



Value of using the ICF Core Set for patients with Musculoskeletal Conditions in Outpatient Rehabilitation Facilities in South-Eastern Poland

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Abstract

Introduction and Objective. A biopsychosocial model for assessing the functioning of patients with musculoskeletal diseases is essential for planning health services for this patient group. For this purpose, the International Classification of Functioning, Disability and Health (ICF) and the 'core sets' created on its basis are used. The aim of this study was to validate and evaluate the effectiveness of the application of the ICF classification in the assessment of patients with musculoskeletal problems in outpatient rehabilitation facilities.

Materials and Methods. A group of 528 people of working age with musculoskeletal conditions receiving outpatient rehabilitation in south-eastern Poland were included in the study. The ICF Core Set for Patients with Musculoskeletal Conditions was used in the study. The WHODAS 2.0 questionnaire was used to assess disability and the WHOQOL-BREF questionnaire was used to assess quality of life.

Results. In testing for significance of change at the level of ICF Core Set for Patients with Musculoskeletal Conditions using the test-retest method, no significant differences were found for any category. There was a statistically significant correlation between the WHODAS 2.0 questionnaire total score and ICF categories, as well as a statistically significant negative correlation between quality of life assessment and ICF codes for function, activity and participation and environmental factors.

Conclusions. The study confirms the effectiveness of the use and feasibility of implementing the ICF Core Set for Patients with Musculoskeletal Conditions in outpatient rehabilitation facilities in south-eastern Poland. The ICF Core Set evaluated is compatible with commonly used questionnaires for the clinical assessment of health status and quality of life.

Key words

International Classification of Functioning, Disability and Health, Quality of life, Musculoskeletal Diseases, Disability Evaluation

INTRODUCTION

The International Classification of Functioning, Disability and Health (ICF) was proposed by the World Health Organization (WHO) as a global instrument used to assess health status at individual and group levels [1]. The ICF model provides a multidimensional and biopsychosocial view of the functioning of the life of an individual in a specific context, in which the interaction between all parts of the classification is important. The ICF combines 1,495 numerical categories systemised into health-related domains: human body functions and structures, and activity and participation [2]. It also describes environmental factors, taking into account the personal context that influences an individual's level of functioning, regardless of his or her health status, degree of dependency, or its cause. The main aim of the ICF is to establish a standardised language to describe health and health-related conditions [3].

Due to the breadth of ICF classifications, 'core sets' have been developed. A core set is a short list of selected ICF

categories most relevant to a particular health condition or situation. There are two types of Core Sets – comprehensive, which consist of all the most relevant ICF categories for a given health condition, and brief core sets, which are the minimum set that best describes the patient's condition [4]. To date, about 80 Core Sets have been published [5].

Musculoskeletal diseases represent a wide range of conditions experienced by 1.7 billion people. They are also the second most common cause of disability worldwide [6]. This type of ailment affects the onset of pain and physical deficits that limit patients' functional abilities, affecting their professional, social and personal lives. Musculoskeletal pathologies are also a major cause of chronic pain [7]. In Poland, musculoskeletal conditions were the second most common cause of sickness absence [8]. Expenditure related to musculoskeletal conditions in 2009 amounted to almost EUR 330 million paid in for sickness benefits, EUR 470 million were the costs related to incapacity for work, and EUR 38 million were spent on health rehabilitation. These figures highlight the fact that more and more people of working age (an average age in Poland is 46) need assistance in the form of rehabilitation for the treatment of long-term conditions [9]. A comprehensive approach to musculoskeletal

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problems focuses not only on the functional state of the patient, but also on a variety of factors: environmental, personal, psychological and social [10].

Data on functional status are essential for planning health services, social insurance policies, and public health. The implementation of Core Sets is carried out in different settings and countries. For all types of tools or instruments intended for the use in both clinical and research settings, one of the most fundamental issues is to conduct a validation process in different contexts [11]. The use of the ICF classification in clinical practice is recommended by the WHO, hence a framework for the patient assessment is needed to facilitate its implementation. Therefore, the aim of the study was to validate and evaluate the effectiveness of the application of the ICF classification in the assessment of patients with musculoskeletal problems in outpatient rehabilitation facilities, and to identify correlations between the ICF and other scales for health assessment.

MATERIALS AND METHOD

Study design. The study was cross-sectional and observational, involving 528 people aged 45–65 living in the south-eastern region of Poland. To ensure an even distribution of institutions in each region, 25 institutions in different parts of the region were selected and invited to participate in the project. After final approval, the study was implemented in 15 outpatient rehabilitation facilities.

Population. The study included a population of working-age people with diagnosed musculoskeletal conditions. Diseases classified according to ICD-10 (osteoarthritis M15-M19, rheumatoid arthritis M05-M06, spinal conditions M45–54) were the basis for referring the patient to outpatient rehabilitation. The study was conducted between October 2021 – March 2023. Consecutively admitted patients to outpatient rehabilitation with diagnosed musculoskeletal conditions were studied. The inclusion criteria for the study were as follows: age between 45–65 years, diagnosed musculoskeletal conditions according to ICD-10, normal cognitive status to perform the reliable study (Abbreviated Mental Test Score >6), informed and voluntary consent to participate in the study. The exclusion criterion were mental disorders – depression or personality disorders confirmed by a medical diagnosis.

Sample size. The size of the group was determined on the basis of statistical data on the average registered incidence (number of new patients with a given diagnosis appearing in the public health care system) of musculoskeletal conditions in the Podkarpackie Province per 100,000 inhabitants [12]. On the basis of the incidence of musculoskeletal conditions, the actual percentage of persons with a given disease was calculated in relation to the statistics of the Central Statistical Office on the number of persons in particular age groups in the Podkarpackie Province, which amounted to 446,43 [13]. Then, using a sampling calculator, the required number of people in the study was calculated which, assuming the parameters of maximum error of 4% and a confidence level of 95%, amounted to 528 people.

Data collection. Basic socio-demographic data (gender, age, body mass, height, education, professional activity) were

collected. Body mass index (BMI) was calculated as weight in kg divided by height in meters squared, and classified according to World Health Organization (WHO) categories [14]. To assess physical health, the number of chronic diseases present and the severity of pain were assessed according to the Visual Analogue Scale (VAS) pain scale [15].

ICF Assessment. The study used the ICF Research Branch Brief ICF Core Set for Patients with Musculoskeletal Conditions in post-acute care [16]. A validation of the ICF categories included in the set was performed by conducting a discussion panel consisting of health experts. Members of the discussion panel included a primary care physician, a medical rehabilitation specialist, a public health specialist, physiotherapists, an occupational therapist, a psychologist, a nurse, a social worker, and members of the Polish ICF Council. The specialists were recruited from rehabilitation facilities in Poland caring for acute and sub-acute patients with musculoskeletal disorders. All members of the discussion panel were provided with the ICF Core Set Brief for Patients with Musculoskeletal Conditions in the post-acute care developed by members of the ICF Research Branch, a list of all ICF Level 2 categories Functions and Body Structures, Activity and Participation, and Environmental Factors, as well as details of instructions for confirming categories reflecting the most significant health problems for people with musculoskeletal ailments. The task of the panel was to validate the ICF categories included in the set in Polish conditions. Consequently, the Polish version of the ICF Core Set for Patients with Musculoskeletal Conditions was slightly modified. The methodology of the panel discussion (in accordance with WHO guidelines [17]) was also based on the experience of other researchers [18, 19].

The set of codes covered a total of 33 categories, including 10 Body Functions, 14 Activities and participation, and 9 Environment Factors (Tab. 1). All codes from each category were quantitatively assessed with qualifiers using the same scale denoting the severity of the problem or the magnitude of the impairment on a scale of 0–4 (xxx.0 NO problem; xxx.1 MILD problem; xxx.2 MODERATE problem; xxx.3 SEVERE problem; xxx.4 COMPLETE problem; xxx.8 not specified and xxx.9 not applicable). For the assessment of environmental factors, qualifiers were assessed from the perspective of the interviewees in terms of both the positive aspects of the environment, i.e. facilitators and the extent of negative environmental impacts – barriers. The scale for assessing environmental factors was as follows: xxx.0 NO barriers; xxx.1 MILD barriers; xxx.2 MODERATE barriers; xxx.3 SEVERE barriers; xxx.4 COMPLETE barriers; xxx.+0 NO facilitator; xxx.+1 MILD facilitator; xxx.+2 MODERATE facilitator; xxx.+3 SUBSTANTIAL facilitator; xxx.+4 COMPLETE facilitator; xxx.8 no barrier specified; xxx.+8 unspecified facilitator and xxx.9 not applicable [2].

CLINICAL ASSESSMENT

Disability. A validated and translated questionnaire, the WHO Disability Assessment Schedule (WHODAS 2.0), was used to assess disability [20, 21]. It was developed by WHO to provide a standardised method for assessing health and disability in different communities, and developed on the basis of the ICF classification. WHODAS 2.0

Table 1. ICF Core Set for patients with musculoskeletal conditions

ICF Components	ICF Core Set for Patients with Musculoskeletal Conditions			
	WHO Brief Version		Polish Version	
	ICF Code	ICF Categories	ICF Code	ICF Categories
Body Functions	B134	Sleep functions	B134	Sleep functions
	B260	Pro-prioceptive function	B260	Pro-prioceptive function
	B280	Sensation of pain	B280	Sensation of pain
	B435	Immunological system functions	B435	Immunological system functions
	B530	Weight maintenance functions	B530	Weight maintenance functions
	B620	Urination functions	B620	Urination functions
	B730	Muscle power functions	B730	Muscle power functions
	B740	Muscle endurance functions	B740	Muscle endurance functions
	B755	Involuntary movement reaction functions	B755	Involuntary movement reaction functions
	B780	Sensations related to muscles and movement functions	B780	Sensations related to muscles and movement functions
Activities and participation	D155	Acquiring skills	D155	Acquiring skills
	D177	Making decisions	D177	Making decisions
	D230	Carrying out daily routine	D230	Carrying out daily routine
	D240	Handling stress and other psychological demands	D240	Handling stress and other psychological demands
	D410	Changing basic body position	D410	Changing basic body position
	D415	Maintaining a body position	-	-
	D430	Lifting and carrying objects	D430	Lifting and carrying objects
	D445	Hand and arm use	D445	Hand and arm use
	D450	Walking	D450	Walking
	D465	Moving around using equipment	D465	Moving around using equipment
	D510	Washing oneself	D510	Washing oneself
	D520	Caring for body parts	D520	Caring for parts of the body
	D530	Toileting	D530	Toileting
	D540	Dressing	D540	Dressing
	D550	Eating	D550	Eating
Environment Factors	E110	Products or substances for personal consumption	E110	Products or substances for personal consumption
	E115	Products and technology for personal use in daily living	E115	Products and technology for personal use in daily living
	E120	Products and technology for personal indoor and outdoor mobility and transportation	E120	Products and technology for personal indoor and outdoor mobility and transportation
	E225	Climate	E225	Climate
	E310	Immediate family	E310	Immediate family
	E320	Friends	E320	Friends
	E355	Health professionals	E355	Health professionals
	E450	Individual attitudes of health professionals	E450	Individual attitudes of health professionals
	E580	Health services, systems and policies	E580	Health services, systems and policies

covers 6 Domains of Functioning, including: Cognition – understanding and communicating; Mobility – moving and getting around; Self-care – hygiene, dressing, eating and staying alone; Getting along – interacting with other people; Life activities – domestic responsibilities, leisure, work and school; Participation – joining in community activities. The answers to the questions in the questionnaire are coded according to a 5-point scale indicating the level of difficulty or problem: 0 – none; 1 – mild, 2 – moderate, 3 – severe, 4 – extreme or cannot do. The final score is converted on a scale from 0–100 (where 0 means no disability, and 100 – total disability) [20].

Quality of Life. The WHOQOL-BREF questionnaire developed by WHO was used to assess quality of life [22], and allows for the assessment of quality of life of both healthy and sick people in different populations. The WHOQOL-BREF questionnaire assesses the quality of life of respondents in 4 domains: Physical health; Psychological health; Social relationships; Environment and two indicators: Overall Quality of Life and General Health. For the domains, responses were given on a 5-point scale assessing the level of difficulty or problems. The scores obtained for each domain range from 0–100, where 0 indicates a very poor quality of life and 100 a very good quality of life. On the other hand,

indicators of health perception and quality of life are included on a 5-point scale from 1–5, with a positive direction of evaluation [23].

Performing measurements. The study was conducted by appropriately prepared and trained physiotherapists in facilities providing medical rehabilitation services on an outpatient basis. Those conducting the examination were trained in assessing functional status, quality of life and disability and participated in classes on the goals and methods of using the ICF classification in assessing the health status of adults. The methodology for assessing the patient's health condition was presented by members of the National Council for the Implementation of the International Classification of Functioning, Disability and Health.

Ethics. This study was approved by the Bioethics Committee of the University of Rzeszów (Resolution No. 11/02/2020). All participants provided written informed consent. All methods were performed in accordance with relevant guidelines and regulations.

Statistical Analysis. The analysis of quantitative variables was performed by calculating the mean and standard deviation. The analysis of qualitative variables was presented as numbers and percentage. The results of the ICF qualifiers for function, activity and participation were presented on a scale from 0–4, while qualifiers 8 (not specified) and 9 (not applicable) were coded as 0, as a category that could not be sufficiently defined or was considered as 'not applicable' and did not represent a significant problem for the patient. The same criteria were applied to environmental factors. The recalculation was performed according to the methodology used in previous studies using the ICF [24].

A re-test was carried out in a group of 34 people. The average time between 2 measurements was 7 days. The reliability of the test-retest was analysed using an interclass correlation coefficient (ICC) type 2 (according to Shrout and Fleiss classification). The ICF Core Set and WHODAS 2.0 and WHOQOL-BREF category scores were presented as continuous variables. Spearman's correlation coefficient was used to examine the correlations between the ICF components and the questionnaires. The level of statistical significance was assumed at $p < 0.05$. Statistical analysis was performed using the R programme, version 4.3.1.

RESULTS

Baseline characteristics of patients. A group of 528 people, aged between 45–65 years (54.95 ± 5.64) – 303 women and 225 men, were involved in the study. Most of the study subjects were overweight and had a vocational education. The mean number of chronic diseases in the study group was 2.83 and the severity of pain – 4.1. According to the 36-item WHODAS 2.0 scale, the mean disability score in the study population was 46.17 ± 14.22 . The lowest quality of life was shown in the physical domain 65.10 ± 16.46 . The baseline characteristics of the patients are presented in Table 2.

Distribution of ICF core set for patients with musculoskeletal conditions and internal consistency reliability. In testing the significance of changes at the

Table 2. Baseline socio-demographic characteristics of the studied population

Socio-demographic Characteristics (n=528)		No. (%) Mean (SD)
Gender	Male	225 (42.61)
	Female	303 (57.39)
Age		54.95 (5.64)
Height [cm]		170.08 (8.76)
Body Weight [kg]		76.63 (14.11)
BMI [kg/m ²]		26.41 (4.03)
BMI	Underweight	2 (0.38)
	Weight normal	201 (38.07)
	Overweight	242 (45.83)
	Obesity	89 (15.72)
Education	Basic or incomplete basic	17 (3.22)
	Essential vocational	159 (30.11)
	General secondary education	84 (15.91)
	Secondary vocational	97 (18.37)
Professional status	Higher	171 (32.30)
	Actively working	371 (70.27)
Type of professional work	Not working	157 (29.73)
	Mental	115 (21.78)
No. of diseases	Physical	133 (25.19)
	Mixed	123 (23.30)
	Lack	157 (29.73)
Pain [VAS]		4.10 (1.89)
36-item WHODAS 2.0	Total Score	46.17 (14.22)
	Cognition	43.47 (14.93)
	Mobility	49.91 (17.99)
	Self-care	40.94 (15.49)
	Getting along	42.01 (15.63)
Quality of life WHOQOL-BREF	Life activities	50.38 (17.88)
	Participation	51.61 (17.10)
	Overall Quality of Life	4.05 (0.73)
	General Health	3.56 (0.90)
	Physical health	65.10 (16.46)
	Psychological health	74.90 (14.46)
Environment	Social relationships	76.51 (15.14)
	Environment	69.60 (15.55)

ICF Core Set for Patients with Musculoskeletal Conditions level in the retest, no significant differences were found for any category. The reliability of the test-retest method was confirmed by the ICC. Temporal concordance for individual ICF categories ranged from 0.95–1.00, confirming the high concordance of the scale over time. The mean scores of the ICF categories and the test-retest results are shown in Table 3.

Correlation between ICF Core Set for patients with musculoskeletal conditions and WHODAS 2.0. The study found a statistically significant correlation between the WHODAS 2.0 questionnaire total score and the following ICF codes: B134, B260, B280, B435, B530, B620, B730, B755, B740, B780, D155, D177, D230, D410, D430, D445, D450,

Table 3. Distribution of ICF core set for patients with musculoskeletal conditions and internal consistency reliability

ICF Code	WHO ICF Core Set for Patients with Musculoskeletal Conditions					
	Study Population n=528			Test Retest n=34		
	Mean (SD)	Test	Retest	ICC	95%CI	
B134	1.13 (1.09)	1.12 (1.43)	1.47 (1.24)	0.981	0.964	0.991
B260	0.35 (0.75)	0.56 (1.14)	0.65 (1.05)	0.988	0.976	0.994
B280	1.52 (1.10)	1.24 (1.24)	1.97 (1.07)	0.988	0.976	0.994
B435	0.98 (1.12)	0.97 (1.20)	1.41 (1.26)	0.981	0.963	0.991
B530	0.86 (0.82)	1.03 (1.34)	1.26 (1.09)	1.000	1.000	1.000
B620	0.28 (0.91)	0.44 (1.14)	0.59 (1.11)	0.989	0.978	0.994
B730	0.57 (0.78)	0.56 (1.14)	1.00 (1.00)	0.986	0.973	0.993
B740	1.46 (1.29)	0.65 (1.41)	1.82 (1.20)	0.980	0.961	0.990
B755	0.50 (0.92)	0.91 (1.42)	0.82 (1.17)	0.990	0.981	0.995
B780	0.82 (0.88)	0.79 (1.37)	1.24 (1.14)	0.989	0.978	0.994
D155	0.41 (0.76)	0.41 (1.14)	0.97 (1.22)	1.000	1.000	1.000
D177	0.32 (0.67)	0.56 (1.14)	0.79 (1.16)	1.000	1.000	1.000
D230	0.52 (0.85)	0.65 (1.33)	1.00 (1.31)	0.992	0.984	0.996
D240	0.70 (0.92)	1.15 (1.29)	1.32 (1.39)	0.985	0.969	0.992
D410	0.43 (0.78)	0.50 (1.29)	0.97 (1.27)	1.000	1.000	1.000
D430	0.40 (0.76)	0.47 (1.14)	0.74 (1.07)	1.000	1.000	1.000
D445	0.36 (0.86)	0.41 (1.14)	0.59 (1.03)	1.000	1.000	1.000
D450	0.77 (1.00)	0.68 (1.32)	1.35 (1.23)	1.000	1.000	1.000
D465	0.16 (0.57)	0.35 (1.03)	0.53 (1.04)	0.957	0.836	0.990
D510	0.23 (0.63)	0.41 (1.14)	0.65 (1.13)	1.000	1.000	1.000
D520	0.25 (0.73)	0.62 (1.50)	0.74 (1.27)	1.000	1.000	1.000
D530	0.11 (0.52)	0.41 (1.14)	0.53 (1.22)	1.000	1.000	1.000
D540	0.23 (0.61)	0.44 (1.13)	0.68 (1.18)	1.000	1.000	1.000
D550	0.08 (0.40)	0.35 (1.03)	0.32 (0.90)	1.000	1.000	1.000
E110	1.34 (2.06)	0.71 (1.65)	2.85 (0.88)	0.982	0.964	0.991
E115	1.09 (1.77)	0.35 (1.41)	1.82 (1.44)	0.983	0.965	0.992
E120	0.51 (1.50)	0.62 (1.26)	1.56 (1.63)	0.971	0.927	0.989
E225	-0.14 (1.49)	-0.44 (2.02)	0.15 (1.87)	0.995	0.991	0.998
E310	1.77 (2.40)	1.44 (2.07)	3.21 (1.02)	1.000	1.000	1.000
E320	1.46 (2.17)	1.00 (2.10)	2.85 (1.03)	0.986	0.973	0.993
E355	0.79 (1.82)	0.21 (1.81)	2.06 (1.24)	1.000	1.000	1.000
E450	0.54 (1.59)	0.09 (1.74)	1.53 (1.54)	1.000	1.000	1.000
E580	0.48 (1.62)	0.09 (1.31)	1.65 (1.26)	0.991	0.982	0.996

D455, D510, D520, D530, D540 and D550. The greater the extent of the problem presented by the subjects in terms of assessed function, activity and participation, the higher was their degree of disability as expressed by the overall WHODAS 2.0 scale score. The total disability score negatively correlated with the environmental codes: E110, E115, E225, E355, E450, E310, E320 and E580. The ICF codes for function, activity and participation correlated significantly positively with the WHODAS 2.0 questionnaire scores on the subscales: Mobility, Self-care, Getting along, Life activities and Participation. In contrast, ICF codes relating to environmental factors correlated negatively. Which meant that the higher the degree of disability of the respondents, the greater the barriers they experienced from the environment. The correlations between the ICF Core Set for Patients with Musculoskeletal Conditions and WHODAS 2.0 are shown in Table 4.

The study found a statistically significant negative correlation between perception of quality of life and one's own health and ICF codes for function, activity and participation and environmental factors. Similar correlations are found between ICF codes: B134, B260, B280, B435, B530, B620, B730, B755, B740, B780, D155, D177, D230, D240, D410, D430, D445, D450, D455, D510, D520, D530, D540, D550 and the physical, psychological, social and environmental domains of the WHOQOL-BREF. There were no statistically significant correlations between the environmental domain of the WHOQOL_BREF and the environmental factors of the ICF Core Set for Patients with Musculoskeletal Conditions. Correlations between the ICF Core Set for Patients with Musculoskeletal Conditions and WHOQOL_BREF are shown in Table 5.

Table 4. Correlation between ICF components and WHODAS 2.0

	WHODAS: Total Score	WHODAS: Cognition	WHODAS: Mobility	WHODAS: Self-care	WHODAS: Getting along	WHODAS: Life activities	WHODAS: Participation
B134	r=0.26. p<0.001 *	r=0.216. p<0.001 *	r=0.227. p<0.001 *	r=0.189. p<0.001 *	r=0.131. p=0.003 *	r=0.244. p<0.001 *	r=0.335. p<0.001 *
B260	r=0.28. p<0.001 *	r=0.198. p<0.001 *	r=0.322. p<0.001 *	r=0.232. p<0.001 *	r=0.201. p<0.001 *	r=0.251. p<0.001 *	r=0.325. p<0.001 *
B280	r=0.223. p<0.001 *	r=0.092. p=0.035 *	r=0.245. p<0.001 *	r=0.158. p<0.001 *	r=0.05. p=0.25	r=0.227. p<0.001 *	r=0.319. p<0.001 *
B435	r=0.24. p<0.001 *	r=0.233. p<0.001 *	r=0.198. p<0.001 *	r=0.151. p<0.001 *	r=0.15. p=0.001 *	r=0.233. p<0.001 *	r=0.305. p<0.001 *
B530	r=0.086. p=0.048 *	r=0.022. p=0.613	r=0.159. p<0.001 *	r=0.051. p=0.239	r=0.055. p=0.205	r=0.068. p=0.123	r=0.11. p=0.011 *
B620	r=0.122. p=0.005 *	r=0.089. p=0.041 *	r=0.144. p=0.001 *	r=0.107. p=0.014 *	r=0.088. p=0.043 *	r=0.105. p=0.016 *	r=0.199. p<0.001 *
B730	r=0.205. p<0.001 *	r=0.049. p=0.263	r=0.302. p<0.001 *	r=0.147. p=0.001 *	r=0.045. p=0.3	r=0.194. p<0.001 *	r=0.305. p<0.001 *
B755	r=0.294. p<0.001 *	r=0.181. p<0.001 *	r=0.367. p<0.001 *	r=0.26. p<0.001 *	r=0.139. p=0.001 *	r=0.284. p<0.001 *	r=0.332. p<0.001 *
B740	r=0.38. p<0.001 *	r=0.232. p<0.001 *	r=0.443. p<0.001 *	r=0.306. p<0.001 *	r=0.169. p<0.001 *	r=0.377. p<0.001 *	r=0.415. p<0.001 *
B780	r=0.219. p<0.001 *	r=0.065. p=0.137	r=0.271. p<0.001 *	r=0.134. p=0.002 *	r=0.065. p=0.138	r=0.268. p<0.001 *	r=0.277. p<0.001 *
D155	r=0.161. p<0.001 *	r=0.174. p<0.001 *	r=0.113. p=0.009 *	r=0.087. p=0.047 *	r=0.13. p=0.003 *	r=0.153. p<0.001 *	r=0.216. p<0.001 *
D177	r=0.115. p=0.009 *	r=0.181. p<0.001 *	r=0.012. p=0.78	r=0.05. p=0.253	r=0.17. p<0.001 *	r=0.077. p=0.077	r=0.141. p=0.001 *
D230	r=0.161. p<0.001 *	r=0.066. p=0.131	r=0.181. p<0.001 *	r=0.062. p=0.155	r=0.01. p=0.81	r=0.24. p<0.001 *	r=0.208. p<0.001 *
D240	r=0.036. p=0.409	r=0.055. p=0.209	r=-0.022. p=0.619	r=-0.02. p=0.643	r=0.011. p=0.798	r=0.047. p=0.279	r=0.114. p=0.009 *
D410	r=0.24. p<0.001 *	r=0.092. p=0.035 *	r=0.348. p<0.001 *	r=0.18. p<0.001 *	r=0.044. p=0.311	r=0.273. p<0.001 *	r=0.294. p<0.001 *
D430	r=0.114. p=0.009 *	r=-0.028. p=0.527	r=0.235. p<0.001 *	r=0.09. p=0.038 *	r=-0.016. p=0.716	r=0.085. p=0.052	r=0.185. p<0.001 *
D445	r=0.174. p<0.001 *	r=0.079. p=0.07	r=0.221. p<0.001 *	r=0.155. p<0.001 *	r=0.086. p=0.049 *	r=0.159. p<0.001 *	r=0.222. p<0.001 *
D450	r=0.216. p<0.001 *	r=0.03. p=0.494	r=0.374. p<0.001 *	r=0.13. p=0.003 *	r=0.008. p=0.863	r=0.237. p<0.001 *	r=0.258. p<0.001 *
D455	r=0.257. p<0.001 *	r=0.194. p<0.001 *	r=0.289. p<0.001 *	r=0.25. p<0.001 *	r=0.16. p<0.001 *	r=0.224. p<0.001 *	r=0.328. p<0.001 *
D510	r=0.252. p<0.001 *	r=0.122. p=0.005 *	r=0.326. p<0.001 *	r=0.296. p<0.001 *	r=0.144. p=0.001 *	r=0.239. p<0.001 *	r=0.282. p<0.001 *
D520	r=0.216. p<0.001 *	r=0.104. p=0.017 *	r=0.265. p<0.001 *	r=0.256. p<0.001 *	r=0.134. p=0.002 *	r=0.181. p<0.001 *	r=0.235. p<0.001 *
D530	r=0.202. p<0.001 *	r=0.178. p<0.001 *	r=0.222. p<0.001 *	r=0.244. p<0.001 *	r=0.204. p<0.001 *	r=0.155. p<0.001 *	r=0.256. p<0.001 *
D540	r=0.252. p<0.001 *	r=0.073. p=0.093	r=0.322. p<0.001 *	r=0.313. p<0.001 *	r=0.089. p=0.041 *	r=0.257. p<0.001 *	r=0.332. p<0.001 *
D550	r=0.152. p<0.001 *	r=0.187. p<0.001 *	r=0.147. p=0.001 *	r=0.167. p<0.001 *	r=0.231. p<0.001 *	r=0.087. p=0.046 *	r=0.203. p<0.001 *
E110	r=-0.252. p<0.001 *	r=-0.299. p<0.001 *	r=-0.161. p<0.001 *	r=-0.329. p<0.001 *	r=-0.36. p<0.001 *	r=-0.129. p=0.003 *	r=-0.17. p<0.001 *
E115	r=-0.24. p<0.001 *	r=-0.254. p<0.001 *	r=-0.173. p<0.001 *	r=-0.309. p<0.001 *	r=-0.308. p<0.001 *	r=-0.136. p=0.002 *	r=-0.168. p<0.001 *
E120	r=-0.069. p=0.114	r=-0.125. p=0.004 *	r=-0.014. p=0.755	r=-0.071. p=0.102	r=-0.09. p=0.039 *	r=-0.013. p=0.773	r=-0.021. p=0.638
E225	r=-0.291. p<0.001 *	r=-0.296. p<0.001 *	r=-0.213. p<0.001 *	r=-0.309. p<0.001 *	r=-0.317. p<0.001 *	r=-0.209. p<0.001 *	r=-0.32. p<0.001 *
E355	r=-0.251. p<0.001 *	r=-0.284. p<0.001 *	r=-0.178. p<0.001 *	r=-0.29. p<0.001 *	r=-0.332. p<0.001 *	r=-0.174. p<0.001 *	r=-0.161. p<0.001 *
E450	r=-0.215. p<0.001 *	r=-0.224. p<0.001 *	r=-0.159. p<0.001 *	r=-0.281. p<0.001 *	r=-0.262. p<0.001 *	r=-0.164. p<0.001 *	r=-0.172. p<0.001 *
E310	r=-0.361. p<0.001 *	r=-0.364. p<0.001 *	r=-0.274. p<0.001 *	r=-0.438. p<0.001 *	r=-0.437. p<0.001 *	r=-0.229. p<0.001 *	r=-0.263. p<0.001 *
E320	r=-0.294. p<0.001 *	r=-0.302. p<0.001 *	r=-0.229. p<0.001 *	r=-0.366. p<0.001 *	r=-0.366. p<0.001 *	r=-0.167. p<0.001 *	r=-0.221. p<0.001 *
E580	r=-0.203. p<0.001 *	r=-0.206. p<0.001 *	r=-0.149. p=0.001 *	r=-0.255. p<0.001 *	r=-0.26. p<0.001 *	r=-0.114. p=0.009 *	r=-0.121. p=0.005 *

r – Spearman correlation coefficient

* statistically significant relationship (p<0.05)

DISCUSSION

The aim of the study was to validate and evaluate the effectiveness of using the ICF classification in the assessment of patients with musculoskeletal problems, and to identify correlations between the ICF and other health assessment scales. The use of the ICF in clinical practice requires the categories to be carefully revised and defined in a way that allows for standardised patient assessment and comparability of health status analysis at both national and international levels.

After verification and identification of the ICF Core Set for Patients with Musculoskeletal Conditions in the post-acute care setting, 33 ICF categories were identified, including 10 Body Functions, 14 Activities and participation and 9 Environment Factors necessary for the assessment of patients in Polish

healthcare settings. The selected categories differed little from the original set. In addition, 3 codes assessing the environment were introduced: Immediate family (E310), Friends (E320) and Health services, systems and policies (E580). Similar findings were obtained by Hernandez-Lazaro et al., indicating that there are areas of functioning related to environmental factors that were not included in the original set [25].

In previous studies, many researchers have emphasised the important role of environmental factors in assessing the functioning of an individual. Zhang et al. note that the environment is an element external to the individual, but can passively or actively influence function and activity and participation [26]. Nevertheless, the authors point out the need to pay attention to the way the ICF environmental factors are scored, modifying the qualifiers in the context of the adopted methodology of the studies conducted [27].

Table 5. Correlation between ICF components and WHOQOL-BREF

	WHOQoL: Overall Quality of Life	WHOQoL: General Health	WHOQoL: Physical health	WHOQoL: Psychological health	WHOQoL: Social relationships	WHOQoL: Environment
B134	r=-0.319. p<0.001 *	r=-0.351. p<0.001 *	r=-0.518. p<0.001 *	r=-0.318. p<0.001 *	r=-0.315. p<0.001 *	r=-0.29. p<0.001 *
B260	r=-0.258. p<0.001 *	r=-0.327. p<0.001 *	r=-0.37. p<0.001 *	r=-0.223. p<0.001 *	r=-0.179. p<0.001 *	r=-0.24. p<0.001 *
B280	r=-0.328. p<0.001 *	r=-0.396. p<0.001 *	r=-0.43. p<0.001 *	r=-0.2. p<0.001 *	r=-0.114. p=0.009 *	r=-0.213. p<0.001 *
B435	r=-0.263. p<0.001 *	r=-0.253. p<0.001 *	r=-0.373. p<0.001 *	r=-0.261. p<0.001 *	r=-0.139. p=0.001 *	r=-0.238. p<0.001 *
B530	r=-0.169. p<0.001 *	r=-0.199. p<0.001 *	r=-0.226. p<0.001 *	r=-0.171. p<0.001 *	r=-0.203. p<0.001 *	r=-0.12. p=0.006 *
B620	r=-0.139. p=0.001 *	r=-0.177. p<0.001 *	r=-0.243. p<0.001 *	r=-0.193. p<0.001 *	r=-0.142. p=0.001 *	r=-0.122. p=0.005 *
B730	r=-0.372. p<0.001 *	r=-0.389. p<0.001 *	r=-0.461. p<0.001 *	r=-0.313. p<0.001 *	r=-0.251. p<0.001 *	r=-0.314. p<0.001 *
B755	r=-0.29. p<0.001 *	r=-0.35. p<0.001 *	r=-0.434. p<0.001 *	r=-0.258. p<0.001 *	r=-0.233. p<0.001 *	r=-0.264. p<0.001 *
B740	r=-0.393. p<0.001 *	r=-0.413. p<0.001 *	r=-0.493. p<0.001 *	r=-0.325. p<0.001 *	r=-0.236. p<0.001 *	r=-0.314. p<0.001 *
B780	r=-0.329. p<0.001 *	r=-0.358. p<0.001 *	r=-0.5. p<0.001 *	r=-0.255. p<0.001 *	r=-0.21. p<0.001 *	r=-0.224. p<0.001 *
D155	r=-0.21. p<0.001 *	r=-0.296. p<0.001 *	r=-0.329. p<0.001 *	r=-0.275. p<0.001 *	r=-0.263. p<0.001 *	r=-0.198. p<0.001 *
D177	r=-0.121. p=0.005 *	r=-0.158. p<0.001 *	r=-0.188. p<0.001 *	r=-0.276. p<0.001 *	r=-0.207. p<0.001 *	r=-0.174. p<0.001 *
D230	r=-0.27. p<0.001 *	r=-0.345. p<0.001 *	r=-0.438. p<0.001 *	r=-0.219. p<0.001 *	r=-0.212. p<0.001 *	r=-0.197. p<0.001 *
D240	r=-0.18. p<0.001 *	r=-0.163. p<0.001 *	r=-0.265. p<0.001 *	r=-0.299. p<0.001 *	r=-0.251. p<0.001 *	r=-0.16. p<0.001 *
D410	r=-0.379. p<0.001 *	r=-0.346. p<0.001 *	r=-0.45. p<0.001 *	r=-0.274. p<0.001 *	r=-0.253. p<0.001 *	r=-0.248. p<0.001 *
D430	r=-0.33. p<0.001 *	r=-0.301. p<0.001 *	r=-0.331. p<0.001 *	r=-0.204. p<0.001 *	r=-0.218. p<0.001 *	r=-0.147. p=0.001 *
D445	r=-0.247. p<0.001 *	r=-0.257. p<0.001 *	r=-0.327. p<0.001 *	r=-0.185. p<0.001 *	r=-0.121. p=0.005 *	r=-0.152. p<0.001 *
D450	r=-0.277. p<0.001 *	r=-0.3. p<0.001 *	r=-0.435. p<0.001 *	r=-0.172. p<0.001 *	r=-0.173. p<0.001 *	r=-0.156. p<0.001 *
D455	r=-0.282. p<0.001 *	r=-0.281. p<0.001 *	r=-0.333. p<0.001 *	r=-0.258. p<0.001 *	r=-0.225. p<0.001 *	r=-0.204. p<0.001 *
D510	r=-0.276. p<0.001 *	r=-0.271. p<0.001 *	r=-0.377. p<0.001 *	r=-0.25. p<0.001 *	r=-0.206. p<0.001 *	r=-0.202. p<0.001 *
D520	r=-0.244. p<0.001 *	r=-0.264. p<0.001 *	r=-0.33. p<0.001 *	r=-0.19. p<0.001 *	r=-0.21. p<0.001 *	r=-0.182. p<0.001 *
D530	r=-0.183. p<0.001 *	r=-0.192. p<0.001 *	r=-0.237. p<0.001 *	r=-0.23. p<0.001 *	r=-0.16. p<0.001 *	r=-0.171. p<0.001 *
D540	r=-0.337. p<0.001 *	r=-0.341. p<0.001 *	r=-0.391. p<0.001 *	r=-0.256. p<0.001 *	r=-0.228. p<0.001 *	r=-0.209. p<0.001 *
D550	r=-0.152. p<0.001 *	r=-0.218. p<0.001 *	r=-0.241. p<0.001 *	r=-0.233. p<0.001 *	r=-0.231. p<0.001 *	r=-0.148. p=0.001 *
E110	r=-0.21. p<0.001 *	r=-0.256. p<0.001 *	r=-0.251. p<0.001 *	r=-0.087. p=0.047 *	r=-0.141. p=0.001 *	r=0.011. p=0.8
E115	r=-0.246. p<0.001 *	r=-0.128. p=0.003 *	r=-0.149. p=0.001 *	r=-0.096. p=0.028 *	r=-0.164. p<0.001 *	r=-0.016. p=0.705
E120	r=-0.216. p<0.001 *	r=-0.195. p<0.001 *	r=-0.207. p<0.001 *	r=-0.144. p=0.001 *	r=-0.215. p<0.001 *	r=-0.045. p=0.303
E225	r=0.049. p=0.258	r=0.15. p=0.001 *	r=0.122. p=0.005 *	r=0.148. p=0.001 *	r=0.007. p=0.871	r=0.187. p<0.001 *
E355	r=-0.154. p<0.001 *	r=-0.126. p=0.004 *	r=-0.171. p<0.001 *	r=-0.04. p=0.353	r=-0.096. p=0.027 *	r=0.032. p=0.466
E450	r=-0.045. p=0.299	r=-0.093. p=0.032 *	r=-0.126. p=0.004 *	r=-0.019. p=0.663	r=-0.08. p=0.066	r=0.044. p=0.311
E155	r=-0.19. p<0.001 *	r=-0.159. p<0.001 *	r=-0.203. p<0.001 *	r=-0.168. p<0.001 *	r=-0.156. p<0.001 *	r=-0.074. p=0.091
E310	r=-0.114. p=0.009 *	r=-0.135. p=0.002 *	r=-0.132. p=0.002 *	r=0.033. p=0.449	r=-0.044. p=0.312	r=0.058. p=0.183
E320	r=-0.112. p=0.01 *	r=-0.107. p=0.014 *	r=-0.125. p=0.004 *	r=0.035. p=0.421	r=-0.009. p=0.845	r=0.063. p=0.146
E580	r=-0.075. p=0.086	r=-0.047. p=0.281	r=-0.141. p=0.001 *	r=-0.023. p=0.6	r=-0.066. p=0.128	r=0.053. p=0.221

r – Spearman's correlation coefficient
* statistically significant relationship (p<0.05)

The implementation of ICF Core Sets should always be based on validation, so that individual codes and assessment methods are validated for a specific population or a target group. According to the scoping review by Karlsson and Gustafsson, only 66% of the Core Sets have been validated [19]. Hernandez-Lazaro et al. conducted validations of the ICF Core Set for musculoskeletal conditions in Spain. The authors identified 35 categories relevant from the physiotherapists' perspective and an additional 68 categories from the researchers' perspective in the ICF Core Set [25]. Kurtaiş et al., in validating the ICF Core Set for osteoarthritis, showed that it can be used in the clinical assessment of patients [28].

Clinicians identify several challenges in the practical application of assessing functional status using ICF qualifiers [29]. The first is to determine what needs to be assessed, i.e. which ICF categories need to be included in the collection of

data for clinical use, and how to assess them in given cultural settings [30]. The authors indicate that the reliability of the qualifier assessment may be influenced by the description of the ICF categories, the assessment method, the professional background and the experience of the assessor [31]. Therefore, the results of clinical measures using the ICF are expected to be consistent over time and across assessors [32].

The results of own study confirm the high reproducibility of the ICF qualifiers in the Core Set assessment. In the retest study, compared to the test study, no differences were found in any of the codes analysed. The ICC value for individual ICF codes ranged from 0.95–1.00. Similar results were obtained by Bagraith et al., indicating an excellent ICC index when analysing the repeatability of the Low Back Pain Core Set [33]. Increased reliability of the assessment will increase the utility of using the ICF for clinical and statistical purposes.

In the current study involving 528 people with musculoskeletal conditions, multiple statistically significant correlations were found between individual ICF Core Set for Patients with Musculoskeletal Conditions codes and the WHODAS 2.0 questionnaire for assessing disability, and the WHOQOL-BREF scale. The strongest correlations were found between the overall disability score according to WHODAS 2.0 and Body Function Categories:

- B134 – Sleep functions;
- B260 – Proprioceptive function;
- B280 – Sensation of pain;
- B435 – Immunological system functions;
- B730 – Muscle power functions;
- B740 – Muscle endurance functions;
- B755 – Involuntary movement reaction functions;
- B780 – Sensations related to muscles and movement functions.

Activity and Participation Categories:

- D155 – Acquiring skills;
- D230 – Carrying out daily routine;
- D410 – Changing basic body position;
- D445 – Hand and arm use;
- D450 – Walking;
- D465 – Moving around using equipment;
- D510 – Washing oneself;
- D520 – Caring for parts of the body;
- D530 – Toileting;
- D540 – Dressing;
- D550 – Eating.

Environment Factors Categories:

- E110 – Products or substances for personal consumption;
- E115 – Products and technology for personal use in daily living;
- E225 – Climate; E310 Immediate family;
- E320 – Friends;
- E355 – Health professionals;
- E450 – Individual attitudes of health professionals;
- E580 – Health services, systems and policies ($p < 0.001$).

The bio-psychosocial model describing the health status of a population is recognised as useful worldwide, and the ICF Core Sets enable comprehensive assessment of patients. However, there is a lack of validation studies for existing ICF Core Sets, which presents barriers to the implementation of the ICF classification in clinical practice.

The current study is the first to be conducted in Poland, and one of the first in the world, to analyse the effectiveness of using the ICF Core Set for Patients with Musculoskeletal Conditions. Only the team of Hernandez-Lazaro et al., in a multicentre cross-sectional study, also demonstrated the good content validity of the ICF Core Set for Patients with Musculoskeletal Conditions in Primary Care Physiotherapy Services in the assessment of patients receiving physiotherapy in primary care settings [24].

Limitations of the study. Despite the use of a relatively large sample compared to similar studies using the ICF, generalisation of the results is limited, as only patients living in south-eastern Poland were included in the study; therefore, the results cannot be extended to the entire population of Poland. Further research is needed to validate

the effectiveness of using the ICF Core Sets on national and international levels.

CONCLUSIONS

The study confirms the effectiveness of the use and feasibility of implementing the ICF Core Set for Patients with Musculoskeletal Conditions in outpatient rehabilitation facilities in south-eastern Poland. The ICF Core Set evaluated is compatible with commonly used questionnaires for the clinical assessment of health status and quality of life. The ICF Core Set for Patients with Musculoskeletal Conditions enables full functional assessment, the creation of statistical summaries on the health of individuals, analysis and steering of system solutions in health care.

Ethical Committee. The study was conducted in accordance with the Declaration of Helsinki and approved by the Bioethics Committee of the University of Rzeszów (Resolution No. 11/02/2020) and by all appropriate administrative bodies.

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