefits, such as diagnosis of uncontrolled hypertension, were shared by both patient and tele-therapist. Patients identified equipment setup issues and a limited scope of exercises as barriers; tele-therapists identified patient assessments, interface problems, and a limited scope of exercises as barriers; and connectivity barriers were common to both.<sup>(24)</sup> Many of the barriers to high dosage therapy, such as transportation limitations or restricted regional access, can be solved via telehealth approaches.<sup>(25)</sup>

The ETNS is a novel therapy approach that combines neuromuscular electrical stimulation and EMG biofeedback.<sup>(26)</sup> It has become a novel treatment alternative in treating paralysed patients because it can raise stroke patients' motivation to participate in rehabilitation training and effectively improve motor function of the afflicted limb and daily living activities.<sup>(27)</sup> In stroke patients, a home-based motor training telerehabilitation intervention lasting up to 12 weeks with a goal of 10 rehabilitation training sessions per week with 60 minutes of physical therapy and 20 minutes of ETNS for each session has a beneficial effect on motor function.<sup>(28)</sup>

Action observation therapy (AOT) and mirror therapy (MT) are two examples of novel stroke motor recovery approaches that are based on neuroscientific evidence. Patients can safely perform movements and motor tasks with AOT, which involves action observation and action execution. AOT has been found to be an

effective and helpful method of improving patient motor function. Over the last decade, Mirror therapy (MT) has developed as yet another revolutionary stroke-rehabilitation technique. Participants in this treatment are instructed to move their arms and look in the mirror at the action reflection of the non-affected arm as if it were the affected one. MT has the potential to be a more practical, less expensive, and successful stroke rehabilitation therapy in clinical settings.<sup>(29)</sup>

Aphasia, a disturbance in language function that can damage one's ability to communicate and involves difficulties with speech production, auditory comprehension, reading, and writing, is one of the most devastating outcomes of a stroke.<sup>(30)</sup> Virtual reality (VR) systems could be used to monitor, alter, and boost the aphasic patient's contact with their surroundings in order to promote functional recovery, according to a growing field of innovative technologies.<sup>(31)</sup> Our research by G. Maresca et al has shown that a home-based telerehabilitation programme for poststroke aphasia, delivered via a touch-screen tablet with a virtual reality system, is successful (i.e., the VRRS-Tablet). This home training did, in fact, have a positive impact on the rehabilitation of linguistic functions, mood, and perception of one's health.<sup>(31)</sup> As measured by the corresponding subsections of the Norwegian Basic Aphasia Assessment and the Verb and Sentence Test, augmented telerehabilitation provided through videoconference resulted in a considerable increase in the capacity to repeat words and form phrases.<sup>(32)</sup>

One study suggested stroke patients recovering at home, smart technology performed no better than traditional paper-based home exercise programmes.<sup>(33)</sup> In contrast a study by Steven C et al suggest that telerehabilitation has the potential to greatly expand large-scale access to rehabilitation therapy. For improving arm motor function and stroke knowledge, TR is not inferior than in-clinic (IC) therapy.<sup>(34)</sup> According to Thielbar KO et al Virtual Environment for Rehabilitative Gaming Exercises (VERGE) system, developed to permit interactions among multiple users located remotely which concluded Multi-user VR activities might be an effective way to bring clinical therapy into the home.<sup>(35)</sup> In Low- and Middle-Income Countries, a rehabilitation strategy involving the family of stroke survivors and remote supervision via telemedicine may be a feasible and cost-effective intervention to

explore.<sup>(36)</sup> Tele-rehabilitation could be a viable option for providing rehabilitation services in Singapore, reducing obstacles to health-care utilisation and encouraging continued participation in therapy after release from the hospital following a stroke.<sup>(37)</sup> one study found that, as compared to standard care, the novel nurse-trained, family member-delivered rehabilitation model improved physical recovery as measured by BI scores while reducing caregiver stress in rural stroke patients in southwest China.<sup>(38)</sup>

**Conclusion:** Telerehabilitation methods have significant potential outcome in management of stroke patients and it can be a reliable and feasible method to deliver effective treatment during pandemic, where many measures are being taken to minimize direct contact between therapist and patient.

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