

Addressing functional activities and the influence of environmental factors in post-stroke hemiparetic patients before and after physical therapy

Geovanna Lemos Lopes¹, Luciana Castaneda², Luciane Lobato Sobral³

ABSTRACT

Abstract: Stroke is the leading cause of neurological disability and hemiparesis is its most common sequelae. The physical and functional limitations combined with the influence of environmental factors directly affect an individual's functionality. For an effective neurological rehabilitation, it is essential that physiotherapists know the patient's functional profile in order to plan the treatment to meet his/her real needs. **Objective:** To analyze the functional activities and influence of environmental factors in post-stroke hemiparetic patients before and after physical therapy. **Method:** Twelve post-stroke hemiparetic patients were evaluated before and after 20 physical therapy sessions with the Barthel Index (BI) and an evaluation model based on an abbreviated core set of the International Classification of Functioning, Disability and Health (ICF) for stroke, based in the generic qualifiers system of the ICF. **Results:** There was significant improvement for the activities walk (d450) ($p = 0.0033$), dress (d540) ($p = 0.018$) and eat (d550) ($p = 0.018$) for the evaluation model based on the ICF. According to the BI, significant improvement was detected for the activities of feed ($p = 0.0341$), dress ($p = 0.0277$), toilet ($p = 0.0117$), and up/down stairs ($p = 0.0077$). The environment factors immediate family and health professionals were the most positive influence on the health status of patients. **Conclusion:** Physical therapy was effective for improving the condition of patients since, according to the patients, some daily activities can be performed with more ease at the end of the physical therapy treatment. To meet their needs, it is important to develop an individual treatment plan, emphasizing the context in which he/she is inserted, in order to address the real limitations on activities and restrictions to participation.

Keywords: stroke/rehabilitation, data collection, questionnaires, International Classification of Functioning, Disability and Health

¹ Physiotherapist, Resident in the Multi-professional Residency Program in Family Health Strategy.

² Masters in Collective Health, Physiotherapy Course Professor at the Rehabilitation Medicine Brazilian Institute - Laureate Universities.

³ Masters in Physiotherapy, Physiotherapy Course Professor at the State University of Pará - (UEPA) and the University of Amazônia (UNAMA).

Mailing address:

Neurological Rehabilitation Clinic at the
Physiotherapy and Occupational Therapy Teaching
and Assistance Unit (UEAFTO) - University of the
State of Pará (UEPA), Belém, Pará
Geovanna Lemos Lopes
Cjto. Abelardo Conduru, Quadra 6, Casa 6
CEP 67015-060
Ananindeua - PA
E-mail: naninha_to@yahoo.com.br

Received on October 3, 2012.

Accepted on February 19, 2013.

DOI: 10.5935/0104-7795.20120038

INTRODUCTION

Fifteen million people worldwide suffer a stroke (CVA) every year, and its incidence grows drastically with age, representing the number three cause of death in the world and the number one in Brazil.^{1,2} Its pathology consists of a focal neurological deficit with sudden onset caused by an interruption of the blood flow to a determined brain area that lasts more than 24 hours, being able to cause a variety of neurological damages, with hemiparesis being the most frequent.^{3,4}

A stroke is one of the leading causes of permanently debilitating sequelae.^{5,6} In these cases, physical therapy intervention is indispensable, for it helps patients to improve their functional performance of daily life activities.⁷

In the practice of physical therapy it is common to use evaluating instruments that help the professional to identify the functional deficits caused by the affliction, in order to plan the most viable therapy to recover or minimize the stroke sequelae.⁸ The Barthel Index (BI) is one of the evaluation tools used most by physical therapists. Widely used for stroke victims, it was created in 1965 to evaluate their level of functional independence in the performance of daily activities.⁹

More recently, in 2001, the International Classification of Functioning, Disability and Health (ICF) was approved, which belongs to the "Family of International Classifications" prepared by the World Health Organization (WHO).¹⁰ The ICF describes functionality and disability as they relate to the health conditions of an individual, identifying what "the person can do in his or her daily life," in view of organ functions or systems and body structures, as well as identifying limitations to activities and restrictions to participation in the environment where the individual is inserted.^{11,12}

The WHO affirms that it is a multiple purpose classification, able to be used as a statistical, investigative, pedagogical, and clinical tool to evaluate needs, to reconcile treatments with specific actions, and to evaluate rehabilitation and its results.¹³ However, there are few studies in Brazil on the impact of the ICF on health care, which is due to the ICF being recent, complex, and presenting difficulties during clinical implementation.¹⁴

OBJECTIVE

This study was made to analyze functional activities and the influence of environmental

factors as perceived by post-stroke hemiparetic patients before and after the physical therapy treatment in a rehabilitation referral unit in Belém, in the state of Pará, through an evaluation model based on the Brief ICF Core Set for Stroke and on the BI.

METHOD

This was a longitudinal study, descriptive and with intervention, made from a field study of patients afflicted by stroke, from June to September of 2011, at the Neurological Rehabilitation Clinic at the Physiotherapy and Occupational Therapy Teaching and Assistance Unit (UEAFTO), in the city of Belém, Pará.

The 12 patients included in the study met the inclusion criteria: clinical diagnosis of stroke, in the chronic phase, with hemiparesis established for more than one year, both genders, age bracket from 50 to 70 years old, and were not under physical therapy treatment in any other location at the time of the study. They had received occupational therapy treatment before the study, also at UEAFTO, two months before the physical therapy sessions. Only the patients who had their language and cognition functions preserved were studied, and then evaluated by the Mini-Mental State Examination (MMSE), which was interpreted according to the patient's level of schooling.

Patients who had some auditory alteration, who needed wheelchairs, who were aphasic, and/or had some other associated pathology were excluded. However, patients who had pathologies correlated in some way to the stroke were not excluded.

Initially, before the first physical therapy session, two instruments were used to collect data from the patients: first, the BI and second, an evaluation model based on the Brief ICF Core Set for Stroke prepared by Andrade et al.¹⁵ This model evaluates the functional performance of the individuals, since it emphasizes the activities performed in a real environment. In addition, it includes questions containing the descriptions of specific codes pertaining to Activity and Participation and Environmental Factors of the Brief ICF Core Set for Stroke. The questions allow an analogy between the description of a specific code and a patient's daily life situation. From their answers it is possible to encode, also with the qualifiers, relating the answer "none" with the qualifier 0, or "slight" with 1, "moderate" with 2, "serious" with 3, and "complete" with qualifier 4, in a generic form suggested by the WHO.¹⁶

While preparing this instrument, Andrade et al.¹⁵ chose to exclude the body functions and structures due to the difficulty in choosing analogy qualifiers, for not having the possibility to observe the perception of the patient on functional aspects, and also because the information on these components is normally already investigated in biomedical evaluations (Chart 1).

After that, the 12 patients underwent 20 physical therapy sessions, performed three times a week, conducted exclusively by a physical therapist from the unit, without any intervention from the researchers. Each session lasted 40 minutes, with the application of the treatment protocol prepared by the UEAFTO professional. After the twentieth session, both instruments mentioned above were used again.

The Wilcoxon test, a non-parametric method, was used to evaluate the data collected through the model based on the Brief ICF Core Set for Stroke and the BI. The categories of the model based on the ICF to qualify activity, participation and environmental factors were evaluated individually. To analyze the influence of environmental factors, descriptive and inferential statistical methods were applied.

The simple frequencies of each category of both instruments used were compared before and after the physical therapy intervention to discuss the results. In addition to the isolated evaluation of each BI activity, the information obtained with this instrument was also evaluated, adding all the partial values of each activity to obtain a final score, before and after rehabilitation.

In the entire analysis, $p < 0.05$ was considered as the level of statistical significance, and the statistical processing of the results was done through BioStat 5.3.

The study was made according to the precepts of the Declaration of Helsinki and of the Nuremberg code, meeting the research norms involving human beings from the National Health Council (Res. CNS 196/96), after approval of the Committee for Ethics in Research, Pará State University, under protocol N^o. 21/2011.

RESULTS

In this study, 12 post-stroke hemiparetic patients were evaluated, of which 8 were female (66.7%) and 4 were male (33.3%). The average age of the participants was 57 ± 5 years, with the youngest at 51 and the oldest at 66 years.

Chart 1. Adapted instrument

Code	Code description	Analogies to choose the qualifier	Qualifier
d310	Communicating with - receiving - verbal messages (Is it difficult for you to communicate - receive - verbal messages?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
d450	Walking (Is it difficult for you to move around in different locations?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
d510	Washing oneself (Is it difficult for you to wash yourself?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
d530	Toileting (Is it difficult for you to use the toilet and clean yourself?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
d540	Dressing (Is it difficult for you to get dressed?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
d550	Eating (Is it difficult for you to eat?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Serious () 4 - Complete	
e310	Immediate family (How much does the support of your family ease your health condition?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Considerable () 4 - Complete	
e355	Health professionals (How much does the support of health professionals ease your health condition?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Considerable () 4 - Complete	
e580	Health services, systems, and policies (How much do health services ease your health condition?)	() 0 - None () 1 - Slight () 2 - Moderate () 3 - Considerable () 4 - Complete	

Through the data obtained by the Brief ICF Core Set for Stroke, three activities were verified as showing improvement during performance, with a significant statistical difference ($p < 0.05$) after the physical therapy intervention: *walking* (d450) ($p = 0.0033$), *dressing* (d540) ($p = 0.0180$), and *eating* (d550) ($p = 0.0180$).

As for the influence of environmental factors on the functionality of the post-stroke hemiparetic individuals, it was observed that 75% mentioned that their *immediate family* (e310+4) as much as their *health professionals* (e355+4) eased their health condition completely. However, for the environmental factor *health services, systems, and policies* the results were less dramatic with only 25% of the patients reporting it as complete facilitator (e580+4), as shown in Table 1.

During the investigation of the functional independence level of stroke patients through the BI, it was observed that before the physical therapy intervention none of them showed either complete or serious dependence, with 41.66% being moderately dependent and 58.34% being slightly dependent. After the physical therapy treatment, 66.6% referred to slight dependence and 33.4% reported independence performing their daily activities. It was also observed in the functional independence evaluation, that four activities showed a statistically significant difference ($p < 0.05$) after the physical therapy sessions: *eating* ($p = 0.0341$), *dressing* ($p = 0.0277$), *toileting* ($p = 0.0117$), and *going up and down stairs* ($p = 0.0077$).

Washing oneself and *cleanliness*, major complaints from most participants in the stu-

dy, did not show any significant improvement. These results are shown in Table 2.

DISCUSSION

Stroke (CVA) happens most frequently in males.^{17,18} However, this study verified that the disease was predominant in females, as in the study by Reis et al.¹⁹ Although there are some stroke cases with younger people, there is a consensus among topical studies that the incidence of stroke increases progressively with age.^{7,20} The average age of individuals afflicted

by this pathology is around 60 years,^{2,21} which is close to the results of the present study.

The functional approach has been emphasized in the literature in recent years, despite there being few studies discussing the question from the point of view of the patient.¹⁵ According to the ICF, the experience of illness is essentially individual and depends on the context in which the individual is inserted. The personal and social resources a person possesses are a way to determine the implications of functionality and disability, for it becomes relevant not only in evaluating the functional decline, but also in searching for information on how such limitations are experienced by each one and, also, how the environment effects such a state.^{22,23}

The results found in this study, whether through the evaluation model based on the ICF or on the BI, corroborate other studies such as Costa²⁴ that also reveal the benefits of physical therapy in minimizing the impact of motor sequelae in stroke victims. Kakiyama & Neves²⁵ obtained similar results when submitting a group of stroke victims to only conventional physical therapy treatment with kinesiotherapy, and observed improvement on the activities of *transferences, going up and down stairs*, and *washing oneself*, which were also evaluated through the BI. In the same way, André²⁶ points out the importance of physical therapy for these patients. He declares that 80% of stroke survivors are left with some degree of neurological deficit and, for this

Table 1. Brief ICF Core Set for Stroke

		Brief ICF Core Set for Stroke (% of 12 patients)					
		None	Slight	Moderate	Considerable	Complete	p value
d450	Before	0.0	0.0	83.3	16.7	0.0	0.0033*
	After	0.0	83.3	16.7	0.0	0.0	
d510	Before	66.7	0.0	0.0	25.0	83.3	0.0679
	After	75.0	25.0	0.0	0.0	0.0	
d530	Before	75.0	16.7	0.0	8.3	0.0	0.1088
	After	100.0	0.0	0.0	0.0	0.0	
d540	Before	16.7	25.0	25.0	25.0	8.3	0.0180*
	After	41.7	41.7	16.7	0.0	0.0	
d550	Before	25.0	0.0	16.7	50.0	8.3	0.0180*
	After	25.0	33.3	33.3	8.3	0.0	
e310	Before	8.3	0.0	0.0	16.7	75.0	0.3173
	After	8.3	0.0	0.0	8.3	83.3	
e355	Before	0.0	8.3	8.3	8.3	75.0	0.593
	After	0.0	0.0	8.3	16.7	75.0	
e580	Before	25.0	8.3	25.0	16.7	25.0	0.2336
	After	0.0	33.3	25.0	0.0	41.7	

Walking (d450); Washing oneself (d510); Care related to defecation (d530); Dressing (d540); Eating (d550); Immediate family (e310); Health professionals (e355); Health services, systems, and policies (e580). * Wilcoxon test for paired samples

Table 2. Post-stroke hemiparetic patients' distribution (%) of DLAs before and after physical therapy intervention (n = 12), according to the BI

	Barthel Index Activities (% of 12 patients)									
	Eating	Washing oneself	Dressing	Cleanliness	Defecation	Urination	Toileting	Transferences	Mobility	Up&Down Stairs
Before										
Dependent	16.7	33.3	16.7	25.0	0.0	0.0	8.3	8.3	0.0	16.7
Needs help	58.3	66.7	58.3	75.0	16.7	41.7	66.7	8.3	0.0	75.0
Independent	25.0	0.0	25.0	0.0	83.3	58.3	25.0	83.3	100.0	8.3
After										
Dependent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Needs help	50.0	100.0	41.7	100.0	0.0	8.3	16.7	8.3	0.0	33.3
Independent	50.0	0.0	58.3	0.0	100.0	91.7	83.3	91.7	100.0	66.7
p-value	0.0341*	0.0679	0.0277*	0.1088	0.1797	0.0679	0.0117*	0.1797	0.9998	0.0077*

reason, they need rehabilitation to improve their functional independence level. In other words, despite the characteristics inherent to the disease and the factors that can function as barriers to the patient's improvement, physical therapy is expected to be one of the facilitators in his or her health condition.

Nevertheless, there was improvement in the execution of some activities, while not in others, and this can be justified by the chronicity of the disease, a characteristic that makes it so disabling. Souza et al.,⁸ observed that most motor recovery happens within the first three months after the brain injury, and that after that period, clinical evolution is slower. In these cases the objectives of rehabilitation must be to bring the patient to the highest possible functional level compatible with what his or her health condition allows, and that it be as satisfactory as possible to the patient.

Both evaluation instruments used in this study include aspects related to human functionality. The instruments to evaluate patients who suffered stroke generally have items in common that include 'mobility', 'personal care', and 'activities related to domestic life',²² which are observed, for example, in the BI and in the ICF Core Set used in this study.

However, each one of these tools has shown particularities, either in their purposes, in the items that composed the evaluation instrument, or in the way the results were qualified and/or quantified.

The BI, defined as a generic and reliable measurement, grades the patient's level of independence to perform Daily Life Activities (DLAs), and through which different results can be obtained (independent, needs help, and dependent).²¹ Many studies made with stroke victims using the BI are seen in the literature.^{2,9,19}

Wellwood²⁷ affirms that through the BI there is the possibility of collecting overall and

also partial information for each activity, which helps to reveal the specific differences of each person and facilitates the evaluation of the patient's evolution over time. However, there is no psychometric corroboration that considers it valid to evaluate BI activities separately, and for this reason a possible limitation to the present study is indicated, since it evaluated the index activities separately.

Different from and more far reaching than the BI, the ICF approaches functionality and disability in a peculiar way, since it is the only instrument to consider the influence of contextual factors (environmental and personal factors - these are not encoded by the classification) on the functional aspects of the individual.²⁸ It is also noteworthy that for its being more recent, more far reaching, of complex use, and mostly unknown by health professionals, the practical use of the ICF has met great challenges.²⁹

Thus, to increase the applicability of the classification, ICF core sets were created with a group of categories describing the functionality of individuals in a determined health condition.⁶ A brief core set for a specific condition includes the smallest number of categories so that its use is practical and viable for clinical or epidemiological use.¹⁵

Although this study recommends the use of the ICF Core Set for Stroke in clinical practice as a way to analyze, from the patient's point of view, the functional aspects after rehabilitation, there is a lack of studies with the same approach in the literature, which limits the discussion of the work.

It is important to highlight the study by Castaneda et al.³⁰ in which the same ICF evaluation model being discussed here was used and obtained similar results when applying the activity categories, and participation and environmental factors of the brief

core set for stroke in chronic hemiparetic patients. However, as it was not in harmony with the objectives of their study, Castaneda et al.³⁰ did not reevaluate the patients after the physical therapy treatment.

It is important to consider that the ICF core set offers suggestions in construction and with proposals for validation, under the process of investigating more appropriate ways of using it. Validation has been made empirically for various health conditions, according to the point of view of health professionals and even of patients.²⁸

Recently, Riberto et al.³¹ proposed the empirical validation of the extended ICF core set for stroke, according to the reality of patients with the disease in three different rehabilitation centers in Brazil. The authors concluded that the extended core set for stroke can be used by a multiprofessional team to classify the daily experiences of these patients, but greater effort is needed to operationalize it and increase its reproducibility to guarantee its reliable use.

Castaneda et al.³⁰ while analyzing environmental factors, using the same evaluation model based on the brief core set for stroke, observed that 25% of the study subjects considered the support of their *immediate family* (e310) and of *health professionals* (e355) as complete facilitators, and 50% of the sample considered them as considerable facilitators, which are lower results than those found in the present study. In this way, it is possible to show that environmental factors - *immediate family* and *health professionals* - helped the patients more in the present study than in the study by Castaneda et al.³⁰

Machado et al.³² also pointed to the family as having an important role in the recovery of a stroke victim, since the social support provided by the family minimizes the impact of the

disease and allows the practice of a greater number of activities, in addition to encouraging the participation of the stroke victim.

This study also corroborates the study by Felício et al.³³ for it affirms that the conduct of the physical therapist allows for a more effective recovery of the patients with clinical repercussions of the disease, and leads to their being less dependent on their caregivers.

As for the support for *health services, systems, and policies* (e580), the results of Castaneda et al.,³⁰ and Lima et al.,²³ were more promising, since the users they researched perceived health services as considerable facilitators and mostly as complete facilitators, which is different from the findings in the present study. The results of this study may be justified by the high demand for health services in the metropolitan area of Belém (Pará) in contrast to the restricted material and human resources that make for better services.

The studies discussed above were made in different geographical areas within Brazil and many studies confirm that there is a difference in the access and use of health services between some states in the country. Travassos et al.³⁴ confirmed that people who live in the southern and southeastern regions of Brazil have more chances of using health services and policies than those who live in the other regions, and also that the people in the north had 45% less chances of doing so.

Although the evaluation instrument based on the brief core set for stroke directs the patients' answers only to environmental factors with "facilitator" qualifiers and not with "barriers," some findings point out that the factors *immediate family* and *health services, systems, and policies* that were rated as "no facility" for 8.3% and 25% of the patients, respectively, are not facilitators.

The WHO¹³ affirms that an environmental factor should be considered as a barrier when it is present as much as when it is absent. That way, the environmental factors seen by the patients as "no facility" may suggest a "barrier" for not being "facilitators," but are aspects that need to be better studied to achieve reliable conclusions.

Even if the results of the study indicate functional improvement according to the patient's point of view and that the evaluation instruments perceived such changes, the study presents some possible limitations such as the non-recognition of the average time passed since the onset of hemiparesis among the study's participants, and the fact of the

patients having been submitted to other rehabilitation procedures before the data collection, possibly becoming biased in the interpretation of the results.

In addition, the functional improvement of the patients submitted to rehabilitation may have been influenced by other factors not measurable in this study, such as: controlling complications such as spasticity, inclusion of other environmental factors, or even a previous ineffective treatment, which obviously escapes any possibility of analysis in this study.

Another relevant aspect to explain the results is based on the evaluation instruments used to measure functionality, but in different dimensions, since the levels of "functional (in)dependence" are different from levels of "difficulty" to perform the DLAs, which represents a possible limitation of the study.

Although the study demonstrates some limitations that require a more directed approach in future works with this theme, its relevance needs to be considered, since there are few studies published with the same purpose and, besides, this study tried to adapt the ICF to the clinical practice, one of the greatest challenges for the use of this classification nowadays. The use of the ICF as a clinical tool to investigate functional and disabling aspects and environmental influences on post-stroke hemiparetic patients represents an important instrument for investigating the functional profile of patients, observing their needs, appreciating the results of the physical therapy treatment, and helping the proper professionals in preparing a treatment plan that meets the individual needs of the patients.

CONCLUSION

In this study it was confirmed that a stroke causes negative impacts on the functional performance of its victim. However, the results of the study show that the physical therapy intervention applied to these patients was important to minimize some functional limitations and thus contributed, even if partially, to their recovery, which may be the result of controlling secondary complications, that developed in the patient with stroke sequelae.

The BI and the ICF are options for identifying the intensity of the patient's functional impairment, and are instruments that can be important for the physical therapist, for they make it possible to prepare a treatment plan centered on the patient, in order to meet his or her real needs.

Even if the model used in the study were based on all the codes referring to the environmental factors of the Brief ICF Core Set for Stroke, there are various other factors in the environment that influence functionality and that were not included here, which makes this study limited. In this case, other environmental factors could have been added.

Although this study has been considerable, there is need for future studies on the conclusion of the findings, since this study had limitations related to the reduced number of subjects in the sample.

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