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ORIGINAL ARTICLE

Comparison of instruments for sleep, cognition and function evaluation in stroke patients according to the international classification of functioning, disability and health (ICF)*

Comparação dos instrumentos de avaliação do sono, cognição e função no acidente vascular encefálico com a classificação internacional de funcionalidade, incapacidade e saúde (CIF)

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Abstract

Background: The International Classification of Functioning, Disability and Health (ICF) should be widely used in research and clinical practice, but there are few studies that do so with the evaluation instruments used in physical therapy. **Objective:** To compare instruments that evaluate sleep, cognition and function in stroke patients according to the ICF. **Methods:** Twelve patients (6 women) with a mean age of 55.4 (±6.2) years and a recovery time from 7 to 36 months took part in the study. Patients were evaluated using the Pittsburgh Sleep Quality Index (PSQI), the Mini-Mental State Examination (MMSE) and Barthel Index (BI). A frequency comparison of ICF categories and those of the above-mentioned instruments was performed using Fisher's exact test and chi-square. Agreement regarding the categories was recorded by two evaluators and assessed with the Kappa index. **Results:** Mean scores of 5.0 (±3.0), 22.5 (±3.4) and 74.6 (±17.2) were found for the PSQI, MMSE and BI, respectively. The changes identified in the other instruments were recorded in 46 ICF categories, with the most frequent component being "Body Functions", followed by "Activities and Participation". We found an inter-rater agreement of 0.87 for the PSQI (substantial), 0.44 for the MMSE (moderate) and 0.39 for BI (fair). **Conclusions:** The results indicate that the instruments' concordance differed greatly, which suggests a more thorough use of these instruments in physical therapy to optimize the formulation and standardization of diagnoses.

Keywords: classification of functioning; disability and health; stroke; sleep; cognition; physical therapy.

Resumo

Contextualização: A Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF) precisa ser empregada amplamente na pesquisa e prática clínica, mas há escassez de trabalhos que vinculem sua utilização a instrumentos de avaliação utilizados na fisioterapia. **Objetivo:** Comparar os instrumentos de avaliação do sono, cognição e função com a CIF em pacientes com AVE. **Métodos:** Participaram 12 pacientes (seis mulheres), com idade média de 55,4 (±6,2) anos e tempo de recuperação de sete a 36 meses. Os pacientes foram avaliados pelo Índice de Qualidade do Sono de Pittsburgh (IQSP), Miniexame do Estado Mental (MEEM) e Índice de Barthel (IB). A comparação da frequência das categorias registradas da CIF com os itens dos instrumentos foi realizada por meio do teste de Fisher e teste do qui-quadrado. A concordância das categorias registradas por dois avaliadores foi analisada pelo Índice de Kappa. **Resultados:** Na análise do IQSP, encontrou-se um escore médio de 5,0 (±3,0); para o MEEM, de 22,5 (±3,4) e para o IB, de 74,6 (±17,2). Na CIF, as alterações identificadas nos instrumentos anteriores foram registradas em 46 categorias, sendo a maior parte no componente "Funções do Corpo", seguido de "Atividades e Participação". Encontrou-se uma concordância interavaliador de 0,87 para o IQSP (substancial), de 0,44 para o MEEM (moderada) e de 0,39 para o IB (justa). **Conclusões:** Os resultados indicam que as concordâncias de cada instrumento foram muito diferentes, sugerindo a necessidade de maior utilização desses instrumentos na prática fisioterapêutica, a fim de otimizar a formulação e padronização do diagnóstico fisioterapêutico.

Palavras-chave: classificação internacional de funcionalidade; incapacidade e saúde; acidente vascular encefálico; sono; cognição; fisioterapia.

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Introduction

Stroke is a pathology that leads to alterations in consciousness level and functioning, somatosensory dysfunctions, motor deficits and cognitive, language and sleep disorders[1-3]. Stroke rehabilitation programs are undergoing a paradigm shift, redefining recovery in broader terms by recognizing social, psychological and environmental factors as contributors to health and quality of life[4]. Diagnosis is becoming increasingly based on the International Classification of Functioning, Disability and Health (ICF), whose objective is to record and organize health information. This classification provides standardized language that allows comparison of data between countries[4-6].

The ICF defines health components in two basic lists. The first involves two components: (1) Functions (*b*) and Body Structure (s) and (2) Activities and Participation (*d*). The second involves Contextual Factors, including Environmental Factors (*e*) and Personal Factors[4,5]. In the ICF, the classification components are identified with a numeric code that begins with the chapter number (one digit), followed by a second level (two digits) and a third and a fourth level (one digit each)[5].

Different core sets have been tested regarding validity and reliability[7-12]. A core set refers to a list of ICF categories that includes the fewest possible items for practicality's sake but enough to be sufficiently comprehensible and effective for a multidisciplinary investigation of a series of patient functionality problems[7]. For stroke, the core set comprises a group of 130 categories in the second classification level[8].

A number of studies have promoted a systematic association of specific domains of clinical assessment tools with corresponding ICF categories to facilitate the standardization of rehabilitation diagnosis[10,13-15]. One study showed that the ICF includes most of the items found in the Stroke Impact Scale (SIS-16) for measuring functional status[16]. It has also been verified that the ICF is associated with the comprehensive Early Physical Functioning (EPF) instrument, which may significantly aid the planning and evaluation of early interventions[17]. Another previous study verified that the ICF categories plus qualifiers could detect changes in the functional profile of stroke patients in a rehabilitation program[18]. Moreover, the ICF has been considered a useful instrument for selecting clinical measures related to fall prediction in people with stroke[19].

The above-mentioned studies notwithstanding, there is still a great need for investigations into an association of the ICF with other assessment tools as a possible influence on physical therapy for people with stroke, especially regarding sleep, cognition and functional independence[20]. Such interaction is of fundamental importance for formulating more uniform physical therapy diagnosis as well as for guiding the development of more efficient intervention strategies. Thus, the objective of the present study was to compare instruments of sleep, cognition and functioning evaluation with their respective ICF core set in patients with stroke.

Methods

Sample

Twelve Physical Therapy Services clients (six women) with a mean age of 55±6 years old participated in this study. Each had suffered an ischemic stroke and were in the chronic stage with a recovery time from seven to 36 months. Their mean years of education were 7±3. Individuals with a previous or current history of psychiatric disorders, users of sedatives, antidepressants or neuroleptics and those presenting severe aphasia or dementia were excluded.

Procedures

The study was approved by the Research Ethics Committee of the Universidade Federal do Rio Grande o Norte (UFRN), Natal, RN, Brazil, protocol no. 193/06, and followed the ethical standards of Resolution 196/96 of the National Council of Health. The participants were informed about the research procedures and signed the informed consent form.

The Pittsburgh Sleep Quality Index (PSQI) was used for sleep evaluation, aiming to identify and quantify the subjective quality of sleep, latency (time necessary to fall asleep), duration (hours of sleep per night), efficiency (total sleep time divided by time in bed), sleep disturbances (e.g., waking up in the middle of night), use of sleep medication and dysfunction during the day (difficulty staying awake). Scores higher than 5 imply poor sleep quality[21]. Regarding the cognitive evaluation, the Mini Mental State Examination (MMSE) was used, which rates cognitive performance on a scale from 0 to 30 points, with a score below 24 indicating cognitive deficit[22]. The Barthel Index (BI) was applied to evaluate the patients' functional status, measuring the degree of dependence with respect to mobility, hygiene, feeding, etc., with a score ranging from 0 to 100[23].

After applying these instruments, two independent examiners who were both from the area of Neurological Physical Therapy, experts in stroke rehabilitation and familiar with the ICF core set, carried out the comparison process. The examiners separately recorded all ICF core set codes that characterized each of the questions in the studied instruments (PSQI, MMSE and BI) as well as the characteristics that best represented the

answers to each question, in agreement with the protocol established in the literature[24-26] for identifying the concepts and objectives of instruments. No third examiner's participation was necessary because there were no conflicts or questions when comparing the instruments with the ICF.

Data analysis

SPSS 15.0 (*Statistical Package for the Social the Science*) was used for the data analysis. Descriptive analysis was carried out to determine the sample's characteristics regarding sleep, cognitive and functional alterations, as well as to verify the number and type of ICF categories recorded for each instrument. Fisher's exact test and the chi-square test were used to compare the recorded ICF categories with the items in the instruments. The agreement between the two examiners regarding the categories was analyzed using the Kappa Index, and included the following outcomes: values <0.0 – poor agreement; 0.0 to 0.20 – mild agreement; 0.21 to 0.40 – fair agreement; 0.41 to 0.60 – moderate agreement; 0.61 to 0.80 – substantial agreement; 0.81 to 1 - almost perfect agreement[27].

Results

There was a mean score of 5.0 (±3.0) on the PSQI analysis, a mean of 22.5 (±3.4) on the MMSE (cognitive evaluation), and a mean of 74.6 (±17.2) on the BI (degree of functional independence).

There were 47 unique ICF core set categories described by the two examiners, which is 36.1% of the 130 total categories for stroke. These were limited to the "Body Functions" and "Activities and Participation" components, i.e., there were no items related to the "Environmental Factors" or "Body Structure" components. Of the 47 recorded categories, 22 (46.8%) corresponded to categories in the Body Functions component and 25 (53.2%) to those in the Activities and Participation component.

In the PSQI, the examiners recorded only two ICF categories, both of which refer to the Body Functions component in chapter 1: Mental functions (Table 1). The category *b110* (consciousness functions) was mentioned only by examiner 1, so statistical analysis for frequency comparison could not be carried out.

Of the 26 reported categories for the MMSE, 15 (57.7%) referred to the Body Functions component and 11 (42.3%) to the Activities and Participation component (Table 2). When comparing the MMSE codes with Fisher's exact test, there was no significant interexaminer difference regarding the frequency of categories related to the Body Functions and Activities and Participation components (p=0.629). The MMSE items involving the largest number of categories were Language and Construction Capacity. Together, these items were related to 23 ICF categories, with seven recorded by both examiners: *b117* (intellectual functions), *b156* (perceptual functions), *b164* (higher-level cognitive functions), *b167* (mental functions of language), *b210* (seeing functions), *d170* (writing) and *d210* (undertaking a single task) (Table 2).

A total of 19 categories were assigned to the BI, five (26.3%) in Body Functions and 14 (73.7%) in Activities and Participation. Only questions relating to bathing, personal hygiene and dressing were not related to ICF codes belonging to the Body Functions component (Table 3). Five ICF categories were attributed to the personal hygiene item, although examiner 1 recorded two categories and examiner 2 indicated three different categories. On the other hand, for the intestines item the examiners were unanimous in the two assigned categories. In spite of these results, there was no significant difference in the frequency of categories attributed to the two components or between the examiners (p=0.902).

Regarding the differences between MMSE and BI, 75% of the categories attributed to the MMSE were from the Body Functions component, with 25% from Activities and Participation. However, on the BI, 56% were from the Activities and Participation component and 44% were from Body Functions; there was a significant difference between these frequencies according to the chi-square test (p=0.002).

Table 1. Categories included in the ICF Core Set for Stroke selected to each components of the Pittsburgh Sleep Quality Index (PSQI), according to both examiners.

PSQI	b	d	Description	Examiner 1	Examiner 2
Subjective Sleep Quality	b134	-	Sleep Functions	X	X
Sleep Latency	b134	-	Sleep Functions	X	X
Sleep Duration	b134	-	Sleep Functions	X	X
Habitual Sleep Efficiency	b134	-	Sleep Functions	X	X
Sleep Disturbances	b134	-	Sleep Functions	X	X
Use of Sleep Medications	b110	-	Consciousness Functions	X	-
	b134	-	Sleep Functions	X	X
Daytime Dysfunction	b134	-	Sleep Functions	X	X

*b and d correspond to the components from ICF: "Body Functions" and "Activities and Participation", respectively.

Table 2. Categories of the ICF Core Set for Stroke selected to each component of the Mini Mental State Examination (MMSE), according to both examiners.

MMSE	b	d	Description	Examiner 1	Examiner 2
Orientation in Espace	b114		Orientation Functions	X	X
	b140		Attention Functions	X	X
	b156		Perceptual Functions	-	X
	b180		Experience of self and time functions	-	X
		d310	Communicating with – receiving – spoken messages	-	X
Orientation in Time	b114		Orientation Functions	X	X
	b140		Attention Functions	X	X
	b180		Experience of self and time functions	X	X
		d160	Focusing attention	-	X
		d310	Communicating with – receiving – spoken messages	-	X
Memory Registration	b144		Memory Functions	X	X
	b164		Higher-level cognitive functions	-	X
		d115	Listening	-	X
		d160	Focusing attention	X	X
Attention and concentration	b117		Intellectual functions	-	X
	b140		Attention Functions	X	X
	b164		Higher-level cognitive functions	-	X
		d160	Focusing attention	X	X
		d172	Calculating	X	X
Memory Recall	b144		Memory Functions	X	X
	b164		Higher-level cognitive functions	-	X
		d160	Focusing attention	-	X
		d310	Communicating with – receiving – spoken messages	-	X
Language	b140		Attention Functions	-	X
	b144		Memory Functions	-	X
	b164		Higher-level cognitive functions	X	X
	b167		Mental functions of language	X	X
	b210		Seeing functions	X	X
	b310		Voice functions	X	-
	b320		Articulation functions	X	-
		d115	Listening	X	-
		d160	Focusing attention	-	X
		d166	Reading	X	-
		d170	Writing	X	X
		d175	Solving problems	-	X
		d210	Undertaking a single task	X	X
		d345	Writing messages	-	X
		d440	Fine hand use	X	-
Construction	b117		Intellectual functions	X	X
	b140		Attention Functions	-	X
	b156		Perceptual Functions	X	X
	b164		Higher-level cognitive functions	X	X
	b176		Mental function of sequencing complex movements	-	X
	b210		Seeing functions	X	X
	b710		Mobility of joint functions	-	X
	b730		Muscle power functions	-	X
	b760		Control of voluntary movement functions	-	X
		d160	Focusing attention	-	X
		d175	Solving problems	-	X
		d210	Undertaking a single task	X	-
		d445	Hand and arm use	-	X

*b and d correspond to the components from ICF: "Body Functions" e "Activities and Participation", respectively.

Table 3. Categories of the ICF Core Set for Stroke selected to each component of the Barthel Index (BI), according to both examiners.

BI	b	d	Description	Examiner 1	Examiner 2
Feeding	b510		Ingestion functions	-	X
	b760		Control of voluntary movement functions	-	X
		d230	Carrying out daily routine	-	X
		d445	Hand and arm use	-	X
		d550	Eating	X	X
Bathing		d230	Carrying out daily routine	-	X
		d455	Moving around	-	X
		d510	Washing oneself	X	X
		d520	Caring for body parts	-	X
Grooming		d230	Carrying out daily routine	-	X
		d445	Hand and arm use	-	X
		d510	Washing oneself	X	-
		d520	Caring for body parts	X	-
		d540	Dressing	-	X
Dressing		d230	Carrying out daily routine	-	X
		d540	Dressing	X	X
Bowels	b525		Defecation functions	X	X
		d530	Toileting	X	X
Bladder	b620		Urination functions	X	X
		d520	Caring for body parts	-	X
		d530	Toileting	X	X
		d570	Looking after one's health	-	X
Toilet use	b760		Control of voluntary movement functions	X	X
		d410	Changing basic body position	X	-
		d420	Transferring oneself	-	X
		d430	Lifting and carrying objects	-	X
		d520	Caring for body parts	-	X
		d530	Toileting	-	X
Transfers (bed-chair)	b760		Control of voluntary movement functions	X	X
		d410	Changing basic body position	X	-
		d420	Transferring oneself	X	X
		d455	Moving around	-	X
Mobility (on level surfaces)	b770		Gait pattern functions	-	X
		d450	Walking	X	X
		d465	Moving around using equipment	-	X
Stairs	b770		Gait pattern functions	-	X
		d455	Moving around	X	X

According to the Kappa test analysis, the inte-rater agreement index for comparison of the ICF core set categories for stroke and the questions of the evaluated instruments was 0.87 for the PSQI (substantial agreement), 0.44 for the MMSE (moderate agreement) and 0.39 for the BI (fair agreement).

Discussion

The present study is a precursor for considering three health-related domains (sleep, cognition and function) in stroke patients and to relate them to the ICF core set for stroke.

Through the descriptive analysis, alterations in the patients' sleep quality were verified, which corroborates the commonly-reported reduction in sleep efficiency, increased sleepiness and increased sleep interruptions in stroke[3].

A cognitive deficit was also observed among the patients in our study. Aston-Jones[28] observed that sleep disturbances may lead to several cognitive deficits, including decreased attention-concentration, spatial and temporal orientation, memory performance and impaired psychological and social functioning.

The results of the present study also demonstrated that, on average, patients showed a moderate functional dependence, which was expected due to the stroke symptoms and included movement disorders and cognitive deficits that could affect activities of daily living[18,29].

The list of codes obtained by comparing the PSQI, MMSE and BI with the ICF core set for stroke included only categories

from the Body Functions and Activities and Participation components. This result agreed with the findings of Grill et al.[30], who compared the BI with the ICF and reported that the BI included no item that could possibly be related to the components Body Structure or Environmental Factors. However, it is of fundamental importance that the ICF categories are related to each other by the components, thus corroborating the basic biopsychosocial model of health. For instance, a certain disability in the Body Functions or Structures component may be reflected in limitations in Activities or restrictions in Participation. Moreover, Environmental Factors play an important role in the functioning of patients with stroke, either as a facilitator or a barrier[5,31]. Such factors should be carefully evaluated, otherwise, the physical therapist's performance may be is limited.

Stucki et al.[32] proposed the formulation of an ICF core set for people with sleep disturbances, including the categories *b134* (sleep functions), *b152* (emotional functions), *d640* (undertaking domestic tasks) and *d850* (paid work). In the present study, however, only the first category (*b134*) was selected. This occurred because the PSQI components refer exclusively to aspects of sleep quality, unlike the core set for sleep disorders. Furthermore, it is possible that the PSQI components correlate better with the domains in the third level of the category in question. For instance, the PSQI component "subjective sleep quality" matches the ICF domain *b1343* (sleep quality), the component "sleep latency" is equivalent to *b1341* (sleep onset) and the component "sleep duration" is linked to *b1340* (amount of sleep).

The comparison process between the instruments and the ICF was evaluated by calculating the Kappa coefficient, which varied from fair to substantial agreement depending on the classification adopted. This result should effect the recommendation of such evaluation instruments when forming physical therapy diagnoses in conjunction with the ICF. A higher index was observed for the PSQI questionnaire than for the MMSE or the BI. Such a finding may be related to the fact that the ICF has more specific categories in some areas than in others. The observed results also demonstrate the importance of utilizing the ICF during physical therapy with stroke patients.

The present study has some limitations: since mapping the items of the measurement instruments according to the ICF involves extensive classification, this study was limited to the categories of the core set for stroke in the second classification item and did not cover the common qualifiers. Another limitation was the small sample size, which indicates that the results are more representative of the evaluated patients. Moreover, due to type of patients served at the Physical Therapy Service where the study was carried out, chronic patients with more than six months of recovery time were included, which means that there was a wide range of patients with different recovery times. The lack of previous training in applying the ICF core set and relying instead only on the examiners' prior knowledge was a further limitation. In spite of these limitations, however, the study succeeded in demonstrated agreement between the sleep, cognition and functioning evaluation instruments, pursuant to its objective.

The literature has been gradually providing examples of how the ICF may be used in practice, although such studies are still essentially descriptive. Professionals should familiarize themselves with the new language, structure and classification system provided by the ICF in order to consider its clinical applicability. Physical therapists will have to import these factors to professional models, definitions and existing measurement instruments[33].

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