SHORT REPORT

Characterizing clinical patterns of physical therapy activities for post-stroke spasticity in stroke rehabilitation: looking into the "Black Box"

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Abstract

Physical therapy is considered to be an adjunctive therapy for the management of post-stroke spasticity. The insight of this study is to observe the current clinical practices of rehabilitation for post-stroke spasticity. For this purpose, an observational cross-sectional study was conducted. Data was collected by a standardized therapy documentation form for spasticity management. Fifty physiotherapists filled out that form. Almost all of them used subjective measures (modified Ashworth scale) for spasticity assessment and functional independence measure for level of independence. Readings were taken in the first, second, and third blocks of six-hour duration. Results showed that 42 (83.5%) physiotherapists measured spasticity at the initial session, while 47(94.6%) reported various multiple rehabilitation treatment preferences for spasticity management. Disparities exist in therapeutic management for post-stroke spasticity throughout rehabilitation which are mainly based on physiotherapists' clinical expertise. However, a better understanding of current trends in physical therapy clinical practices will assist in tailoring strategies to upgrade management for post-stroke spasticity.

Keywords: Clinical practice patterns, Physical therapy, Rehabilitation, Stroke, Spasticity.

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Introduction

Spasticity is a velocity-dependent increase in the stretch reflex. It is a common significant symptom affecting 35% of people who had a stroke[1]. Post-stroke spasticity is a major challenge in rehabilitation, in which neuroplasticity plays a dual role. Maladaptive plastic changes can contribute to the development of spasticity, while adaptive plasticity can play a role in spasticity management and motor recovery[2].

Stroke rehabilitation comprises a combination of restorative, compensatory, and preventive therapeutic interventions. Current post-stroke rehabilitation guidelines[3] recommended multidisciplinary approaches for spasticity management whereas physical therapy acts as an adjunctive therapy. In many countries, it is a standard and integral part of stroke rehabilitation. The Physical Therapy Practice framework optimises physical function and participation in various activities throughout the patients' life roles[4]. The main objectives of physical therapy after a stroke are to increase the patient's functional capacities, promote independence, and enhance their general quality of life. To achieve the specific rehabilitative goals for each patient, a variety of interventional approaches are in practice[5].

Current clinical practices in rehabilitation mean the use of taxonomy to characterize the current trends of those therapy activities and interventions, used in post-stroke spasticity rehabilitation programmes to maximise physical potential[6].Diversity and complexity exist in spasticity management but no well-defined and standardised intervention is available to measure which therapy is more beneficial or being practiced in clinical settings and is still challenging and found as a black box. The term Black box is used to explain characteristics of particular functional activity to attain results across rehabilitation that are missing from the respective literature[7].

Effective management relies on tailored strategies based on valid and reliable assessment tools. So, it is very important to understand the current trends or preferences in clinical practices for post-stroke spastic muscles concerning assessment and intervention to promote the implementation of recommended clinical practice guidelines for physical therapy[8] aiming to formulate a strategy. However, [1] current trends or preferences in clinical practice for spasticity management, [2] implementation of clinical guidelines in current practice, and most commonly [3] emphasizing areas concerning therapeutic activity and time spent for that activity in patient care are unknown. Therefore, the aim of this study is to observe the current clinical practices of rehabilitation for post-stroke spasticity management and to use standardized approaches for documenting therapy interventions.

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Methods and Results

A cross-sectional study was conducted as part of a larger study aimed at understanding the current clinical practices of rehabilitation for spasticity management after stroke. It was a multicentre study. Physiotherapists who were registered with the Pakistan Physical Therapy Association (PPTA), having clinical experience of more than eight years, and engaged in stroke rehabilitation were targeted to fill out the standardized therapy documentation forms for spasticity management. It was answered by 50 physiotherapists. The sample size was calculated by Open Source Epidemiologic Statistics for Public Health[9]. Fifty physiotherapists were included in the study they recruited total 370 stroke patients using consecutive sampling methods, between May 2022 and November 2022. A standardised therapy documentation form was used as a data collection tool and released in Google form. Physical therapists were guided and encouraged to complete the form and to report the spasticity management strategies on it. Reference material [7] and explanations of definitions of terms were given to the therapists, along with written and verbal demonstrations on how to complete the forms.

Physiotherapists were free to choose the therapeutic intervention in their usual practice and the goals for treatment. Ethical permission was taken from the ethical review committee of Riphah International University, Lahore, with reference no (REC/RCR&AHS/22/23).

Clinical patterns are the methods and ways to treat spasticity by the physical therapist based on the International Classification of Functioning, Disability, and Health (ICF)[10]. A standardised documentation form comprising 47 interventions and 11 physical activities categorised by certain bodily systems were used. FIM (Functional Independence Measure)[11, 12] and MAS (Modified Ashworth Scale)[13] were the outcome-measuring tools. Before and after intervention readings were evaluated.

Patients were split into three groups depending on the six-hour block of therapy, according to 6, 12, and 18 hours of treatment sessions. Data was analysed using SPSS 26. Firstly, calculation of the time expended on assessment and FIM motor score category was assessed; then to ascertain the link between the duration of activities with better improvements, patients who had scores ranging from 13 to 48 on FIM motor item were considered. A correlation between FIM and MAS was observed; percentage of patients with gait activity, and percentage of interventions used to improve gait activity was presented in the form of charts.

Table-1: Patients Characteristics, Processes, and Outcome Variables by Amount of PT Received.

	No of PT session in 6 hours blocks		
	1st Block (n = 95)	2nd Block (n = 85)	3rd Block (n = 190)
Demographic factors			
Mean Age	53.85±8.591	53.65±13.439	54.40±9.544
Gender (%)			
• Male	58(61%)	40(47.1%)	57(30%)
• Female	37(39%)	45(52.9%)	133(70%)
Mean Time Since Stroke	8.85±5.161	8.12±4.961	6.95±4.211
Clinical Characteristics			
Aetiology (%)			
• Ischaemic	37(38.5%)	45(52.9%)	133(70%)
• Haemorrhagic	44(46.2%)	40(47.1%)	57(30%)
• Mixed	14(15.4%)	NA	NA
Affected Side (%)			
• Right	59(61.5%)	40(47.1%)	95(50%)
• Left	36(38.5%)	45(52.9%)	95(50%)
Previous Stroke (%)			
• Yes	16(15.4%)	10(11.8%)	38(20%)
• No	80(84.6%)	75(88.2%)	152(80%)
Co-morbidities			
Hypertension (%)			
• Yes	88(92.3%)	65(76.5%)	152(80%)
• No	7(7.7%)	20(23.5%)	38(20%)
Diabetes (%)			
• Yes	37(38.5%)	50(58.8%)	114(60%)
• No	59(61.5%)	35(41.2%)	76(40%)
Obesity (%)			
• Yes	37(38.5%)	25(29.4%)	86(45%)
• No	59(61.5%)	60(70.6%)	105(55%)
Smoking (%)			
• Current smoker	7(7.7%)	NA	29(15%)
• Quit 1 year before stroke	NA	5(5.9%)	NA
Non smoker	88(92.3%)	80(94.1%)	162(85%)
Outcome variables			
FIM pre-Intervention (Mean ±SD)	25.92±9.314	31.58±13.091	29.00±12.217
FIM post-Intervention (Mean ±SD)	39.46±14.158	47.00±13.578	48.55±14.965
MAS pre-Intervention (mean ±SD)	3.62±0.650	3.53±0.624	3.45±0.686
MAS Post-Intervention (mean ±SD)	2.23±0.832	2.06±0.658	1.95±0.605
Process variables			
Total no. of sessions, Median (IQR)	16.00(8.00)	14.00(8.50)	15.00(8.50)
Sessions per weeks, Median (IQR)	3.00(1.00)	3.00(1.00)	3.00(1.75)
Total Therapy Time Median (IQR)	35.00(17.50)	55.00(20.00)	3.00(23.75)
Assessment time Median (IQR)	15.00(12.50)	15.00(12.50)	10.00(20.00)
Programme Duration Median (IQR)	2.00(1.00)	3.00(1.00)	3.50(1.00)

FIM: Functional independence measure, MAS: Modified ashworth scale, SD: Standard deviation IQR: inter quartile range, PT:Physiotherapy.

Out of the 65 physiotherapists contacted, 50 completed the standardised therapy documentation form. They recruited total 370 stroke patients, out of them 164(44%) were males and 204(56%) were females. The mean age of the patients was 54±8.591 years and the mean duration of stroke was 7.84±5.161 months. Demographic data describing patients' characteristics, processes, and outcome variables by the amount of physical training received are mentioned in Table 1.

Patients in the third block spent the majority of their time in rehabilitation, their FIM motor scores improved more than those in the other two blocks. For the three categories of hour blocks, the mean FIM motor scores before intervention were 25.92±9.31, 31.58±13.09, and 29.00±12.21, while the scores following intervention were 39.46±14.15, 47.00±13.57, and 48.55±14.96, respectively whereas, mean pre-intervention MAS scores were 3.62±0.65, 3.53±0.624, and 3.45±0.69, and mean MAS scores after the intervention were 2.23±0.83, 2.06±0.65, and 1.95±0.61 respectively.

Physical therapy interventions that were used by a physical therapist to facilitate pre-functional and gait activities to the number of patients are summarised in Figure 1. The results of this study showed that the most common clinical practice to manage post-stroke spasticity belonged to motor learning therapy based on the principle of neural plasticity. The major focus during the rehabilitation period was on pre-gait and gait training even at the beginning of the ambulatory rehabilitation programme. This is evident from results obtained in the first six-hour block and continues to increase in other blocks of activities throughout the rehabilitation stages.

Data showed that the most common therapy chosen for gait were coordination exercises. As gait is a complex functional activity that requires integrated lower extremity function and coordination, and spasticity deteriorates the coordinated function of the lower extremity muscle.

One of the striking observations was that even in higher-functioning patients belonging to the third block of six-hour rehabilitation, less time was spent on community mobility. This may be due to the factor that focal lower limb spasticity affects mobility but does not limit the functional activity of the lower limb and participation in the community. So, therapists spent less time on focusing on community-based ambulatory activities.

A small number of clinical and rehabilitation settings and sample size make its generalizability questionable. Therefore, future studies must be larger to identify the relationship between the therapy time, rest interval, intensity used, and achievement of functional outcomes. Evidence-based spasticity management guidelines developed by such studies may help the clinical practice and make the therapy cost-effective, focussed and based on functional goal achievement.

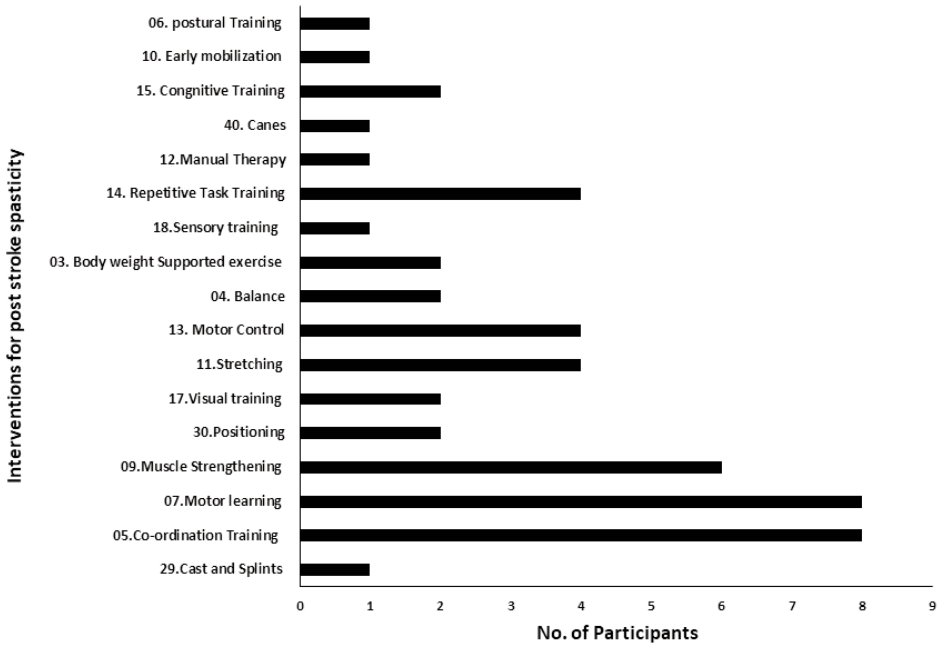

Figure-1: Type of intervention used for post stroke spasticity.

Conclusion

This study demonstrated that there is a lack of standardised protocols available for post-stroke spasticity management. Multiple rehabilitation intervention preferences are currently in practice which are based on the clinical expertise of physiotherapists. A better understanding of current trends in physical therapy clinical practice and inculcation of recommended stroke rehabilitation guidelines into current practice is required to encourage modifying strategies in upgrading the management of post-stroke spasticity.

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Abbreviations

IQR=Interquartile range.
SD=Standard deviation.
NA=Not applicable.

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Authors' Contributions
BA: Data analysis, acquisition, concept, interpretation and drafting.
RN: Critical review, final approval.