

## Original Article

# Perception of Neurophysiotherapists in Maharashtra about Scope of Teleneurorehabilitation in Chronic Conditions

Shubham Khemchand Joshi<sup>1</sup>, Dinesh Chavhan<sup>2</sup>, Ashok Shyam<sup>3</sup>, Parag Sancheti<sup>4</sup>

<sup>1</sup>Sancheti Institute College of Physiotherapy, Pune,

<sup>2</sup>NeuroPhysiotherapy Department, Sancheti Institute College of Physiotherapy, Pune,

<sup>3</sup>Research head, <sup>4</sup>Chairman, Sancheti Institute of Orthopaedics and Rehabilitation, Pune, Maharashtra, India

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### ABSTRACT

**Background:** Telerehabilitation is a key component in the evolution of healthcare; so it is important to understand the scope and potential of telerehabilitation systems to meet as full a range as possible of user needs. Obstacles of telerehabilitation must be addressed before its implementation. So considering the above points, this study will help to find perception of neurophysiotherapist about scope, limitations, and obstacles of teleneurorehabilitation while treating chronic patients and the results of the study will help other clinicians in proper and accurate application of telerehabilitation for treating patients in future. **Methods:** After taking verbal consent from neurophysiotherapists in Maharashtra, a Google Form-based questionnaire about scope of teleneurorehabilitation was sent to them through their emails and social websites that were accessible to them and 134 neurophysiotherapists who fitted in inclusion criteria filled the Google Form. The responses were collected then descriptive analysis was done and results were obtained. **Results:** About 11.9% neurophysiotherapists feel that teleneurorehabilitation can be preferred over face to face visits while 88.1% do not feel it. About 55.2% agree that tele-neurorehabilitation can be used in stroke, 35.1% agree that it can be used in spinal cord injury, 62.7% agree that it can be used in Parkinsonism, 56% agree that it can be used in peripheral nerve injury. **Discussion:** According to this study, there is positive perception of teleneurorehabilitation among neurophysiotherapists in Maharashtra as it can be used in stroke, Parkinsonism, peripheral nerve injury but not spinal cord injury and they all agreed with effectiveness of teleneurorehabilitation in patient and family education, bed transfers, balance training, co-ordination training, environmental modifications of patient and motor learning but not in gait training. **Conclusion:** Neurophysiotherapists in Maharashtra have good perception about scope of teleneurorehabilitation but according to them, teleneurorehabilitation cannot substitute face to face rehabilitation but can be used as an adjunct.

**KEYWORDS:** Neurophysiotherapists, Obstacles, Scope, Teleneurorehabilitation, Telerehabilitation

## INTRODUCTION

In near future, various forms of acquired neurological diseases of different etiologies, causing cognitive deficits and physical limitations (in particular stroke) are expected to increase, leading to a greater need of rehabilitation. These impairments have a great impact

on daily functioning in affected patients, contributing to the higher cost of therapy and care.

**Address for correspondence:** Dr. Dinesh Chavhan, Sancheti Healthcare Academy, 11/12 Thube Park, Shivajinagar, Pune 411005, Maharashtra, India. E-mail: [sancheticop@gmail.com](mailto:sancheticop@gmail.com)

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Ongoing long-term rehabilitation requirements of patients with stroke, traumatic brain injury, progressive neurological disorders, and developmental disorders are not met in individual's local community due to (1) difficulty in recruitment and retention of rehabilitation professionals in non-metropolitan centers in rural and remote areas and (2) significant mobility issues in individuals with disability and their families associated with physical impairments, access to transport, and socioeconomic factors which prevent them from accessing any services regardless of distance. Optimal face-to-face treatment regimens are unsustainable because of the need of healthcare systems to operate with ever-increasing restrictions in relation to inpatient, outpatient, and community service models. Also they are unable to support intensive therapy regimens recommended for neurorehabilitation.<sup>[1]</sup> There is a need for new solution due to the following reasons: (1) shortage in the area of specialized medical staff, (2) limited help of families/carers, and (3) limited amount of money to spend on.<sup>[2]</sup> Thus, the rehabilitation process for these individuals can be enhanced by establishment of an alternate model to face-to-face treatment that is accessible, flexible, and equally therapeutic and economic.<sup>[1]</sup>

Due to introduction of new digital systems in rehabilitation, it is possible to provide different sensory stimuli enhancing patients' resources such as attention and motivation. With digital technologies in rehabilitation, it is possible to provide information and/or support emotional, behavioral, or physiological features of the pathology within an enriched and stimulating environment. With this, technology-based interventions can be applied to provide a rehabilitation service through digital and telecommunication technologies during the hospitalization period or at home after discharge from hospital. Such application is called telerehabilitation.<sup>[3]</sup>

Telerehabilitation can be performed with observed progress in IT, robotics, and communication. Telerehabilitation is a good solution to provide equitable access to geographically remote and physically and/or economically disadvantaged patients as well as to improve the quality of rehabilitation health care.<sup>[2]</sup> Telerehabilitation is defined as a practice of effective communication and information technologies solution to deliver clinical rehabilitation services.<sup>[4]</sup> The aim of telerehabilitation is to transfer as well as use new technologies<sup>[5]</sup> for helping patients with barriers of accessing rehabilitation centers.<sup>[6]</sup>

Physical distance between a client and a clinic is no longer an obstacle to rehabilitation. Telerehabilitation

can be used to extend the reach of clinicians far beyond the physical walls of a healthcare facility directly to clients in their homes. A wide variety of assessment and treatment interventions can be delivered to clients using remote monitoring systems, inertial sensors, robotic and haptic devices, and synchronized collaboration with online material. Home-based telerehabilitation programs have the potential to promote self-care in numerous ways. Clients would feel empowered to take an active role in their own rehabilitation, so that they can conduct self-care whenever they feel appropriate.<sup>[7]</sup> As a way to enhance quality of care and improve accessibility, rehabilitation practitioners are turning to telerehabilitation in developed countries. Telerehabilitation patients include those with stroke, spinal cord injuries, amputation, etc.<sup>[8]</sup>

Neurological telerehabilitation is provision of rehabilitation services through electronic systems for patients with neurologic diseases (stroke, spinal cord injury, cerebral palsy, etc.) who have lifelong rehabilitation needs and live in remote areas or because of other causes are allowed home therapy. Thus telerehabilitation is remote equivalent of rehabilitation. Using newest technology, patients are supervised by an specialized equipment controlling their work and by a physiotherapist. The basic goal of neurological telerehabilitation is to provide patients' independence as much as possible and to increase their quality of life.<sup>[2]</sup>

Teleneurorehabilitation is for needy patients who are unable to access healthcare facility due to long distance, immobility, cost, non-availability of the expert clinician in their geographical area, etc. This reduces health cost burden for patient and society, as suggested by many studies in the past. The biggest advantage of teleneurorehabilitation is reducing treatment gap by providing health service at the doorstep, especially to unreached needy patients.<sup>[9]</sup>

### Need of the study

Telerehabilitation is a key component in the evolution of health care; therefore, it is important to understand the scope and potential of telerehabilitation systems to meet as full a range as possible of user needs. Before telerehabilitation becomes an integral part of rehabilitation health care, there are a number of barriers and issues that need to be addressed. Obstacles of telerehabilitation must be addressed as it is the long-term goal in improving health outcomes, empowering clients, and serving as a cost-effective mainstream tool for all. Neurological telerehabilitation cannot be a solution in every neurological condition, and it is

essential for physiotherapists to develop neurological telerehabilitation in the required direction.

So considering all the above points, this study will help to find perception of neurophysiotherapists about limitations and obstacles of teleneurorehabilitation while treating chronic patients, and the results of the study will help other clinicians in proper and accurate application of telerehabilitation for treating patients in future. Also this study will find the willingness of neurophysiotherapists for using teleneurorehabilitation.

## MATERIALS AND METHODS

The design of this study was cross-sectional.

### Ethical considerations

The study was approved by the Institutional Ethical Committee. Verbal consent on phone call was obtained from each participant in this study, and the participants were informed that their participation was voluntary and that they could withdraw at any time.

### Study design

#### *Selection and description of participants*

Inclusion criteria were as follows:

- (a) Neurophysiotherapists who are aware about telerehabilitation;
- (b) Neurophysiotherapists in Maharashtra;
- (c) Minimum 1 year of experience in neurorehabilitation;
- (d) Academicians and clinical therapists.

Exclusion criterion was students of Masters in Neurophysiotherapy.

### Sampling strategy

For the quantitative approach, convenience sampling was conducted. A web survey was developed via Google Docs to collect data from neurophysiotherapists. The Google Docs form was circulated via a WhatsApp (a smartphone messaging application) group that included all of the neurophysiotherapists working in Maharashtra or through email for those who were not comfortable sending response through Whatsapp. Furthermore, a soft reminder message/ call was sent once a week. Neurophysiotherapists who filled the form were also asked to further circulate questionnaire to their colleagues who were fitting in inclusion criteria; in this way, snow-balling technique of sampling was also used in order to get more responses. The data collection process took about a month. In the questionnaire, a confidentiality statement was shown after the title and aim of the study, informing the respondents that their identity would be kept anonymous.

In total, 180 eligible neurophysiotherapists completed the questionnaire and took part in this study. Out of 180, only 134 participants fitted in inclusion criteria. The remaining participants out of 180 were either unaware about telerehabilitation or they were not fitting in inclusion criteria, so they were excluded from the study. More than half of the participants had 0–5 years of clinical experience and most of them were currently working in Mumbai and Pune and rest were working in Amravati, Lonavala–Khandala, Nashik, Nagpur, Aurangabad, Nanded, Badlapur, Solapur, Ahmednagar, Latur, and Buldhana. In addition, participants who could not read and understand English were excluded from the study.

### Instruments

**Questionnaire:** A self-constructed validated questionnaire was made with the help of questionnaires which were used in previous studies. This questionnaire consisted of two sections. The first section included participants' profile like name, phone number, place, qualification of therapist, and years of experience in neurorehabilitation. Section 1 included a Yes/No question of whether the therapist is aware of teleneurorehabilitation. Section 2 consists of 13 items about perception of teleneurorehabilitation where questions were related to advantages, limitations of teleneurorehabilitation, and also scope of teleneurorehabilitation in neurological conditions such as stroke, spinal cord injury, parkinsonism, peripheral nerve injury, and other conditions. Also questions were included about its scope in domains such as patient and family education, bed transfers/mobility, balance training, gait training, coordination improvement, environmental modifications of patients and motor learning. The answers in the second section were provided using a Likert scale (from strongly agree to strongly disagree). Some of the questionnaire items were adapted to suit the physiotherapy profession.

The questionnaire was piloted with four physiotherapy specialists to test the suitability and readability of the items. Minor feedback was provided, and modifications were made accordingly, which included adding the items “years of experience,” “qualification of therapist,” and “domains of neurophysiotherapy.”

### Data analysis

Descriptive data analysis was conducted, which included calculating the frequencies and percentages of participants' demographic data and also percentage of responses on Likert scale. Mean and standard deviation of years of experience of participants in neurorehabilitation was calculated.

## RESULTS

### Participants' profile

Participants who completed Masters in Physiotherapy were recruited for the study, so all 134 participants fitted in the criteria. Out of 134, 27 participants were male and 107 were female physiotherapists. Fifty-eight participants were from Mumbai, 53 from Pune, 5 each from Aurangabad and Nagpur, 3 from Latur, 2 from Nashik, and 1 each from Amravati, Lonavala, Badlapur, Nanded, Solapur, Buldhana, Ahmednagar, and Khandala. About 83 participants had 0–5 years of experience, 32 participants with 6–10 years of experience, 15 participants with 11–25 years of experience, and 4 participants with more than 30 years of experience in neurorehabilitation. Mean of years of experience of participants in neurorehabilitation was  $6.6 \pm 8.1$  years.

### Perception of therapists about advantages and limitations of teleneurorehabilitation

About 6% of neurophysiotherapists strongly agreed and 32.1% agreed that teleneurorehabilitation is easy to learn and simple; 37.3% are neutral, whereas 23.9% disagreed and 0.7% neurophysiotherapists strongly disagreed to this view.

About 4.5% of the neurophysiotherapists strongly agreed and 44% agreed that teleneurorehabilitation saves time of both therapist and patient; 29.1% are neutral, whereas 21.6% disagreed and 0.7% neurophysiotherapists strongly disagreed.

About 3.7% of the neurophysiotherapists strongly agreed and 22.4% agreed that teleneurorehabilitation program is expensive to incorporate in clinical practice; 31.3% are neutral, whereas 41.8% disagreed and 0.7% strongly disagreed.

About 6% of the neurophysiotherapists feel that patient compliance is better with teleneurorehabilitation,

whereas 59% do not feel that and 35.1% of the therapists feel that it may be better.

Neurophysiotherapists (48.5%) strongly agreed and 40.3% agreed that correction of mistakes is limitation of teleneurorehabilitation; 6.7% are neutral whereas 4.5% disagreed.

Fifty-nine percent of neurophysiotherapists strongly agreed and 38.1% agreed that assistance of caregiver/family member is needed during teleneurorehabilitation. About 3% of the neurophysiotherapists are neutral.

Neurophysiotherapists (39.6%) strongly agreed and 47.8% agreed that availability of proper/accurate equipment/software is necessary for the application of teleneurorehabilitation. Nine percent are neutral, whereas 3.7% of the neurotherapists disagreed.

About 29.9% of the neurophysiotherapists strongly agreed and 58.2% agreed that teleneurorehabilitation is useful for people living at long distance; 11.2% are neutral whereas 0.7% disagreed.

About 9.7% of the neurophysiotherapists strongly agreed and 49.3% agreed that teleneurorehabilitation can be used for group therapy; 23.9% are neutral whereas 12.7% disagreed and 4.5% strongly disagreed.

About 2.2% of the neurophysiotherapists strongly agreed and 21.6% agreed that teleneurorehabilitation improves quality of rehabilitation health care; 35.1% are neutral, whereas 37.3% disagreed and 3.7% strongly disagreed.

### Perception of therapists about scope of teleneurorehabilitation in chronic neurological conditions

Table 1 consists of responses of participants on a Likert scale for scope of teleneurorehabilitation under various conditions. The data are in the form of responses both in percentage and absolute value (in bracket)

**Table 1: Perception of therapists about scope of teleneurorehabilitation in chronic conditions**

Teleneurorehabilitation can be used effectively in chronic stages of following conditions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Stroke	5.2% (7)	50% (67)	19.4% (26)	21.6% (29)	3.7% (5)
Spinal cord injury	5.2% (7)	29.9% (40)	23.1% (31)	34.3% (46)	7.5% (10)
Parkinsonism	11.2% (15)	51.5% (69)	22.4% (30)	10.4% (14)	4.5% (6)
Peripheral nerve injury	6.7% (9)	49.3% (66)	23.9% (32)	18.7% (25)	1.5% (2)
Any other neurological conditions	3.7% (5)	32.1% (43)	46.3% (62)	17.2% (23)	0.7% (1)

## Perception of therapists about scope of teleneurorehabilitation in the following domains of patient management

Table 2 consists of responses of participants on a Likert scale for effectiveness of teleneurorehabilitation in various domains of patient management in neurological conditions. The data are in the form of responses both in percentage and absolute value (in bracket).

**Table 2: Perception of therapists about scope of teleneurorehabilitation in following domains of patient management**

Teleneurorehabilitation is effective in chronic stages of following domains	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Patient and family education	35.8% (48)	56% (75)	5.2% (7)	3% (4)	0 (0)
Bed transfers/mobility	6% (8)	32.8% (44)	27.6% (37)	30.6% (41)	3% (4)
Balance training	1.5% (2)	39.6% (53)	24.6% (33)	30.6% (41)	3.7% (5)
Gait training	3% (4)	30.6% (41)	28.4% (38)	32.1% (43)	6% (8)
Coordination improvement	4.5% (6)	53% (71)	17.9% (24)	20.9% (28)	3.7% (5)
Environmental modifications of patient	26.9% (36)	56.7% (76)	14.2% (19)	2.2% (3)	0 (0)
Motor learning	5.2% (7)	45.5% (61)	28.4% (38)	18.7% (25)	2.2% (3)

## View of therapists on telerehabilitation as a replacement for traditional rehabilitation

An overwhelming majority of therapists (118; 88.1%) clearly indicated that telerehabilitation cannot be preferred as a substitute for traditional rehabilitation.

## DISCUSSION

### Facilitators of teleneurorehabilitation

According to this survey, neurophysiotherapists in Maharashtra perceive that advantages of teleneurorehabilitation are as follows: it is easy to learn and simple to use, it saves time of both therapists and patients, and it is not expensive. This is supported by previous studies which suggested that potential benefits of neurological telerehabilitation are shorter hospitalization, time saving, lower costs, care and rehabilitation in friendly home environment, and close to family.<sup>[2,3]</sup> Time is saved in teleneurorehabilitation as patients do not need to travel to hospitals for rehabilitation.

Other advantages of teleneurorehabilitation according to neurophysiotherapists in Maharashtra are it is useful for people living at long distances and it can be used for group therapy. Patients at remote places with the help of newest technology can get access to rehabilitation in friendly home environment. Also, telerehabilitation in group

therapy can boost confidence and motivate patients while it will save time for therapists as they can treat patients with similar diagnosis and impairments at one time.

### Limitations of teleneurorehabilitation

According to this survey, a majority of neurophysiotherapists perceive limitations of teleneurorehabilitation, which are patient compliance is not better with teleneurorehabilitation due to loss of real contact between therapists and patients, correction of mistakes is not possible with teleneurorehabilitation, and assistance of caregiver/family member is needed during teleneurorehabilitation. This limitation is supported by one previous study that stated that consultation may need to be conducted with an assistant at the patient end who will assist in the performance of the tasks as directed by online therapist.<sup>[1]</sup>

Availability of proper/accurate equipment/software is needed during teleneurorehabilitation. Teleneurorehabilitation requires an adequate technology for patient and therapist communication, so that rehabilitation can be conducted in a much better way and this will not be possible if the equipment used for telerehabilitation is not proper. Telerehabilitation does not improve quality of rehabilitation healthcare when compared with traditional rehabilitation. For example, with the help of telerehabilitation, performing spinal manipulation is not possible unlike face-to-face traditional rehabilitation. Rehabilitation therapist involves a “hands-on approach” with significant physical contact between therapists and patients. Through telerehabilitation, some treatment techniques are difficult to be applied online as it requires physical contact.

### Scope of telerehabilitation in neurological conditions

According to the majority of neurophysiotherapists in Maharashtra, teleneurorehabilitation can be used in chronic conditions of stroke, parkinsonism, peripheral nerve injury, but not in spinal cord injury. A home-based telerehabilitation program for stroke patients was conducted and it was observed that arm motor status improved significantly overall on Fugl-Meyer score, patient's compliance was better, daily education increased stroke prevention knowledge by 39%, and review of patients performance by therapists was possible.<sup>[10]</sup> According to the systematic review of Mikołajewska and Mikołajewski, with home-based telerehabilitation interventions, there was improvement in health status of stroke patients as well as high levels of satisfaction and acceptance of telerehabilitation interventions were seen in patients and medical staff

but there was no evidence regarding effects on cost-effectiveness and resources utilization. A pilot study was conducted on parkinsonism patients, and it suggested that telerehabilitation approach to group tango class for people with Parkinson's disease is feasible and may have outcomes similar to in-person instruction.<sup>[11]</sup> Specific benefits of teleneurorehabilitation were seen in speech and voice, swallowing, posture, and gait in Parkinson's disease.<sup>[12]</sup>

Reason for limitation of teleneurorehabilitation in spinal cord injury patients can be requirement of proper manual handling of patients, more balance issues compared with patients of other conditions, etc. These issues can be tackled more properly in traditional rehabilitation as mistakes during rehabilitation can be immediately rectified with tactile cues from a therapist. Also, therapists can check if required muscle training is done during supervised traditional rehabilitation. In spinal cord injury, classification of patients is either complete or incomplete injury or quadriplegic or paraplegic, so prognosis of spinal cord injury patients with the help of telerehabilitation depends on the type of injury.

About 11.9% of the neurophysiotherapists feel that teleneurorehabilitation can be preferred over face-to-face visits, whereas 88.1% of the neurophysiotherapists do not feel. The majority of the neurophysiotherapists in Maharashtra agreed with effectiveness of teleneurorehabilitation in patient and family education, bed transfers, balance training, coordination training, environmental modifications of patient and motor learning but disagreed with effectiveness of teleneurorehabilitation in gait training.

According to the authors, reason for limitation of teleneurorehabilitation in gait training can be proper manual handling. As patients with balance issues have more chances of falls, it can harm patient while training gait on telerehabilitation due to any of the reason. So, gait training requires an environment in which patients feel confident, which can include use of mirrors, parallel bars, use of assistive devices, etc.

There is no influence of gender on findings of this study as answers to the questionnaire were based on clinicians experience in neurorehabilitation. For this reason, years of experience in neurorehabilitation were asked in this study and more than half of the population had 0–5 years of experience, which means that they were in their early stages of clinical practice. Participants who completed Masters in Neurophysiotherapy were recruited for this study to avoid bias in study.

According to the study of Theodoros and Russell, at the grassroots level, changing the attitude of rehabilitation

therapists toward telerehabilitation technologies is the most significant challenge to the integration of telerehabilitation services. Many therapists are in doubt about ability to perform remote patient assessment and have reservations about its diagnostic accuracy. This is due to a lack of exposure to telerehabilitation technologies and reduced number of published diagnostic equivalence studies. Many practitioners have great difficulty in conceptualizing how to apply “hands on” therapy through telerehabilitation. Exposure to the possibilities and the emerging evidences for telerehabilitation technologies is a critical requirement for greater uptake of telerehabilitation technology in everyday practice.

After knowing obstacles and scope of teleneurorehabilitation from this study, clinicians can work on solutions for these obstacles, which will help in proper and accurate application of telerehabilitation for treating chronic neurological condition patients in future. Limitation of this study was smaller sample size. This study can be extended with larger sample size to make it more reliable. The scope of this study is that it can be further extended with open-ended questions to ask therapists rationale about limitation of teleneurorehabilitation in treating chronic neurological conditions. Also, this study can be carried out in different states of India to know neurotherapists' view on scope of teleneurorehabilitation.

## CONCLUSION

Neurophysiotherapists in Maharashtra have good perception about scope of teleneurorehabilitation but according to them, teleneurorehabilitation cannot substitute face-to-face rehabilitation but it can be used as an adjunct. It can be used in treating chronic neurological conditions such as stroke, parkinsonism, peripheral nerve injury and in domains such as patient and family education, bed transfers, balance training, coordination training, environmental modifications of patient and motor learning.

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## Conflicts of interest

There are no conflicts of interest.

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