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Protocol of early physiotherapeutic intervention in patients with acute stroke intra-hospital: systematic review

Paulo Roberto Fonseca Junior[1], Vanessa Donato do Vale[1,2]

ABSTRACT

Background: Stroke is associated with high rates of mortality and disability. Physiotherapy plays a key role in the treatment these patients. Early rehabilitation proves to be an important point in the recovery process, as it helps to reduce complications and loss of functional capacity. **Objective:** This systematic review aims to analyze the effects of early physiotherapy protocols on recovery after acute stroke intra-hospital. **Methods:** The research sought references with publication date between January 2010 and March 2017, through a database such as MedLine (by PubMed), Lilacs, Cochrane Library, Scielo and PEDro. **Results:** A total of 30 articles were identified. After reading their titles, abstracts and full texts, and being evaluated, punctuated and qualified by the PEDro and Jadad scale, only 6 articles were selected for this review. **Conclusion:** This study provides an insight into the variety of approaches adopted by therapists that can be used in this type of population, demonstrating improvement in several motor and functional aspects, and confirming that the intervention performed at an early stage is safe and without contra- indications.

Keywords: Stroke; Physical Therapy Modalities; Hospital.

INTRODUCTION

According to the World Health Organization, stroke is defined as a clinical disorder of rapid development of focal disturbance of cerebral function, of vascular origin and lasting more than 24 hours. Globally, stroke is the second leading cause of death[1]. The incidence of stroke doubles with each decade of life from the age of 55 years[2]. The symptoms of this disease may include focal or global disturbances of brain function, such as motor disturbance, including unilateral or bilateral neural coordination, unilateral or bilateral sensory disturbance, aphasia or dysphagia, apraxia, ataxias and deficits in cognitive functions, Resulting in degrees of dependence, loss of autonomy and quality of life of these individuals[3].

The initial phase of the pathology is characterized by the presence of muscular hypotonia, a flaccidity associated with hyporeflexia or arreflexia. The evolution of the flaccidity to the spasticity phase occurs slowly. The physical damage present in these patients are plegia or paresis of one or both of the limbs, spasticity, stiffness and abnormal movement development, coordination changes, tremors, deficits in gross and fine motor skills, among others[4].

After a brain injury, both the intensity of rehabilitation and the time elapsed between injury and the beginning of rehabilitation influence the recovery of neuronal function. Rehabilitation during the acute stage may start as soon as the patient is clinically stable within 48 hours[5]. Prolonged absence of active movements after injury may result in subsequent loss of function in adjacent unbroken regions of the brain. However, subsequent damage to adjacent cortical areas can be avoided by re-training of movements[6].

The period of greatest neurological recovery occurs in the first semester after injury, due to the potential of cerebral plasticity and the phenomenon of collateral budding of new synaptic connections and the presence of previously latent pathways, this plasticity could be altered due to external conditions or by global stimulation[7].

After an acute stroke, a multidimensional approach based on multidisciplinary work and rehabilitation is needed to promote functional independence and social reintegration and maintain the medical stability. These activities are usually developed in the hospital setting as a continuum of the acute phase[8]. Multi-faceted interventions should be implemented throughout the course from hospital stay to hospital discharge and to the primary care level[9]. Medical hospitalization, rehabilitation, secondary prevention and social support should be organized into integrated and coordinated care processes[10].

The disparity in stroke care is of the utmost importance, since stroke affects disproportionately people in countries with different income levels. As a result, the World Stroke

Corresponding author: Paulo Roberto Fonseca Junior. Rua Padre João Gonçalves, 116, Pinheiros, Zip Code: 05432-040, São Paulo (SP), Brazil.
Phone: +55 (11) 97194-7326, + 55 (11) 3031-9659. E-mail: paulofonseca28@gmail.com

[1] Specialization Course in Neurofunctional Physiotherapy, Faculdade de Ciências Médicas da Santa Casa de São Paulo (FCMSCSP) - São Paulo (SP), Brazil.

Full list of author information is available at the end of the article.

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Organization was created with the highest priority being given to the detection of barriers and implementation of evidence-based interventions for stroke care. Unfortunately, there are gaps in information about care during the in-hospital phase, making it difficult to implement specifically designed and focused interventions for these types of patients[11].

In view of the above and with the intention of contributing and adding efforts to improve current physical therapy assistance to this type of patient, the aim of this study was to analyze the effects of early physiotherapy protocols in recovery after acute stroke intra- hospital by means of a systematic review of the literature. The specific objectives of this review were to identify the types of physiotherapeutic intervention protocols used and their benefits and, identify the need for an early intervention protocol for physical therapy in patients with acute cerebral vascular accident.

METHODS

Protocol and registration

The PRISMA indication (preferential report items for Systematic Analyzes and Meta-analyzes) for conducting reviews of intervention studies was followed[12]. This systematic review of the literature was also recorded in the PROSPERO database (CRD42017068547).

Sources of data and search strategy

We searched the following databases: MedLine (by PubMed), Lilacs, Cochrane Library, Scielo and Physiotherapy Evidence Database (PEDro). In the Medline database (by PubMed) the articles were searched using the terminology registered in the Medical Subject Headings of the U.S. National Library of Medicine (Mesh). The keywords and their synonyms used were*: Stroke, Physical Therapy Modalities, Hospital.* In the Lilacs, SciELO and PEDro databases, the search for the articles was conduted using the terminologies and their synonyms registered in the Descritores em Ciências da Saúde (DECS), which are: stroke, Physical Therapy and, hospitalization. The first review phase was to determine if the studies met the inclusion criteria. Titles and abstracts were displayed and selected by the author to identify the relevant studies.

Inclusion criteria

- Design: Recent RCTs with publication between January 2010 and March 2017.
- Participants: Patients with acute ischemic or hemorrhagic stroke (intra-hospital).
- Intervention: Early physiotherapeutic intervention.

Quality appraisal

The selected articles were evaluated, scored, and qualified using the PEDro scale, being a list of criteria for the evaluation of randomized clinical trials of quality for systematic reviews[13]. The classification of the studies analyzed based on the PEDro scale was performed by one evaluators, independently and blind to the objective of the present study, if a controversy occurred to the score obtained in the study, a second evaluator was selected to answer the question of the score. The articles selected by inclusion criterion through the PEDro scale would have to score higher or equal to 4 (Table 1).

The Jadad scale was used to assess the risk of bias in the studies (Table 2). This scale evaluates three items: level of blindness, concealment of allocation and description of losses. A maximum of five points can be obtained: three points for each yes, one additional point for an appropriate method of randomization and one additional point for an appropriate method of masking. A study is considered of poor quality if it receives two points or less after its evaluation[14].

RESULTS

Following an evaluation of articles derived from the databases mentioned above, 30 studies were found. After reading their titles, abstracts and full texts, and evaluating articles through the PEDro scale, which selected only articles with a score greater than or equal to 4 (table 1), only 6 articles were selected for this review, if Adapting to the inclusion criteria. A summary of the review process outlining the selection of evidence is presented in Fig 1.

Characteristics of included studies

Of the six studies included[15-20], five[15-18,20] were randomized controlled studies, of which three studies[17-19] were randomized blidly, Through computer-generated random numbers kept in envelopes sealed by an individual not involved with the study[16], Through a pseudorandom sequence computed in blocks, with the codes being stored by an independent person not involved in the recruitment[16] or through a computerized, web-based randomization system[18].

The mean PEDro score of the studies was 5.8 (table 1). All studies reported estimates of precision and variability and analyzed differences between groups. Two studies performed their evaluation blindly[17,20], being unable to distinguish between treatments applied to different groups. Most studies failed to make the subject or therapist blind to study. Although controlled and randomized controlled trials (RCTs) are considered the gold standard of evidence-based medicine currently, being important to direct the therapeutic conduct through consistent scientific observations, the blindness of subject and therapist present some extra difficulties in trials involving interventional procedures or surgical procedures[21].

Table 1. PEDro score for articles included*.

References	Item										
	Random sequence generation	Concealed allocation	Similar prognosis	Blinding of participants	Blinding of therapists	Blinding of examiners	Outcome measures	Intention to treat	Inter-group comparisons	Variability and precision	Score (0-10)
Boss et al. [15]	Y	N	N	N	N	N	Y	N	Y	Y	4/10
Chen et al. [16]	Y	Y	Y	N	N	N	Y	N	Y	Y	6/10
Malhota et al. [17]	Y	Y	Y	N	N	Y	Y	N	Y	Y	7/10
Morris et al. [18]	Y	Y	Y	N	N	N	Y	N	Y	Y	6/10
Skvortsova et al. [19]	N	N	Y	N	N	N	Y	N	Y	Y	4/10
Tyson et al. [20]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8/10

PEDro: Physiotherapy Evidence Database (https://www.pedro.org.au/).

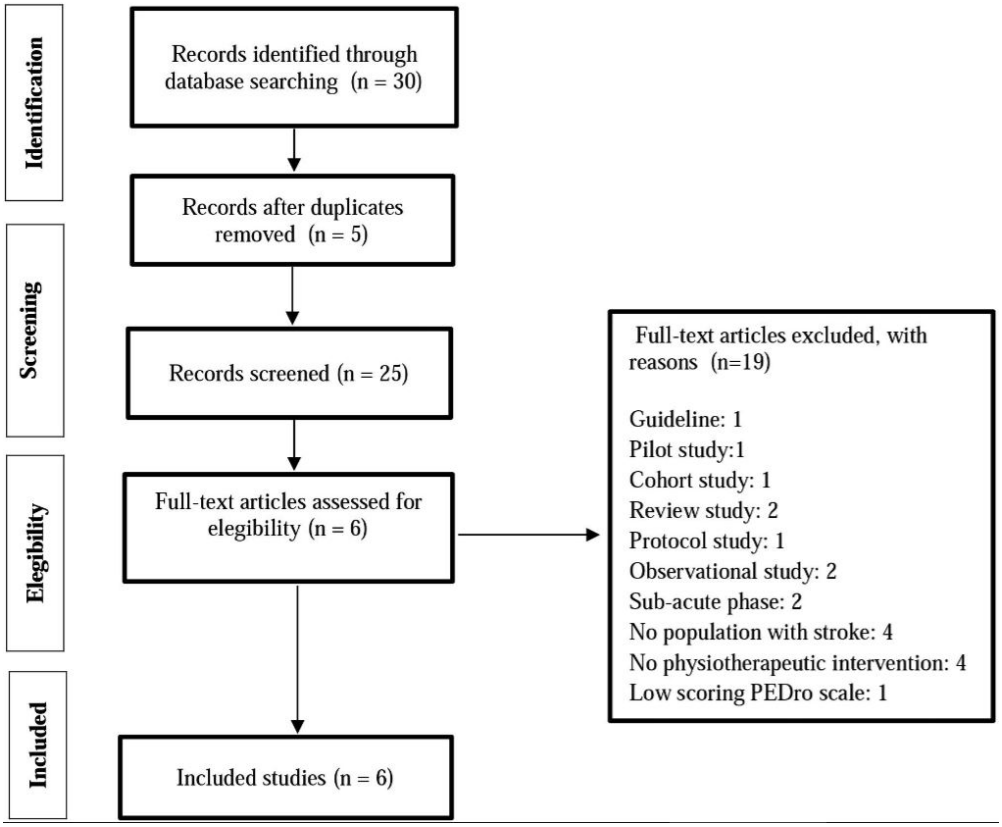

Figure 1. Review flow diagram (PRISMA).

DISCUSSION

The basic issue addressed by this review was to analyze the effects of early physiotherapeutic intervention on post-stroke recovery in acute in-hospital phase. Our inclusion criteria were therefore focused on randomized clinical trials comparing two care policies for stroke patients in the hospital (early intervention versus conventional rehabilitation) or who performed some early intervention in acute stroke patients still in the hospital setting. These characteristics were taken into consideration for the criterion of inclusion of the studies and, later, the interpretation of the results.

All included studies have shown beneficial effects for stroke patients, demonstrating that it is a safe practice to have no serious adverse events. The only dropout case was found in the study by Boss et al.[15], where during a one-year follow-up, two patients in the aerobic exercise group did not complete the intervention. One patient refused to participate due to lack of motivation and the second patient had to stop during the exercise program due to preexisting heart disease and inability to perform physical activity.

In all included studies, inclusion criteria were specified by the authors and chosen according to their expected benefit

Table 2. Characteristics of included studies (n = 6).

Reference	JADAD	Groups	Inclusion criteria	Intervention	Intervention frequency	Evaluation	Outcomes
Boss et al. [15]	3	n = 20 *No exercises = 10* *With exercises = 10*	• At least 18 years old. • Ischemic stroke or AIT with a score of less than or equal to 3 in NIHSS. • Onset of signs and symptoms in less than one week. • Walk independently. • Patients discharged without need for further rehabilitation.	*No exercises:* Pharmacological therapy, counseling and motivational interviews. *With exercises:* Aerobic exercises and muscle strengthening.	*No exercises:* Four visits (4 weeks, 3 months, 6 months and 9 months after stroke) within one year. *With exercises:* 8 weeks x 3 sessions/ week x 1 hour, with a follow-up of one year.	*Primary outcomes:* • Safety and feasibility. *Secundary outcomes:* • Maximal exercise capacity. • Measures of secundary prevention.	The post-stroke program with exercises was considered safe, finding no cardiac or pulmonary contraindication. It was also considered feasible since everyone was able to complete the follow-up
Chen et al.[16]	3	n = 35 *Control = 10* *Thermal= 10*	• Diagnosis of first-ever stroke within four weeks. • Absence of cardiac or orthopaedic problems before the stroke. • Motor deficit of the paretic leg at or less than Brunnstrom stage III. • Walk independently.	*Control:* \Standard therapy and guidance. *Thermal:* Standard therapy and thermal stimulation.	*Control:* 40 minutes of standard therapy + 20 minutes of guidance and discussions. *Thermal:* 40 minutes of standard therapy + 48 minutes of termal stimulation. Both groups performed the intervention for: 6 weeks, with 5 sessions per week.	• Ashworth Scale • Fugl-Meyer Scale • Medical Research Council scale. • Modified Motor Assessment Scale. • Postural Assessment Scale for Stroke Trunk Control.. • Berg Balance Scale • Functional Ambulation Classification	The Thermal group showed significant improvement for Fugl-Meyer, Medical Research Council scale, Modified Motor Assessment Scale, Berg Balance Scale and Functional Ambulance Classification. In addition to having more independent walkers than the Control group.
Malhota et al. [17]	3	n = 90 *Control = 45* *Intervention = 45*	• No useful hand function, defined as a score of 0 in the grasp subsection of the Action Research Arm Test. • No contraindication to surface neuromuscular electrical stimulation.•	*Control:* Standard therapy. *Intervention:* Surface neuromuscular electrical stimulation.	*Control:* 45 minutes of standard therapy. *Intervention:* 30 minutes of surface neuromuscular electrical stimulation. Both groups performed the intervention during: 6 weeks, with 5 sessions per week.	• Pain • Spasticity • ROM • Motor performance in the impaired arm.	The patients in the Intervention group had no increase in pain and had an improvement in ROM. However, there were no changes in stiffness and spasticity.
Morris et al. [18]	3	n = 106 *Bimanual Training (BT) = 56* *Control Training (CT) = 50*	• Acute unilateral confirmed on TC. • Contralesional score of less than 6 on Motor Assessment Scale. • Ability to participate in 30-minute physioterapy session. • Ability to sit unsupported for 1 minute.	*BT group:* Bimanual progressive training *CT group:* Progressive training only with the hemiparetic limb.	Both groups participated in a 20-minute session, 5 days a week, for 6 weeks, in addition to the usual therapy.	• Assessment fine manual dexterity (Nine-Hole Peg Test) • Measure of UL activity limitation (Action Research Arm Test)	The BT group demonstrated significantly greater change in dexterity. Younger participants demonstrated greater overall recovery with BT than older participants.

Abbreviations: n = number; NIHSS= National Institute of Health Stroke Scale; ROM= Range of movement; TC= Computed tomography

Table 2. Continued...

Reference	JADAD	Groups	Inclusion criteria	Intervention	Intervention frequency	Evaluation	Outcomes
Skvortsova et al. [19]	1	n = 78 *Study = 53* *Control= 25*	• Patients in acute phase of stroke who were unable to walk independently. • Diagnosis of stroke based on clinical symptoms and neuroimaging studies.	*Study group:* Motor-assisted training for gait rehabilitation. *Contro Group:* Cardiac trainig and gymnastics.	Both groups participated for 2 weeks, with 30-minute sessions of 5-12 sessions per week.	• Assessment fine manual dexterity (Nine-Hole Peg Test) • Measure of UL activity limitation (Action Research Arm Test)	Patients in the study group presented improvements in the dynamics of permanent stability, walking functionality and the Berg and Bartel scales. All patients in this group were able to walk with a support or completely independent.
Tyson et al. [20)]	3	n = 94 *Mirror Therapy = 63* *Lower-Limb exercises (control) = 31*	• Had experienced stroke at least 1 week previously • No premorbid conditions limiting upper- or lower-limb function. • Sufficient cognitive and communication skills to give informed consent • Had upper- and lower-limb weakness that limited activity.	*Mirror Therapy:* Mirror therapy was performed in 4 levels of progression. *.Lower-limb exercises:* Exercises were performed for the lower limbs, involving the hip, knee and ankle. Note: Both exercises were conducted by the patients.	Patients from both groups were asked to perform up to 30 minutes of daily practice for 4 weeks.	• Upper and lower-limb weakness (Motricity Index and Grip strength). • Upper and lower-limb sensation (Rivermead Assessment of Sensory Perception). • Ashworth Scale. • Neglect (Star Cancellation test). • Brunel Balance Assessment. • Box and the Block Test. • Action Research Arm Test.	Both groups did less therapy than recommended; Typically 5 to 15 minutes for 7 days or less. Participants in the Mirror therapy group tended to do less practice than those in the Lower-Limb Exercises group. Negligence, upper limb strength and dexterity showed improvement in the Mirror therapy group.

Abbreviations: n = number; NIHSS= National Institute of Health Stroke Scale; ROM= Range of movement; TC= Computed tomography

objectives for the intervention. Safety criteria were adequately addressed in the knowledge of the risk of complications that may be developed during this initial phase of stroke, Chen et al.[16] chose as an inclusion criterion for their research, patients who were absent from cardiac or orthopedic problems before the episode of AVC. In the study by Malhota et al.[17] medically unstable patients were included in the exclusion criteria, with no possibility of participating in the study. Boss et al.[15], Chen et al.[16] and Tyson et al.[20] in their studies chose not to include patients who did not have preserved cognitive skills and were unable to follow instructions given by the therapist. Skvortsova et al.[19], knowing the complexity of rehabilitation during this phase, reports in his study that he has constantly monitored the responses of the cardiovascular system during his intervention.

According to the current clinical guidelines for stroke management[22,23], patient rehabilitation needs and goals are assessed within 24-48 hours of arrival at the hospital, where the clinician and multidisciplinary team (eg physician, nurse, Physiotherapist, speech therapist) use valid tools for it, and initiate rehabilitation during the acute phase of treatment. The mean time of stroke patients in the included studies eligible for the intervention was 2,3 weeks after injury. The studies of Boss et al.[15] and Tyson et al.[20] included patients less than one week after the injury, proving to be viable, since the retention rate of patients in the study of Tyson et al.[20] was high (> 90%), And in the study by Boss et al.[15] all patients were able to complete the intervention and the follow-up of one year.

Multivariate models of intervention exposed in this review propose an expansion of the field of physiotherapeutic techniques that can be used in this type of population. Such as: Aerobic exercises and muscular strengthening, with gradual increase of intensity performed in the study of Boss et al.[15]. Thermal stimulation performed by Chen et al.[16] (The thermal agent consisted of a warm (75 ° C) or cold (0 ° C) packet wrapped with two towels) associated with active or passive movement of the same thermally stimulated limb. Malhota et al.[17] used as an intervention the intense neuromuscular electrical stimulation treatment performed by the patient (the patient or his / her caregiver was trained to apply the surface neuromuscular electrical stimulation system after the initial session, performing independently). Morris et al.[18] in their study, performed a training of simultaneous bimanual tasks (specific motor or functional goals developed to provide a range of distances, precision, dexterity and strength requirements), performed progressively. Skvortsova et al.[19] used motor mechanotherapy to improve walking, performing motor-assisted gait training Motomed Viva 2 (RECK-Technik GmbH & Co. KG, Medizintechnik, Betzenweiler, Germany) and Gait Trainer 1-GT1(Reha-Stim Medtec GmbH & Co. KG, Berlin, Germany), with the patient standing, performing movements that required different directions of rotation, active exertion levels, muscular contraction nature, performance rates and exercise periods. Tyson et al.[20] in their study, used two different therapies, led by the patient himself. Mirror therapy was performed for the upper limbs, individualized according to the patient's need (in order to accommodate the wide range of abilities), and for the lower limbs specific exercises were performed without the use of mirror therapy.

Several approaches are adopted by therapists to facilitate recovery of balance and motor function[16,20]; Prevention of pain development, contractures and reduction of spasticity[17]; Improvement in fine motor recovery and dexterity[18,20]; Gait recovery[19]; Reduction of blood pressure and LDL cholesterol levels, thus avoiding secondary complications and risk of new strokes[15]. Some studies have also used as safety outcomes[15], and the feasibility and acceptability of patient-led therapies during the acute stages[16,20].

This review has strengths and limitations. The strengths are the comprehensive search strategy, the lack of bias in the selection of studies due to blindness of the reviewers and the inclusion of only randomized controlled clinical trials. In addition, the results of this review are potentially affected by the small effect size estimate for clinical significance, since only six studies were able to fit the purpose of the study and have a good methodological quality by the PEDro scale (above six points).

CONCLUSIONS

Our review is the first to systematically investigate the efficacy of early physiotherapeutic intervention protocols in post-acute stroke recovery in in-hospital acute phase through randomized clinical trials. As a result, we are able to provide an insight into the variety of approaches adopted by therapists that can be used in this type of population, demonstrating improvement in several motor and functional aspects, and also confirming that the intervention performed early is safe and without contraindications. We suggest that the role of physiotherapy in the multidisciplinary team during the in-hospital phase be better implemented through the creation of intervention protocols developed by therapists, aiming to optimize neurological recovery even in the first weeks after injury, accelerating the return home of people with Stroke patients admitted to the hospital.

AUTHOR'S CONTRIBUTION

Conceptualization and Investigation: PRFJ and VDV; Data curation and Formal analysis: PRFJ and VDV; Writing – original draft: PRFJ; Writing – review & editing: PRFJ and VDV; Final approval of the version to be published: PRFJ and VDV.

CONFLICT OF INTEREST

The author(s) declare that they have no competing interests.

AUTHOR DETAILS

[2] Supervisor of the Adult Nursing Sector Hospital of Irmandade da Santa Casa da Misericórdia de São Paulo (ISCMSP) - São Paulo (SP), Brazil.

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