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Functional Capacity of Geriatric Patients Hospitalized in Neurology Departments and their Physical and Clinimetric Determinants

Wydolność funkcjonalna pacjentów geriatrycznych hospitalizowanych na oddziałach neurologii a ich przedmiotowe i klinimetryczne uwarunkowania

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Abstract

Introduction. The functional capacity of patients hospitalized in neurological wards is determined by multifactorial factors. Accompanying illnesses, independent mobility, and the patient's mental, social, and spiritual state are just a few variables that affect functional performance.
Aim. To analyze the relationship between the results of physical examination elements on the functional capacity of patients hospitalized in Lublin's neurological wards.
Material and Methods. The study was based on quantitative (diagnostic survey) as well as qualitative (individual focus interview) methods. The research tools were the Barthel Scale, the ADL Scale (Katz), and the author's interview questionnaire. During the study, a subject examination of each respondent was also conducted according to a standardized scheme. Statistical analyses were conducted using SPSS Statistica and Microsoft Excel 2020 software.
Results. Patients hospitalized in neurology departments, unable to cope with activities of daily living are characterized by moderately severe disability. Circulatory and respiratory parameters, as well as accompanying neurological symptoms, do not affect the functional capacity of patients. Pain complaints, the intensity of pain and localization impinge on the extent of functional capacity.
Conclusions. Functional fitness depends on the intensity of pain and its location. The Barthel Scale and the ADL Scale correlate with the level of functional capacity, especially in terms of mobility. **(JNNN 2023;12(3):120–126)**
Key Words: elderly, functional capacity, geriatrics, neurological ward

Streszczenie

Wstęp. Wydolność funkcjonalna pacjentów hospitalizowanych na oddziałach neurologicznych uwarunkowana jest wieloczynnikowo. Towarzyszące choroby, samodzielna mobilność, stan psychiczny, społeczny i duchowych chorego to tylko nieliczne z wielu zmiennych wpływających na sprawność funkcjonalną.
Cel. Analiza zależności wyników elementów badania fizykalnego na wydolność funkcjonalną pacjentów hospitalizowanych na lubelskich oddziałach neurologicznych.

Materiał i metody. Pracę oparto o metody ilościowe (sondaż diagnostyczny) jak i jakościowe (indywidualny wywiad zogniskowany). Narzędzia badawcze stanowiły Skala Barthel, Skala ADL (Katza) oraz autorski kwestionariusz wywiadu. Podczas badań przeprowadzono również badanie podmiotowe każdego respondenta według standardowego schematu. Analizy statystyczne przeprowadzono w oparciu o oprogramowanie SPSS Statistica oraz Microsoft Excel 2020.
Wyniki. Pacjenci hospitalizowani na oddziałach neurologii, nie radząc sobie z czynnościami życia codziennego charakteryzują się umiarkowanie ciężką niepełnosprawnością. Parametry krążeniowo-oddechowe, jak i towarzyszące objawy neurologiczne nie wpływają na wydolność funkcjonalną chorych. Dolegliwości bólowe, ich natężenie oraz lokalizacją rzutują na zakres sprawności.
Wnioski. Sprawność funkcjonalna uwarunkowana jest od natężeniem bólu oraz jego lokalizacją. Wynik skali Barthel oraz ADL koreluje z poziomem wydolności funkcjonalnej, szczególnie w zakresie sprawności ruchowej. **(PNN 2023; 12(3):120–126)**
Słowa kluczowe: osoby starsze, wydolność funkcjonalna, geriatria, oddział neurologiczny

Introduction

The nervous system is one of the most important systems of the body, because the reactions and life processes depend on it. The brain develops during the first 2 decades of life, but like the rest of the body, it is subject to the aging process. It is a continuous, endogenous and multi-track process leading to a decrease in human motor, sensory and cognitive functions [1]. The progressive loss of neurons over time results in a decrease in brain mass. Through studies that consisted in measuring the brain parenchyma, a reduction in the volume of gray matter by 15–25% was shown in older people. The white matter remained unchanged [1,2].

The geriatric giants (geriatric syndromes) are also characteristic of elderly patients. These are chronic disorders that ultimately cause the patient's functional failure. These include mobility and falls, vision and hearing impairment, depression and dementia, incontinence, and malnutrition, among others. All major geriatric syndromes have multiple causes. They are directly caused by diseases (e.g., those of the nervous system) or polypharmacy. It is important to note that great geriatric syndromes form a cause-and-effect network. This means that the occurrence of one of them in a patient predisposes to the development of the next ones [3,4].

The functional capacity of an elderly person depends on many endo — and exogenous factors. Geriatricians have divided them into health factors (organ and systemic diseases) and socio-demographic factors (age, gender, place of residence, previous social roles). Many of the aforementioned factors (e.g., comorbidities) can lead to a decrease in functional capacity and, consequently, in a person's quality of life, introducing limitations to it, and causing impairment in the performance of basic activities of daily living [5]. Functional fitness is also affected by executive and motor functions. Striving for the intended goal, the ability to plan, and solving everyday problems are important determinants of functional status [6].

The aim of this study is to evaluate the effect of selected elements of physical examination on the functional capacity of geriatric patients hospitalized in neurology departments.

Material and Methods

The study group consisted of 82 patients of neurology departments of hospitals located in the city of Lublin. Of these, 49 were women and 32 were men. One respondent did not answer the question about gender. The average age of the subjects was 72.60 years with a standard deviation of SD=6.55. The youngest patient was 64 years old, the oldest 90 years old. Half of the patients were at least 71.50 years old, and the other half were at most 71.50 years old. The skewness coefficient indicates the right-sided asymmetry of the obtained distribution (SKEW=0.888) — the quantitative advantage of relatively younger people over relatively older ones.

The execution process of the research data set, in the conceptual phase of the research process was divided into two stages. The first was based on the method of individual focus interview, preceded by an assessment of each respondent using two standardized scales — Bartel Scale, ADL Scale (Katz). The second, on the other hand, consisted of a subjective examination of the patient according to a standardized scheme: general condition, a detailed examination of anatomical systems and topographical areas, with particular attention to circulatory and respiratory parameters, musculoskeletal system neurological symptoms pain [7].

The interview was structured and included questions about respondents' demographics (age, gender), history of previous comorbidities, concomitant symptoms (with a focus on neurological symptoms), motor system disorders, and pain.

The SPSS Statistics statistical package and Microsoft Excel 2020 software were the primary tools for statistical analysis. A level of $\alpha<0.05$ was considered statistically significant. Due to disorders of normality of the distribution of the analyzed variables, relationships

between nominal and quantitative variables were examined using the Kruskal–Wallis test. The description of the effect size was carried out using the eta — square coefficient. Graphical visualization of the data was carried out using histograms.

Results

The first stage of statistical analysis considered the data collected from the research tools used.

The study group scored an average of 67.74 (95% PU (60.01, 75.48) points on the Barthel scale, with a standard deviation of 35.12 points. On average, this score indicates moderately severe disability of the patients (Figure 1). The Shapiro–Wilk test showed statistically significant differences in the obtained score distribution from the normal distribution (S–W=0.815; p<0.001).

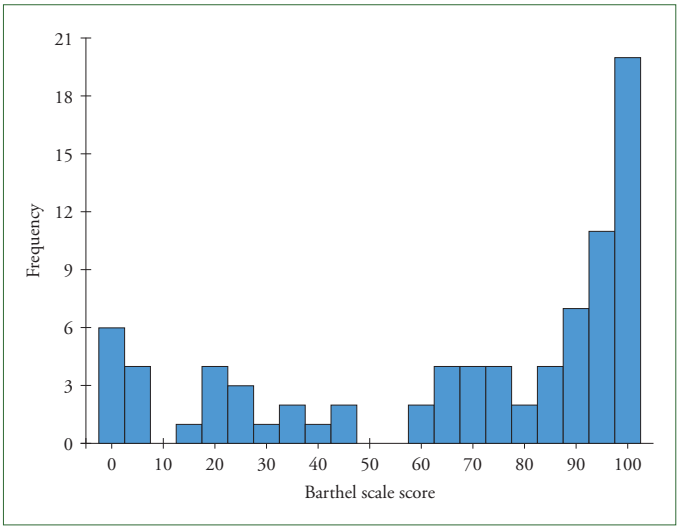

Figure 1. Distribution of scores obtained by the subjects on the Barthel scale

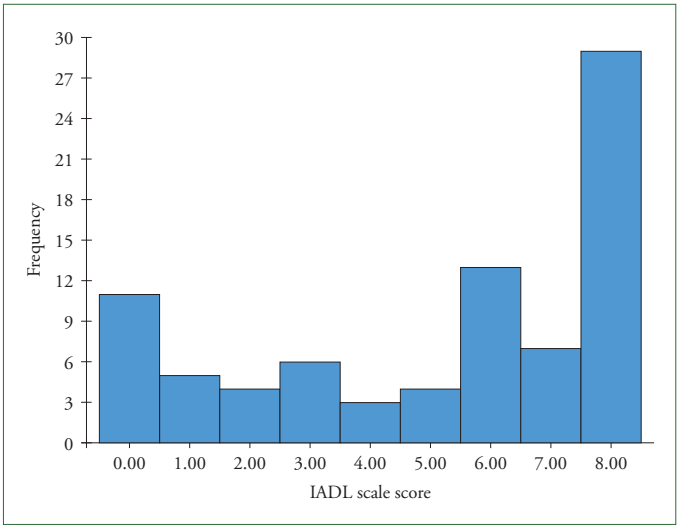

Figure 2. Distribution of scores obtained by the subjects on the IADL scale

The overall score on the IADL scale averaged among the respondents was 5.15 (95% PU (4.49, 5.80) points, with a standard deviation of 2.98. This score meant that on average they could cope with 5 activities out of 8 assessed by the said scale (Figure 2). It should be noted that the median response of the respondents was 6 points, which means that half of the respondents coped with at least 6 daily activities, while half coped with at most 6. The Shapiro–Wilk test conducted showed statistically significant differences in the obtained distribution of scores from the normal distribution (S–W=0.824; p<0.001).

A series of Kruskal–Wallis test were used to verify the relationship between the subjects' cardiorespiratory parameters and their functional capacity. Their results are shown in Table 1. The analyses performed showed no statistically significant relationships between the parameters of heart rate (frequency, regularity, tension) and respiration (frequency, regularity) and the functional capacity of the patients.

A series of Kruskal–Wallis test were used to verify the relationship between mobility limitations and movement dysfunctions and their functional capacity. Their results are shown in Table 2.

In the interview, the question about mobility performance was not answered by 2 subjects, the question about deficits was answered by 14, and the question about musculoskeletal dysfunctions was answered by 3. Symptoms of dysfunction were reported by 31 patients, symptoms of muscle tension by 39, and the use of assistive equipment by 37 subjects.

The analyses showed very strong correlations between Barthel scale scores and mobility (η^2= 0.662), deficits in mobility (η^2=0.426), level of mobility (η^2=0.533), and musculoskeletal dysfunctions (η^2=0.325). There were also statistically significant, strong correlations between the IADL scale score and motor fitness (η^2=0.532), motor deficits (η^2= 0.354), mobility (η^2=0.384), and musculoskeletal dysfunctions (η^2=0.254). The subjects had a higher level of functional capacity if their mobility was normal, there were no motor deficits, mobility was at a normal level, and they did not show musculoskeletal dysfunctions on physical examination.

There were no correlations between functional capacity and symptoms of musculoskeletal dysfunction, muscle tension, and the use of various types of assistive equipment.

To verify the relationship between the subjects' neurological symptoms and their functional capacity, a series of Kruskal–Wallis test were used. Their results are shown in Table 3. The analyses conducted showed no statistically significant correlations between the subjects' functional capacity and the

Table 1. Cardiorespiratory parameters versus functional capacity of subjects

Variable	Grade	N	Barthel Score		Kruskal–Wallis test		IADL Score		Kruskal–Wallis test	
			$\bar{x}$	SD	χ^2	p	$\bar{x}$	SD	χ^2	p
Heart rate-measured	No	2	57.50	53.03	0.000	0.000	4.50	4.95	0.000	0.000
	Yes	80	68.00	35.10	0.000	0.000	5.16	2.96	0.000	0.000
Pulse-tension	Normal	73	69.79	34.51	0.000	0.000	5.32	2.95	0.000	0.000
	Filamentous	6	45.00	42.66	0.000	0.000	2.50	2.81	0.000	0.000
	Wirey	1	45.00	–	0.000	0.000	5.00	–	0.000	0.000
Respiratory-moderate	No	1	25.00	–	0.000	0.000	1.00	–	0.000	0.000
	Yes	81	68.27	35.09	0.000	0.000	5.20	2.96	0.000	0.000

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; χ^2 — chi-square test; p — test probability

Table 2. Mobility limitations and movement dysfunctions vs. functional capacity of subjects

Variable	Grade	N	Barthel Score		Kruskal–Wallis test		IADL Score		Kruskal–Wallis test	
			$\bar{x}$	SD	χ^2	p	$\bar{x}$	SD	χ^2	p
Motor skills	Incorrect	39	40.64	31.85	52.673	0.000	3.03	2.70	42.522	0.000
	Correct	41	93.90	8.91	52.673	0.000	7.34	0.96	42.522	0.000
Deficits	Absent	32	88.13	20.90	29.085	0.000	7.00	1.65	24.345	0.000
	Present	36	43.89	35.74	29.085	0.000	3.11	2.96	24.345	0.000
Mobility	Disordered	40	43.38	34.16	43.646	0.000	3.18	2.85	31.708	0.000
	Normal	42	90.95	14.37	43.646	0.000	7.02	1.54	31.708	0.000
Mobility dysfunction	No	35	88.57	17.80	26.056	0.000	6.91	1.48	20.547	0.000
	Yes	44	50.34	37.34	26.056	0.000	3.64	3.11	20.547	0.000
Symptom dysfunction	Palsy	5	42.00	38.50	0.026	0.871	2.20	1.92	0.061	0.805
	Paresis	26	41.73	32.71	0.026	0.871	2.85	2.84	0.061	0.805
Muscle tension	Lowered	14	46.07	36.86	1.291	0.524	3.07	2.30	1.011	0.603
	Increased	6	55.83	43.75	1.291	0.524	4.50	3.67	1.011	0.603
	Contracture	19	60.79	34.93	1.291	0.524	4.21	3.44	1.011	0.603
Auxiliary equipment	Wheelchair	11	75.00	32.86	2.267	0.519	5.73	2.83	3.244	0.355
	Crutches	15	56.33	37.10	2.267	0.519	3.67	3.18	3.244	0.355
	Balcony	4	71.25	13.15	2.267	0.519	4.25	1.26	3.244	0.355
	Other	7	55.71	40.36	2.267	0.519	4.14	3.29	3.244	0.355

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; χ^2 — chi-square test; p — test probability

presence of neurological symptoms, as well as between specific neurological symptoms and Barthel and IADL scale scores.

During the interviews, two subjects did not answer the question about experiencing pain, 3 subjects answered the question about the nature of pain, 2 subjects answered the question about the severity of pain, and 1 subject answered the question about the location of the pain.

To evaluate the relationship between pain and its location and the functional capacity of the subjects, a series of Kruskal–Wallis test were used. Their results are shown in Table 4. The analyses conducted showed statistically significant correlations between functional capacity and the subjects' perception of pain and its location. Patients declaring that they felt pain were characterized by moderately higher functional capacity on both the Barthel (η^2=0.075) and IADL (η^2=0.078) scales. Post hoc tests showed that respondents who localized experienced pain in the back area were characterized by higher functional capacity than patients who localized pain in the upper or lower extremities. Respondents who localized pain mainly in the area of the head were characterized by a higher functional capacity than those who localized pain in the upper limbs. There were no statistically significant differences between the other study groups.

Table 3. Neurological symptoms vs. functional capacity of subjects

Variable	Grade	N	Barthel Score		Kruskal–Wallis test		IADL Score		Kruskal–Wallis test	
			$\bar{x}$	SD	χ^2	p	$\bar{x}$	SD	χ^2	p
Neurological symptoms	Lack of	21	64.52	41.53	0.031	0.860	5.05	3.32	0.023	0.879
	Present	61	68.85	33.06	0.031	0.860	5.18	2.88	0.023	0.879
Neurological symptoms	Convulsions	4	73.75	31.98	6.258	0.282	5.50	2.38	5.940	0.312
	Delusions	9	79.44	25.43	6.258	0.282	4.67	2.83	5.940	0.312
	Dizziness	29	75.86	26.73	6.258	0.282	6.14	2.34	5.940	0.312
	Sensory disturbances	12	52.50	38.82	6.258	0.282	4.00	3.28	5.940	0.312
	Disturbances of balance	3	33.33	49.07	6.258	0.282	2.67	4.62	5.940	0.312
	Speech disorders	4	65.00	46.01	6.258	0.282	4.50	3.42	5.940	0.312

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; χ^2 — chi-square test; p — test probability

Table 4. Experience of pain and its location vs. functional capacity of the subjects

Variable	Grade	N	Barthel Score		Kruskal–Wallis test		IADL Score		Kruskal–Wallis test	
			$\bar{x}$	SD	χ^2	p	$\bar{x}$	SD	χ^2	p
Pain	No	18	46.11	38.86	0.000	0.000	3.44	3.11	0.000	0.000
	Yes	62	73.79	32.25	0.000	0.000	5.65	2.82	0.000	0.000
Pain-character	Dull	11	70.00	34.93	0.000	0.000	5.36	2.84	0.000	0.000
	Sensory disturbances	2	65.00	42.43	0.000	0.000	5.00	4.24	0.000	0.000
	Balance disorders	1	100.00	–	0.000	0.000	8.00	–	0.000	0.000
	Speech disorders	2	97.50	3.54	0.000	0.000	7.50	0.71	0.000	0.000
	Other	45	74.44	32.11	0.000	0.000	5.73	2.77	0.000	0.000
Pain-strength	2	1	100.00	–	0.000	0.000	8.00	–	0.000	0.000
	3	3	66.67	41.63	0.000	0.000	5.00	1.73	0.000	0.000
	4	2	82.50	24.75	0.000	0.000	7.00	1.41	0.000	0.000
	5	2	100.00	0.00	0.000	0.000	8.00	0.00	0.000	0.000
	6	6	67.50	38.18	0.000	0.000	5.83	3.37	0.000	0.000
	7	4	78.75	32.76	0.000	0.000	5.25	3.59	0.000	0.000
	8	4	66.25	42.11	0.000	0.000	4.75	3.40	0.000	0.000
	At night	2	85.00	21.21	0.000	0.000	7.00	1.41	0.000	0.000
	After exercise	16	80.31	27.84	0.000	0.000	6.13	2.45	0.000	0.000
	Other	22	68.18	36.24	0.000	0.000	5.00	3.18	0.000	0.000
Pain-location	Head	22	74.32	33.68	0.000	0.000	5.77	2.94	0.000	0.000
	Abdomen	1	90.00	–	0.000	0.000	7.00	–	0.000	0.000
	Back	23	81.96	26.57	0.000	0.000	6.65	2.06	0.000	0.000
	Upper limbs	4	30.00	30.82	0.000	0.000	1.75	2.22	0.000	0.000
	Lower limbs	11	76.82	24.93	0.000	0.000	5.09	2.70	0.000	0.000
	Other	2	50.00	70.71	0.000	0.000	4.00	5.66	0.000	0.000

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; χ^2 — chi-square test; p — test probability

Discussion

The vast majority of available studies on the elderly address the subject of the impact of age on the reduction of human functioning efficiency. In recent years, the interest of researchers has also focused on other variables affecting the functional capacity of seniors.

The study conducted by Bartoszek and Przychodzka, which included patients residing in neurological wards, indicates a high level of diversity in the degrees of respondents' self-care capacity. Analyses of the data highlight the relationship of an individual's functional capacity with coexisting disease entities, mobility, mobility, as well as pain and location. Thus, the conclusions obtained by the authors confirm our own studies [8,9].

Staying in a hospital unit plays an important role in the progress of the dynamics of disability. On the one hand, due to the course of the underlying disease, which was the reason for hospitalization, and on the other hand, the risks resulting from hospital stay, which include spending most of the time in bed, reduced calories consumed, higher stress levels, anxiety, pharmacotherapy and others. The above-mentioned variables affect the mobility and functional capacity of the patient [10,11]. A study by Menezes et al. shows that 52.5% of elderly people were characterized by worse functional capacity at discharge from a hospital unit, compared to the admission period [12,13]. Decreased functional status carries serious long-term consequences in the form of longer hospital stays, reduced quality of life, and increased risk of disability [14]. The oldest patients are a worse prognosis group, mainly due to experiencing new dysfunctions during hospitalization, as well as a low likelihood of recovery [15]. The author's study presented in this paper confirmed the described relationships: respondents had a higher level of functional capacity, in the case of preserved mobility. This proves the importance of activating hospitalized patients, early improvement, and rehabilitation.

Ferrucci et al. in their study indicate that accompanying neurological symptoms are independent correlates of the risk of falls and mobility limitations [16]. Our own study did not prove a correlation between accompanying neurological symptoms and the level of performance of patients hospitalized in neurology departments. The reasons for this are probably the size of the study group and its low diversity.

Recent research data show that low levels of patient functional capacity imply deterioration of cognitive and executive functions associated with aging. Positive associations of parameters describing functional fitness with higher cognitive and executive function potential and better psychosocial well-being in the elderly have also been demonstrated. The above-described relationships draw attention to the importance of the need to maintain and even increase the level of functional capacity of patients during hospitalization [17].

Another important issue related to the subject of the study is the impact of pain perception and its location on the patient's functional capacity. Elderly patients, especially those over 85, are characterized by an increased frequency of chronic pain (almost 72% of them suffer from chronic pain). In patients in neurological wards, a specific type of pain is neuropathic pain, associated with the course of an underlying disease such as neuropathy or ischemic stroke [18]. Many available studies describe correlations between pain intensity and the functional capacity of patients [19–21]. Studies by Puto, Rzepka, and Muszalik have shown a negative impact of pain intensity, the occurrence of pain during walking, exercise, and other activities of daily living on an individual's functional capacity. Moreover, chronic pain with concomitant deficits in self-care functionality resulted in gradual social withdrawal and deterioration of the patient's psychological state [22].

The location of pain also affects the level of overall functional capacity of the patient. Pain, spasticity or stiffness in the joints of the upper limbs contribute to the loss of the ability to independently dress, eat, wash, and in the lower limbs lead to instability, problems with independent mobility, and thus an increased risk of falls [23,24]. Therefore, taking into account the results of our own research, pain located in the limbs contributes to the deepening of disability, and thus to the reduction of the patient's quality of life.

Conclusions

1. Patients hospitalized in neurological wards are usually unable to cope with activities of daily living, thus requiring third-party assistance, which indicates moderately severe disability.
2. Functional performance deficits are not dependent on the results of measurements of cardiorespiratory parameters and the presence of neurological symptoms.
3. Mobility limitations and the location of pain complaints correlate with the patient's level of functional capacity.

Implications for Nursing Practice

The obtained results of the study suggest that a full and accurate physical examination and assessment of the existing functional capacity of geriatric patients hospitalized in neurology departments is the basis for professional, evidence-based nursing care, tailored to the needs of patients. The application used is part of the

Comprehensive Geriatric Assessment, nowadays necessary to determine the health and functional problems of a senior. It is used e.g. in patients after a stroke, in dementia syndromes, as well as in patients with diabetes or cardiovascular diseases.

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