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Assessment of Functioning and Disability Based on WHODAS 2.0 and Related Factors Among People Aged 80 and Over Hospitalized in a Geriatric Ward in Southeastern Poland

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Statistical Analysis C
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Background: The incidence of disability increases with age, and its determinants in the oldest age groups are complex. The aim of this study was to assess the level of functioning and disability based on WHODAS 2.0 and related factors in people aged 80 and over hospitalized in a geriatric ward in southeastern Poland.

Material/Methods: The study was conducted in a group of 282 people aged 80 and over hospitalized in a geriatric ward in southeastern Poland. Disability level was assessed using WHODAS 2.0. Contextual factors potentially related to disability during hospitalization were also evaluated. The relationship between disability level and related factors was explored using a linear regression model.

Results: The highest level of disability was observed in the Life Activities (77.27 points) and Mobility (55.90 points) domains. Longer time to walk 10 m was associated with the greatest increase in disability – this factor exhibited a significant relationship across all analyzed WHODAS 2.0 domains. Lack of physical activity was significantly associated with increased disability in the Life Activities domain; absence of falls in the year preceding the study was associated with reduced disability in the Cognition, Self-care, and Getting Along domains.

Conclusions: These results suggest a need for systematic mobility monitoring in hospitalized older adults, as well as the implementation of strategies to support mobility, both during and after hospitalization.

Keywords: **Aged, 80 and Over • Disability Evaluation • Hospitalization**

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Introduction

Current statistics suggest that by 2030, every sixth person in the world will be at least 60 years old. However, the fastest increase will be observed in the proportion of people in the oldest age groups within populations. The global population aged 60 and over is expected to double from 1 billion in 2020 to 2.1 billion in 2050. The number of people aged 80 and over will triple over the same period, reaching 426 million in 2050 [1]. A similar demographic trend is also occurring in Poland. In 2023, people aged 80 and over constituted 16.2% of the older population in Poland; by 2060, this proportion is expected to increase by 7.5% [2].

As the number of people in the oldest age groups increases, so do the prevalences of diseases and health problems, which greatly contribute to the increased incidence of disability and dependence in everyday functioning in this population. According to data from a nationwide survey of older people in Poland (PolSenior2), 28.1% of men and 47.1% of women aged 80 to 84 report limited independence requiring assistance from others. These proportions substantially increase with age, exceeding 70% in men and 84% in women aged 90 and over [3]. With increasing age and the presence of multiple co-occurring chronic diseases, the frequency of hospitalization also considerably rises [4]. Hospitalization is strongly associated with changes in functional status, both during and after the hospital stay. The hospital care process itself – including polypharmacy and the associated risk of iatrogenic effects, prolonged bed rest, and general weakness resulting from impaired health status – may hinder a return to pre-hospitalization levels of functional independence. A patient's clinical condition upon admission to the ward, particularly the presence of major geriatric syndromes and prior hospitalization within the preceding 12 months, is also considered a factor that may determine the decline in functional independence during hospitalization [5]. de Almeida Tavares et al reported that most hospitalized older adults demonstrate impaired functional capacity relative to their pre-hospitalization status, along with an increased level of dependency at 3 months after discharge [6]. These changes often lead to the need for home care services or placement in a nursing home [7]. Therefore, assessments of older patients during hospitalization in terms of functional status and level of disability, as well as factors associated with these outcomes, are essential. Such assessments enable the identification of risk factors for disability in this population and facilitate the definition of targeted therapeutic goals to be achieved during hospitalization, serving as a preventive measure against disability onset. They also provide relevant data for planning post-discharge care and therapeutic services [8].

Accordingly, assessments of older patients should incorporate tools based on the biopsychosocial model, thereby enabling comprehensive evaluation of disability and functioning while considering social relationships, participation, and environmental influences. One such tool is the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0), developed by the World Health Organization (WHO), which is based on the International Classification of Functioning, Disability and Health framework [9].

WHODAS 2.0 has been widely used in studies of various populations, including older adults, confirming its reliability and utility [10-12]. In the Polish population, this tool has also been used to assess functioning and disability, including in studies of older adults (aged 60-80 years) living in the community [13], those in institutional care [14], and individuals over 50 years of age who have undergone hip or knee osteoarthritis procedures [15].

A search of the literature revealed that the WHODAS 2.0 questionnaire has not yet been used to comprehensively assess the level of functioning and disability among hospitalized individuals in the oldest age group (80 and over) in Poland. Given the increasing proportion of this age group in the Polish population, as well as challenges associated with hospitalization in this population, the present study aimed to evaluate the level of functioning and disability using WHODAS 2.0 and related factors, including sociodemographic variables, health parameters, and variables determining functional status in adults aged 80 and over hospitalized in a geriatric ward in southeastern Poland.

Based on the study aim, the following research questions were established:

1. What is the level of disability on the WHODAS 2.0 scale among hospitalized adults aged 80 years and over?
2. What factors (including sociodemographic variables, health parameters, and variables determining functional status) are associated with the WHODAS 2.0 level of disability in this group?

Material and Methods

Study Design and Setting

This cross-sectional study was conducted between January 2019 and March 2020 among patients hospitalized in the geriatric ward of the Hospital in Przeworsk (southeastern Poland). Prior to initiation, the study received approval from the Bioethics Committee of the University of Rzeszów (Resolution No. 2/12/2018). In accordance with the Declaration of Helsinki, all participants were informed about the purpose and procedures of the study and provided written informed consent.

The study was designed in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines [16].

Participants

The study included older adults admitted to the geriatric ward of the hospital in Przeworsk. Inclusion criteria were: (a) age 80 years and over; (b) no cognitive impairment (Abbreviated Mental Test Score >6 points); and (c) functional status enabling the performance of gait, muscle strength, and balance tests (Katz Activities of Daily Living Scale ≥3). Exclusion criteria were: (a) presence of serious systemic diseases or infections preventing the planned assessments; (b) severe visual impairment preventing performance of functional tests; (c) severe hearing impairment preventing understanding of instructions and questions, as well as provision of reliable responses; and (d) lack of informed consent to participate in the study.

Sample Size

The sample size was determined based on statistical data concerning the number of people aged 80 and over in the hospital catchment area [17], as well as data regarding the average hospitalization rate in geriatric wards in the region [18]. Considering a population of 3383 individuals aged 80 and over and a hospitalization rate of 88.03 per 100 000 inhabitants, it was estimated that 1060 individuals in this age group were hospitalized in the region during the study period. This estimate was used for sample size calculation. The Online Sample Size Calculator (https://www.calculator.net/sample-size-calculator.html) was used, assuming a 5% margin of error and 95% confidence level, resulting in a minimum required sample size of 282 participants.

Variables

The following variables were included in the study: (a) level of disability assessed using WHODAS 2.0; and (b) contextual factors potentially related to disability during hospitalization (eg, sociodemographic factors, health status parameters, and functional status parameters).

Outcome Measures

WHODAS 2.0

WHODAS 2.0 is a standardized tool developed by the WHO to measure health, functioning, and disability across cultures and populations. It is based on the framework of the International Classification of Functioning, Disability and Health. This study utilized the 36-item version of the questionnaire, translated and validated for use in the Polish population [13]. WHODAS 2.0 assesses functioning and disability over the 30 days preceding the evaluation across 6 domains: (1) Cognition – understanding and communicating; (2) Mobility – moving and getting around; (3) Self-care – hygiene, dressing, eating, and being alone; (4) Getting along – interacting with other people; (5) Life activities – domestic responsibilities (5.1) and work and school (5.2); and (6) Participation – engagement in community activities. Due to the characteristics of the study population, domain 5.2 (work and school) was not assessed. Responses are recorded on a 5-point scale: 0 – no problem (0-4%); 1 – mild problem (5-24%); 2 – moderate problem (25-49%); 3 – severe problem (50-95%); and 4 – complete problem (96-100%) [19].

Contextual Factors Potentially Related to Disability

Sociodemographic Variables and Health Status Measurement

A proprietary questionnaire was used to collect basic sociodemographic data, including age, sex, place of residence, education level, and marital status. Data regarding environmental factors were also collected, including subjective assessment of housing conditions in relation to functional needs, support received in daily functioning, history of falls in the previous year, and physical activity. Based on medical record review, information was obtained concerning the number of comorbidities and medications. Both chronically used medications and those prescribed upon admission to the geriatric ward were included.

Assessment of Participants' Body Mass Index (BMI)

Measurements were performed using a medical scale with a height gauge. Participants were asked to remove their shoes and stand on the scale, looking straight ahead with their arms at their sides [20]. BMI was calculated based on the obtained height and weight. Classification followed the standards proposed by the Committee on Diet and Health, according to which a healthy body weight in individuals over 65 years corresponds to a BMI of 24 to 29 kg/m^2, underweight to below 24 kg/m^2, and overweight to above 29 kg/m^2 [21].

Berg Balance Scale (BBS)

This scale was used to assess participants' static and dynamic balance. It consists of 14 tasks performed in standing and sitting positions, including activities such as reaching, turning, and picking up objects from the floor. Each task is scored on a 4-point scale, with a maximum total score of 56. Higher scores indicate better balance [22,23].

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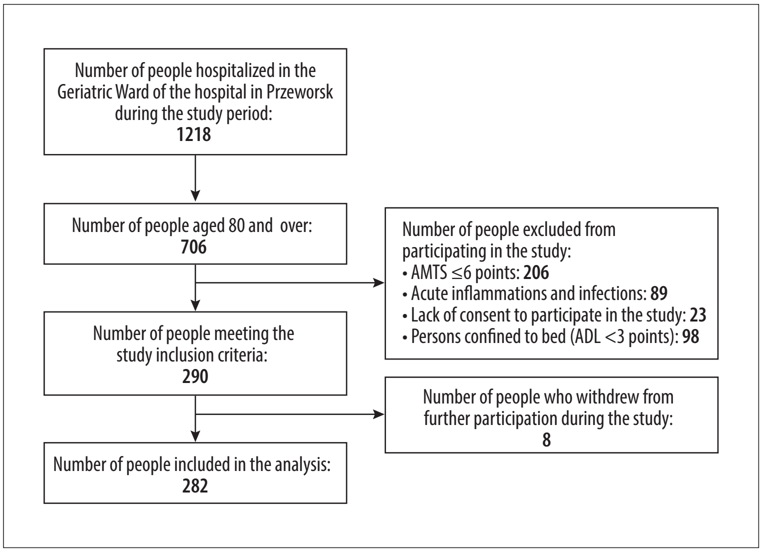

Figure 1. Flow diagram illustrating the stages of participant inclusion in the analysis. ADL – activities of daily living; AMTS – Abbreviated Mental Test Score. *Figure created by the authors based on their own data.*

Timed Up and Go Test

This test was used to assess mobility and fall risk. Participants were instructed to sit in a chair with a backrest (seat height approximately 46 cm) with their feet flat on the floor. The test involved standing up, walking 3 m at a comfortable pace on a flat surface, turning 180 degrees, returning to the chair, and sitting down. The total time to complete the task was recorded in seconds [24]. This simple and inexpensive test is widely used in clinical practice. It is also recommended as a screening tool for fall risk in the geriatric population [25].

10-Meter Walk Test (10MWT)

This test was conducted to assess gait. It was performed along a level corridor over a designated 10-m distance, with an additional 2 m at both the start and end to allow for acceleration and deceleration. Participants began in a standing position. The outcome measure was the time required to walk the 10-m distance [26,27].

30-Second Sit-to-Stand Test

This test was conducted to assess lower limb strength in the study cohort. Participants were instructed to sit on a chair approximately 43 cm in height, with their feet flat on the floor and arms crossed over the chest. The chair was placed against a wall to prevent movement during the test. The task involved repeatedly standing up and sitting down (with full contact of the buttocks on the seat) for 30 seconds. The outcome was the number of completed sit-to-stand cycles within 30 seconds [28].

Assessment of Hand Grip Strength

Hand grip strength was measured using a hand dynamometer (JAMAR PLUS+ Digital Hand Dynamometer, Patterson Medical). Measurements were performed with the participant seated on a chair without armrests, feet flat on the floor, arms alongside the body, elbows flexed at 90 degrees, forearms in a neutral position, and wrists in 0 to 30 degrees of extension. Participants were instructed to squeeze the dynamometer with maximal effort and maintain the grip for 6 seconds. The procedure was repeated 3 times, with a 1-minute rest between attempts. The result was expressed in kilograms as the mean of the 3 measurements [29,30].

Data Collection

Data were collected once, on the day of admission to the geriatric ward. The study procedure consisted of 3 stages and was coordinated by the attending physician. A 30-minute rest period was provided between stages; the total duration of the procedure, including breaks, was approximately 1.5 hours. The stages were as follows:
Stage 1: Admission to the geriatric ward and eligibility assessment by the attending physician based on the inclusion and exclusion criteria.
Stage 2: A face-to-face interview conducted by a member of the therapeutic team trained in the study procedures. This interview was used to collect sociodemographic data, environmental factors, and information about physical activity; it also served to assess the level of disability via WHODAS 2.0.
Stage 3: Functional assessment performed by a physical therapist, including evaluation of balance, muscle strength, gait speed, and fall risk. Prior to testing, the physical therapist provided instructions and ensured participant understanding of each procedure.

Statistical Analysis

Descriptive statistics included absolute and relative frequencies for qualitative variables and mean±standard deviation (SD) for

Table 1. Sociodemographic features and functional status parameters of the study cohort.

Variable	N (%) or mean±SD
Age (years)	84.80±3.80
Sex	
Women	181 (64.18)
Men	101 (35.82)
Place of residence	
Urban	66 (23.40)
Rural	216 (76.60)
Education level	
Primary	192 (68.09)
Secondary	90 (31.91)
Marital status	
Married	96 (34.04)
Widowed/single	186 (65.96)
Falls in the last year	
Yes	123 (43.62)
No	159 (56.38)
Adaptation of living environment to functional needs	
Yes	85 (30.14)
No	197 (69.86)
Declared help from others at place of residence	
Yes	240 (85.11)
No	42 (14.89)
Physical activity at home (leisure, household tasks)	
Yes	59 (20.92)
No	223 (79.08)

Variable	N (%) or mean±SD
Number of comorbidities	7.51±2.89
Number of medications taken	8.23±2.90
BMI	
Underweight	64 (22.70)
Normal body weight	103 (36.52)
Overweight and obesity	115 (40.78)
BBS	36.04±11.97
Low risk of falling	126 (44.68)
High risk of falling	156 (55.32)
Hand grip strength (left hand)	16.42±7.89
Normal	84 (29.79)
Reduced	198 (70.21)
Hand grip strength (right hand)	17.89±7.81
Normal	106 (37.59)
Reduced	176 (62.41)
TUG (seconds)	29.09±23.30
Normal (low fall risk)	133 (47.16)
Abnormal (high fall risk)	149 (52.84)
Walking speed (10MWT, m/s)	0.53±0.25
Normal/average	69 (24.47)
Reduced	213 (75.53)
Lower limb muscle strength (repetitions)	6.22±3.59
Normal	84 (29.79)
Reduced	198 (70.21)

BBS – Berg Balance Scale; BMI – body mass index; SD – standard deviation; TUG – Timed Up and Go; 10MWT – 10-Meter Walk Test.

quantitative variables. The Shapiro-Wilk test was used to assess distribution normality. Because quantitative variables displayed non-normal distributions, Spearman's rank correlation coefficient (for quantitative variables) and the Mann-Whitney U test (for qualitative variables with 2 categories) were used to evaluate associations with disability levels across domains and overall. A linear regression model was utilized to assess the combined effects of variables on disability. Regression coefficients were presented with confidence intervals and corresponding significance levels. The statistical significance threshold was set at $P<0.05$.

Data were analyzed using TIBCO Statistica version 13 (TIBCO Software Inc., 2017; Statistica version 13, http://statistica.io).

Results

Analysis of Sociodemographic, Functional, and Health Status Variables in the Study Cohort

The analysis included 282 participants who met the inclusion criteria (**Figure 1**). The study cohort comprised 64.18% women and 35.82% men, with a mean age of 84.80 years. The majority

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Table 2. Level of disability according to WHODAS 2.0 in the study cohort across individual domains.

Disability domain	Mean WHODAS 2.0 score (95% CI)	SD	None (%)	Mild (%)	Moderate (%)	Severe (%)	Extreme (%)
Domain 1: Cognition	29.17 (26.6-31.73)	21.86	17.38	25.53	35.82	21.28	0.00
Domain 2: Mobility	55.90 (52.98-58.81)	24.90	2.48	8.16	23.40	63.48	2.48
Domain 3: Self-care	27.16 (24.73-29.59)	20.73	13.83	40.78	22.70	22.70	0.00
Domain 4: Getting along	38.24 (35.88-40.60)	20.11	4.61	21.99	31.21	42.20	0.00
Domain 5: Life activities	77.27 (74.58-79.96)	22.95	0.71	2.13	7.80	63.12	26.24
Domain 6: Participation	44.49 (42.40-46.58)	17.84	1.77	11.70	41.84	44.68	0.00
Total WHODAS 2.0 score	44.01 (42.03-45.98)	16.83	0.35	12.41	50.35	36.88	0.00

CI – confidence interval; SD – standard deviation.

of participants were rural residents (76.60%) and were single, including widowed individuals (65.96%). Most participants had not experienced a fall in the preceding year (56.38%) and reported that their living environment was not adapted to their needs and functional abilities (69.86%); however, most had access to assistance from others at their place of residence (85.11%). Overall, 79.08% of participants reported no engagement in physical activity related to household chores. The mean number of comorbid chronic conditions was 7.51, and the mean number of medications taken was 8.23. The largest proportion of participants were overweight or obese (40.78%), whereas the smallest proportion were underweight (22.70%). The mean BBS score was 36.04 points, and most participants (55.32%) had a high risk of falling. Mean hand grip strengths were 16.42 kg for the left hand and 17.89 kg for the right hand; reduced grip strength was observed in the majority of participants (70.21% for the left hand and 62.41% for the right hand). Similarly, reduced lower limb strength was observed in most participants (70.21%), with a mean result of 6.22 repetitions in the sit-to-stand test. Most participants also demonstrated reduced walking speed (75.53%), with a mean gait speed of 0.53 m/s. In the Timed Up and Go test, the majority of participants displayed an increased risk of falls (52.84%), with a mean test result of 29.09 seconds (**Table 1**).

Analysis of Disability Level Using WHODAS 2.0

The highest mean level of disability in the study cohort was observed in Domain 5 – Life Activities, with an average score of 77.27 points. According to the classification of disability levels, 26.24% of participants had extreme problems and 63.12% had severe problems in this domain. The second highest level of disability was observed in Domain 2 – Mobility, with a mean score of 55.90 points. In this domain, 2.48% of participants reported extreme problems, whereas 63.48% had severe problems. The lowest mean score was found in Domain 1 – Cognition (29.17 points). In this domain, the largest proportion of participants (17.38%) reported no problems (**Table 2**).

Analysis of Correlations Between Disability Level on the WHODAS 2.0 Scale and Sociodemographic, Functional, and Health Status Variables

Analysis of correlations between selected sociodemographic factors and disability levels across WHODAS 2.0 domains revealed a significantly higher level of disability among women in the domains of Mobility (P=0.002), Self-care (P=0.001), Getting along (P=0.033), and Participation (P=0.001), as well as the overall disability score (P=0.003), compared with men. A significantly higher level of disability was also observed among widowed and single individuals in the domains of Self-care (P=0.013), Getting along (P=0.015), and Participation (P=0.010), as well as the overall disability score (P=0.031). Experiencing a fall in the preceding year was associated with a significantly higher level of disability across all WHODAS 2.0 domains. Participants who did not engage in physical activity exhibited higher disability levels in the domains of Self-care (P=0.042), Getting along (P=0.015), and Life Activities (P=0.005), as well as the overall disability score (P=0.038). A higher number of comorbidities was associated with increased disability in the Self-care domain (P=0.047). In the study cohort, higher disability levels across all analyzed domains and in the overall WHODAS 2.0 score were significantly associated with worse performance on the Timed Up and Go test and longer time

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Table 3. Relationships between functioning and disability levels according to WHODAS 2.0 and selected sociodemographic factors and functional status parameters.

Variable	Domain 1: Cognition Mean (SD)	Domain 2: Mobility Mean (SD)	Domain 3: Self-care Mean (SD)	Domain 4: Getting along Mean (SD)	Domain 5: Life activities Mean (SD)	Domain 6: Participation Mean (SD)	Total WHODAS 2.0 result Mean (SD)
Age (years)							
80-85	28.33 (20.44)	56.36 (24.68)	26.96 (20.29)	36.74 (19.88)	77.60 (21.63)	44.59 (17.28)	43.75 (16.05)
>85	30.45 (23.94)	55.18 (25.34)	27.48 (21.47)	40.54 (20.33)	76.76 (24.94)	44.33 (18.75)	44.40 (18.03)
P	0.653*	0.721*	0.991*	0.144*	0.991*	0.756*	0.753*
Sex							
Women	30.52 (22.18)	59.22 (24.81)	30.17 (20.88)	40.06 (19.49)	78.67 (23.37)	47.05 (17.90)	46.26 (16.60)
Men	26.73 (21.17)	49.94 (24.05)	21.78 (19.41)	34.98 (20.88)	74.75 (22.07)	39.89 (16.87)	39.96 (16.55)
P	0.186*	**0.002***	**0.001***	**0.033***	0.068*	**0.001***	**0.003***
Place of residence							
Urban	26.44 (23.10)	59.66 (26.02)	28.03 (22.95)	38.76 (22.90)	73.94 (24.11)	44.51 (18.51)	43.87 (18.49)
Rural	30.00 (21.46)	54.75 (24.50)	26.90 (20.05)	38.08 (19.23)	78.29 (22.54)	44.48 (17.68)	44.05 (16.34)
P	0.212*	0.134*	0.983*	0.845*	0.186*	0.912*	0.942*
Education level							
Primary	29.87 (21.96)	56.12 (25.19)	27.40 (19.54)	38.45 (19.76)	78.75 (22.85)	45.66 (17.70)	44.72 (16.63)
Secondary	27.67 (21.70)	55.42 (24.42)	26.67 (23.17)	37.78 (20.95)	74.11 (22.98)	41.99 (17.99)	42.49 (17.25)
P	0.440*	0.818*	0.420*	0.662*	0.074*	0.090*	0.300*
Marital status							
Married	28.54 (20.53)	51.76 (24.48)	22.71 (18.89)	33.94 (18.94)	74.79 (22.71)	41.28 (17.47)	41.00 (15.70)
Widowed/ single	29.49 (22.57)	58.03 (24.91)	29.46 (21.30)	40.46 (20.39)	78.55 (23.03)	46.15 (17.85)	45.56 (17.22)
P	0.918*	0.054*	**0.013***	**0.015***	0.125*	**0.010***	**0.031***
Falls in the last year							
Yes	33.09 (21.42)	59.65 (24.18)	31.63 (21.32)	42.21 (20.21)	80.33 (22.43)	47.53 (16.47)	47.64 (16.13)
No	26.13 (21.79)	52.99 (25.14)	23.71 (19.63)	35.17 (19.55)	74.91 (23.14)	42.14 (18.55)	41.19 (16.87)
P	**0.006***	**0.025***	**0.002***	**0.003***	**0.028***	**0.004***	**0.001***
Adaptation of living environment to functional needs							
Yes	32.35 (22.19)	59.56 (24.02)	28.71 (21.54)	36.96 (22.51)	75.18 (26.80)	45.29 (17.98)	45.32 (17.75)
No	27.79 (21.63)	54.31 (25.17)	26.50 (20.39)	38.79 (19.02)	78.17 (21.09)	44.14 (17.82)	43.44 (16.43)
P	0.087*	0.104*	0.461*	0.453*	0.956*	0.572*	0.390*

Table 3 continued. Relationships between functioning and disability levels according to WHODAS 2.0 and selected sociodemographic factors and functional status parameters.

Variable	Domain 1: Cognition Mean (SD)	Domain 2: Mobility Mean (SD)	Domain 3: Self-care Mean (SD)	Domain 4: Getting along Mean (SD)	Domain 5: Life activities Mean (SD)	Domain 6: Participation Mean (SD)	Total WHODAS 2.0 result Mean (SD)
Declared help from others at place of residence							
Yes	29.15 (22.32)	54.84 (25.18)	26.83 (20.74)	37.36 (20.11)	77.58 (23.20)	44.15 (17.89)	43.61 (17.10)
No	29.29 (19.27)	61.90 (22.59)	29.05 (20.81)	43.25 (19.59)	75.48 (21.66)	46.43 (17.64)	46.25 (15.22)
P	0.842*	0.102*	0.512*	0.073*	0.447*	0.450*	0.311*
Physical activity at home (leisure, household tasks)							
Yes	27.71 (21.90)	51.91 (26.75)	22.54 (20.22)	32.77 (20.75)	67.80 (28.35)	41.45 (21.14)	39.96 (18.42)
No	29.55 (21.89)	56.95 (24.34)	28.39 (20.73)	39.69 (19.73)	79.78 (20.65)	45.29 (16.82)	45.08 (16.26)
P	0.546*	0.270*	**0.042***	**0.015***	**0.005***	0.137*	**0.038***
Number of medications taken	-0.03	0.06	0.05	0.02	-0.05	-0.05	-0.01
P	0.639**	0.314**	0.365**	0.782**	0.440**	0.398**	0.822**
Number of comorbidities	-0.01	0.05	0.12	0.03	-0.02	0.05	0.05
P	0.917**	0.425**	**0.047****	0.570**	0.797**	0.359**	0.444**
BMI	-0.09	-0.03	-0.01	-0.04	-0.07	-0.02	-0.07
P	0.133**	0.589**	0.809**	0.454**	0.226**	0.694**	0.240**
BBS	-0.19	-0.31	-0.24	-0.20	-0.24	-0.26	-0.30
P	**0.002****	**<0.001****	**<0.001****	**0.001****	**<0.001****	**<0.001****	**<0.001****
Hand grip strength (left hand)	-0.17	-0.16	-0.23	-0.17	-0.21	-0.17	-0.23
P	**0.004****	**0.008****	**<0.001****	**0.004****	**<0.001****	**0.004****	**<0.001****
Hand grip strength (right hand)	-0.15	-0.19	-0.22	-0.16	-0.19	-0.19	-0.22
P	**0.009****	**0.001****	**<0.001****	**0.008****	**0.001****	**0.001****	**<0.001****
TUG	0.16	0.30	0.26	0.18	0.27	0.25	0.29
P	**0.008****	**<0.001****	**<0.001****	**0.003****	**<0.001****	**<0.001****	**<0.001****
10MWT	0.38	0.73	0.67	0.49	0.54	0.61	0.70
P	**<0.001****	**<0.001****	**<0.001****	**<0.001****	**<0.001****	**<0.001****	**<0.001****
Lower limb muscle strength	-0.16	-0.31	-0.26	-0.17	-0.24	-0.23	-0.28
P	**0.008****	**<0.001****	**<0.001****	**0.005****	**<0.001****	**<0.001****	**<0.001****

BBS – Berg Balance Scale; BMI – body mass index; SD – standard deviation; TUG – Timed Up and Go; 10MWT – 10-Meter Walk Test.
* Mann-Whitney U test; ** Spearman's rank correlation coefficient.

Table 4. Factors associated with the level of disability (linear regression analysis).

	B	SE	(95% CI)	P
Domain 1: Cognition				
Falls in the last year#	**-2.643**	**1.297**	**(-5.196 -0.089)**	**0.043**
BBS	-0.156	0.178	(-0.506 0.194)	0.381
Hand grip strength (right hand)	0.052	0.294	(-0.527 0.631)	0.859
Hand grip strength (left hand)	-0.226	0.287	(-0.791 0.340)	0.433
10MWT	**0.287**	**0.048**	**(0.192 0.383)**	**<0.001**
Lower limb muscle strength	0.298	0.615	(-0.914 1.509)	0.629
Domain 2: Mobility				
Sex*	-0.973	1.734	(-4.386 2.441)	0.575
Falls in the last year#	-2.007	1.337	(-4.640 0.626)	0.135
BBS	-0.239	0.183	(-0.600 0.122)	0.193
Hand grip strength (right hand)	-0.116	0.316	(-0.739 0.507)	0.713
Hand grip strength (left hand)	0.101	0.301	(-0.492 0.695)	0.737
10MWT	**0.455**	**0.050**	**(0.357 0.554)**	**<0.001**
Lower limb muscle strength	-0.341	0.634	(-1.588 0.907)	0.592
Domain 3: Self-care				
Sex*	-0.454	1.524	(-3.454 2.546)	0.766
Marital status**	1.010	1.230	(-1.413 3.432)	0.413
Falls in the last year#	**-2.966**	**1.101**	**(-5.133 -0.800)**	**0.007**
Physical activity at home##	1.136	1.308	(-1.439 3.711)	0.386
Number of comorbidities	-0.289	0.374	(-1.025 0.446)	0.439
BBS	-0.008	0.151	(-0.305 0.288)	0.957
Hand grip strength (right hand)	0.119	0.260	(-0.394 0.631)	0.649
Hand grip strength (left hand)	-0.150	0.249	(-0.64 0.341)	0.548
10MWT	**0.402**	**0.041**	**(0.321 0.483)**	**<0.001**
Lower limb muscle strength	-0.538	0.529	(-1.579 0.504)	0.311
Domain 4: Getting along				
Sex*	2.164	1.622	(-1.028 5.356)	0.183
Marital status**	2.181	1.326	(-0.429 4.791)	0.101
Falls in the last year#	**-2.503**	**1.188**	**(-4.843 -0.164)**	**0.036**
Physical activity at home##	2.568	1.408	(-0.205 5.340)	0.069
BBS	-0.078	0.163	(-0.398 0.243)	0.634
Hand grip strength (right hand)	-0.005	0.281	(-0.558 0.548)	0.986
Hand grip strength (left hand)	-0.353	0.267	(-0.879 0.173)	0.187

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Table 4 continued. Factors associated with the level of disability (linear regression analysis).

	B	SE	(95% CI)		P
10MWT	**0.260**	**0.044**	**(0.173**	**0.347)**	**<0.001**
Lower limb muscle strength	0.386	0.564	(-0.725	1.496)	0.494
Domain 5: Life activities					
Falls in the last year#	-1.762	1.340	(-4.400	0.876)	0.190
Physical activity at home##	**4.507**	**1.592**	**(1.372**	**7.642)**	**0.005**
BBS	0.010	0.184	(-0.351	0.372)	0.955
Hand grip strength (right hand)	0.282	0.304	(-0.316	0.880)	0.355
Hand grip strength (left hand)	-0.410	0.297	(-0.994	0.174)	0.168
10MWT	**0.295**	**0.050**	**(0.197**	**0.393)**	**<0.001**
Lower limb muscle strength	-0.404	0.639	(-1.662	0.854)	0.528
Domain 6: Participation					
Sex*	-1.122	1.361	(-3.802	1.559)	0.411
Marital status**	0.380	1.111	(-1.807	2.566)	0.733
Falls in the last year#	-1.884	0.998	(-3.848	0.080)	0.060
BBS	-0.145	0.137	(-0.413	0.124)	0.290
Hand grip strength (right hand)	-0.077	0.236	(-0.542	0.388)	0.744
Hand grip strength (left hand)	0.059	0.224	(-0.383	0.500)	0.794
10MWT	**0.311**	**0.037**	**(0.238**	**0.385)**	**<0.001**
Lower limb muscle strength	0.142	0.471	(-0.785	1.069)	0.763
Total WHODAS 2.0 result					
Sex*	0.423	1.205	(-1.949	2.795)	0.726
Marital status**	0.419	0.985	(-1.521	2.358)	0.671
Falls in the last year#	**-2.287**	**0.883**	**(-4.025**	**-0.548)**	**0.010**
Physical activity at home##	0.954	1.046	(-1.106	3.014)	0.363
BBS	-0.118	0.121	(-0.356	0.12)	0.331
Hand grip strength (right hand)	-0.022	0.209	(-0.433	0.389)	0.916
Hand grip strength (left hand)	-0.147	0.199	(-0.537	0.244)	0.461
10MWT	**0.335**	**0.033**	**(0.270**	**0.400)**	**<0.001**
Lower limb muscle strength	0.002	0.419	(-0.823	0.827)	0.996

B – regression coefficient (intercept); CI – confidence interval; SE – standard error. * Reference category: men; ** Reference category: married; # Reference category: yes (fall occurred); ## Reference category: yes (physical activity present).

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to complete the 10MWT. Lower disability levels were associated with higher BBS scores, greater hand grip strength in both hands, and greater lower limb strength according to the 30-Second Sit-to-Stand Test (**Table 3**).

Linear Regression Analysis of Factors Associated With Disability Level

Factors exhibiting statistically significant associations with disability levels in specific domains were included in the linear regression model. Due to a positive correlation between Timed Up and Go results and the 10MWT, the 10MWT variable was included in the model.

The analysis showed that lack of physical activity at home was associated with a statistically significant increase of 4.507 points in Domain 5 (Life Activities). Participants who had not experienced a fall in the year preceding the study had lower disability levels by 2.643 points in Domain 1 (Cognition), 2.966 points in Domain 3 (Self-care), 2.503 points in Domain 4 (Getting along), and 2.287 points in the overall WHODAS 2.0 score. Additionally, each 1-second increase in time to complete the 10MWT was associated with a statistically significant increase in disability across all analyzed domains and in the overall WHODAS 2.0 score (**Table 4**).

Discussion

Population aging in Poland, a major demographic challenge, is also evident in southeastern Poland. According to statistical projections, by 2050, more than 129 000 individuals aged 80 and over will reside in the Podkarpacie region [31]. The high burden of coexisting health conditions in this age group results in frequent need for inpatient care. Comprehensive inpatient care for the oldest age groups is provided by geriatric wards [32]. According to regional healthcare statistics in the Podkarpackie Voivodeship, only 38.8% of patients in the oldest age groups completed treatment in a geriatric ward. For most patients, discharge is associated with recommendations for continued treatment, care, and rehabilitation [18,33]. In many cases, continuity of care and rehabilitation is provided through community-based rehabilitation services. Optimization of community-based rehabilitation services requires precise assessment of the rehabilitation needs of older adults in the community [34].

Previous research has indicated that the functional status of older adults during hospitalization is an important determinant of subsequent medical and care needs after discharge [35,36]. Healthcare experts report that the current geriatric care system in Poland remains inadequate. A major challenge is the lack of clearly defined systemic solutions targeting individuals in the oldest age groups, both during and after hospitalization, to support the maintenance of functional independence [37]. Effective recommendations require reliable data concerning the level of disability and its associated factors in this population. Such data are essential for efforts to identify health, rehabilitation, and care needs, as well as the development of clinical prediction rules that incorporate simple and accessible diagnostic and therapeutic strategies with the potential to support prolonged functional independence in the oldest age groups. Targeted recommendations are particularly important for individuals aged 80 years and over, given that previous studies have demonstrated a substantially higher risk of hospital-associated disability in this group compared with younger cohorts [38].

The present study showed that the highest disability levels on the WHODAS 2.0 scale were observed in the Life Activities and Mobility domains. Similar findings were documented by Salm et al, who used WHODAS 2.0 to assess disability levels among older adults attending the inpatient and outpatient departments of a university clinic in Germany [39]. Likewise, Rashvand et al reported the highest disability levels in the Life Activities and Mobility domains among hospitalized older adults [40]. However, both studies demonstrated a lower overall level of disability compared with the present study. The domains with the highest disability levels (Life Activities and Mobility) in the present study are consistent with findings from studies of older adults living in various settings; however, the severity of impairment in these domains appears to be substantially greater among hospitalized patients [13,41]. This severity finding may be related to the generally worse health status of individuals during hospitalization, which can affect both mobility and the ability to perform daily activities; it may also be related to the specific conditions associated with hospital care. Johansen et al reported that older patients spend more than 22 hours per day in a sitting or lying position during hospitalization and approximately 1 hour engaged in walking or standing activities, averaging fewer than 1200 steps per day. Patients attributed this sedentary behavior to fear of moving in narrow and confined corridors, as well as the lack of structured activities promoting mobility during the day [42]. Such findings highlight the need to adapt the physical environment of geriatric wards to support safe, spontaneous mobility as a strategy to counteract mobility decline during hospitalization. Furthermore, they underscore the importance of engaging patients in simple physical activities during hospitalization. When appropriately tailored, physiotherapeutic activities can improve balance and muscle strength, increase motivation for spontaneous movement, and reduce kinesiophobia [43,44].

Our study demonstrated that lack of physical activity was significantly associated with increased disability in the Life Activities domain. Similar conclusions were reported by Lau

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et al [45] and Wang et al [46]. However, previous studies indicate that the proportion of individuals in the oldest age groups who engage in physical activity remains low and declines further with advancing age [47-49]. Multiple studies have demonstrated the beneficial effects of moderate physical activity on limb muscle strength, grip strength, motor coordination, and cognitive performance in this population, as well as its association with improved performance of daily activities requiring planning and memory (eg, laundry and cooking) [50,51]. The main barriers to physical activity among older adults include the need for assistance during transfers, fear of falling, and low confidence in motor abilities, all of which may further increase disability in daily functioning [52]. Additionally, as noted by Liu et al, individuals in the oldest age groups do not always associate structured exercise performed in a gym setting with improvements in daily functioning at home; exercise programs incorporating task-oriented functional activities (eg, position changes, carrying objects, simulated vacuuming, and hanging laundry) may enhance engagement and yield greater functional benefits [53]. A key systemic strategy to support physical activity in this population should include the provision of safe conditions for exercise, considering environmental adaptations and external support both during hospitalization and after discharge, including at home or in rehabilitation and care facilities.

Our study also revealed that individuals who had not experienced a fall in the year preceding the study had lower levels of disability in the domains of Self-care and Getting along, as well as the overall disability score; a statistically significant association was also detected for the Cognition domain. Current evidence indicates that falls are a common problem among hospitalized older adults, with a higher incidence than in the general population [54,55]. Kobayashi et al reported that fall risk is highest in individuals aged over 80 years, who are also most susceptible to serious fall-related injuries, thereby increasing the risk of disability in daily functioning [56]. Studies conducted in China have shown that the negative impact of hospitalization on fall risk and subsequent dependence in self-care is particularly pronounced when hospital stays exceed 20 days [57,58]. This may be explained by prolonged reductions in physical activity during hospitalization, which contribute to declines in muscle strength, balance, and coordination, thereby increasing fall risk and dependence on others [59]. Furthermore, older adults who experience a fall during hospitalization require substantially greater support from family caregivers or formal care services to regain independence in daily functioning and self-care relative to older adults who do not experience a fall [60,61]. A meta-analysis by Naseri et al demonstrated that individuals in the oldest age groups with increased fall risk after hospitalization require targeted support in the form of home-based programs aimed at maintaining mobility and independence. These programs should include regular physiotherapist supervision over an extended period to ensure safety and adherence. Standard fall prevention exercise programs implemented shortly after hospitalization may be ineffective or even increase fall risk in this population [62]. Such findings highlight the need for systemic solutions to ensure continuity of physiotherapist-led support for older adults after hospital discharge.

In the present study, worse mobility – reflected by longer time to walk 10 m – represented a factor that significantly increased disability across all WHODAS 2.0 domains, as well as the overall disability score. Similar findings were reported by Shimada et al, who demonstrated that older adults with reduced walking speed have a significantly higher risk of developing disability relative to older adults with normal walking speed [63]. Previous studies have shown that reduced mobility and gait speed in older adults are associated with increased risks of disability in activities of daily living [64], cognitive decline [65], depression [66], and frailty [67]. The importance of gait speed assessment in the oldest age groups is underscored by its designation as the "sixth vital sign", reflecting its value in predicting future health deterioration [68]. Studenski and Abellan van Kan et al emphasized that mobility is a key component of disability and is strongly associated with post-hospitalization outcomes, including the likelihood of nursing home placement [69,70]. Furthermore, Studenski et al identified walking speed as an important predictor of mortality in older adults. Gait speed monitoring may help identify individuals with a higher probability of 5- to 10-year survival, as well as those with increased mortality risk, particularly when walking speed is below 0.6 m/s [71].

The present study focused on a specific population of hospitalized individuals aged 80 years and older, who often differ from younger cohorts in terms of health status and functional capacity. Martinez et al noted that walking speed physiologically declines with age; however, statistically significant differences were observed only between individuals aged 80 years and older and those aged 70 to 79 years, whereas no significant differences arose among younger older-age cohorts [72]. These findings highlight the importance of using the present data to develop targeted recommendations for mobility monitoring among individuals in the oldest age groups.

Because gait speed assessment is a simple and quick test that does not require specialized equipment or space, it should be routinely performed in all facilities providing geriatric care. Although it cannot replace a comprehensive geriatric assessment, gait speed assessment may serve as a valuable screening tool for the early identification of patients with high risks of hospital- or post-hospitalization disability, even prior to comprehensive geriatric assessment [73]. This approach may facilitate earlier implementation of individualized rehabilitation programs during hospitalization.

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Limitations

This study has some important limitations. First, its cross-sectional design limits the analysis to a single time point; therefore, the observed associations only apply to the period of hospitalization in the geriatric ward. Longitudinal studies are needed to evaluate changes in disability over time in relation to the duration of hospitalization and the extent of support received during and after discharge. Second, individuals with advanced cognitive impairment were excluded because disability in this population cannot be assessed using WHODAS 2.0. Consequently, the overall level of disability in the study cohort may have been underestimated. Future studies should consider incorporating objective assessment tools that allow the inclusion of individuals with advanced cognitive impairment.

Strengths and Practical Implications

This study provides important information about the level of disability among the oldest-old individuals undergoing hospitalization and identifies domains that require targeted support to enhance independence during and after hospital stay. Such information is particularly relevant given the specific health profiles and increased risk of hospital-associated disability in this population. The study also addresses a gap in current knowledge because demographic projections indicate a rapid increase in the population aged 80 years and over in Poland, but data concerning disability levels in hospitalized individuals within this group remain limited. Key practical recommendations for clinicians include the routine assessment of mobility and gait speed as an initial step prior to comprehensive geriatric assessment in geriatric wards. This approach may facilitate earlier identification of high-risk individuals and enable timely implementation of targeted interventions to support mobility and reduce the risk of hospital-associated disability.

Conclusions

In the study cohort of individuals aged 80 years and over hospitalized in a geriatric ward, the level of disability was high; the greatest impairment was observed in the domains of Life Activities and Mobility. Significant associations were identified regarding disability levels with selected health status and functional parameters. Longer time to walk 10 m was the strongest factor associated with increased disability, showing significant relationships across all WHODAS 2.0 domains. These findings highlight the need for systematic mobility monitoring in hospitalized older adults, using simple and cost-effective tools such as the 10MWT. They also support the implementation of strategies to promote mobility, both during hospitalization and after discharge. Such strategies may include environmental adaptations to facilitate safe movement and tailored exercise programs. These measures may help to reduce disability, maintain independence in daily functioning, extend life expectancy, and decrease the burden on healthcare and long-term care systems in southeastern Poland.

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Patient Consent

Informed consent was obtained from all study participants.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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