KEMAS 20 (3) (2025) 612-618

Jurnal Kesehatan Masyarakat

http://journal.unnes.ac.id/nju/index.php/kemas

Changes Physical Activities of Daily Living Elderly Individuals Involved in Interdisciplinary Care

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Article Info

Article History:
Submitted March 2024
Accepted January 2025
Published January 2025

Keywords:
elderly;
interdisciplinary;
physical
activities of daily living

DOI
https://doi.org/10.15294/kemas.v20i3.2679

Abstract

The populations of all countries, including Indonesia, are aging, leading to an increasing elderly population with a greater number of health issues and comorbidities. The aim was to determine whether involvement in an interdisciplinary care program can help elderly individuals maintain physical activities of daily living. It was a quantitative longitudinal study with a quasi-experimental one-group pretest–posttest design. Fifteen participants were included, and one participant died before the 6-month follow-up. The Indonesian version of the Barthel Index was used to measure physical activities of daily living (PADLs) before and at one, three, and six months after the intervention. Linear regression models using the generalized estimating equation approach were used to determine significant PADLs changes and predictive factors. The mean total PADL score at T1, T2, and T3 increased significantly compared to that at T0 ($p<.001$). Age ($\beta=-0.33$; $p=.001$), diabetes mellitus ($\beta=-2.16$; $p=.001$), stroke ($\beta=-5.78$; $p=.001$) and congestive heart failure ($\beta=-10.68$; $p=.001$) were the strongest predictors of PADLs. Interdisciplinary team care may help elderly individuals maintain PADLs. The risk factors for PADLs deterioration were old age and comorbidities, including diabetes mellitus, stroke, and heart failure. A subsequent investigation of homogeneous participants with a control group is suggested for future studies.

Introduction

The Aging phenomena and degenerative health problems are increasing worldwide (Maresova *et al*., 2019). Studies have reported that age-related declines in physical function are associated with complex health problems in old age (Saadeh *et al*., 2020). Age-related physiological changes include reduced acuity of the senses (vision and hearing), a high risk for hypertension, a slow reaction time, impaired balance, loss of bone density, functional deterioration, cognitive impairment, and multiple chronic conditions (Jaul & Barron, 2017). Elderly patients with multiple health problems often experience disease complications and functional failure and perceive health services as complex and challenging to understand; therefore, they need support from healthcare professionals to ensure the continuity of services (Kumlin *et al*., 2020).

Long-term services, including those providing help with bathing, eating, dressing, and other everyday tasks, are needed for the old. Long-term services and support are provided in nursing homes, assisted living facilities, people's homes, and other settings (Heiks & Sabine, 2022). Aging people can have complex health problems involving physical and mental degeneration. Thus, interdisciplinary care is suggested for this vulnerable population. Interdisciplinary care involves a professional health team that processes, shares, and works together to solve health problems (Codispoti *et al*., 2004). Long-term care with a

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pISSN 1858-1196
eISSN 2355-3596

comprehensive approach is recommended for the elderly with complex health problems. A study showed that long-term interdisciplinary care is recommended as a method to enhance patient and family support systems concerning chronic healthcare management (Wantonoro *et al*., 2023).

Studies have shown that multidimensional health care for frail elderly patients is most effectively provided by interdisciplinary health care teams (Wieland *et al*., 1996). In addition, long-term interdisciplinary care has improved the health of patients with chronic diseases (Wantonoro *et al*., 2023). Considerable regional disparities exist in terms of health status; the quality, availability, and capacity of health services; and demographic and cultural characteristics in Indonesia. Therefore, an investigation of home-based interdisciplinary care approaches for elderly individuals is needed. The objective of the present study was to determine the effect of interdisciplinary home care on the trend of physical activities of daily living (PADLs) among elderly individuals.

Method

It was a quantitative longitudinal study (6 months) with a quasi-experimental one-group pretest–posttest design. Participants were recruited using a convenience sampling approach between April and May 2023 and followed up until October 2023; this approach was recommended by nurses in the hospital home care unit. Fifteen elderly patients with physical activity problems in Yogyakarta, Indonesia, were included and followed for 6 months to evaluate the effect of interdisciplinary team involvement.

The inclusion criteria were as follows: 1) elderly patients (60 years old or older); 2) patients with physical activity problems (including *stroke patients in the rehabilitation phase, diabetes mellitus patients, severe hypertension patients, and congestive heart failure patients);* and 3) patients living in a rural area. Elderly patients with long-term care needs who were dependent and had cognitive impairments (dementia) based on their medical records were excluded from this study. This study was approved by the Health Research Ethics Committee at Universitas 'Aisyiyah in Yogyakarta, Indonesia (No. 2748/KEP-UNISA/IV/2023). All participants provided written informed consent before receiving interdisciplinary home care.

All participants received 6 months of interdisciplinary care and education regarding their daily needs. Specific individual help and education were provided by professional nurses, physiotherapists, and nutritionists via face-to-face demonstrations. All professionals participated in the intervention for 6 months, and education was provided for each patient via face-to-face home care interactions twice a week. We screened each patient to assess their individual needs and determined interventions based on these needs. The professional nurses, physiotherapists, and nutritionists collaborated and discussed the care needed. The description of the intervention was based on individual patient needs. The professional nurses, physiotherapists, and nutritionists discussed and collaborated regarding the following: diabetes care, including foot exercises, exercises for *congestive heart failure*, exercises for stroke, range of motion exercises, decubitus prevention, blood pressure, and glucose control; endurance exercises, including walking and working with balls or balloons; strength exercises, including 10 repetitions in 3 sets; arm exercises, including push-ups in chairs, weight lifting, and water bottle and pulley exercises; hip and leg exercises, including ordinary knee flexion/extension, walking stairs, and steps; leg and feet exercises, including toe and heel rises on the floor and steps; and nutritional needs based on patient needs. All education and any necessary equipment were provided free of charge.

Data were collected using the self-reported Indonesian version of the Barthel Index before, at one, three, and six months after the intervention (T0, T1, T2, and T3, respectively). The Indonesian version of the Barthel Index is a weighted ordinal scale assessing 10 items: bathing and grooming (scores of 0 and 1); eating, dressing, bowel control, bladder control, toileting, and climbing stairs (scores of 0, 1, and 2); and transferring and walking (scores of 0, 1, 2 and 3). The total score (0 to 20) was obtained for the overall scale, with a higher score indicating better function. The reliability and validity of

the Barthel Index in Bahasa, Indonesia, have been tested; the internal consistency was found to have a Cronbach's alpha of 0.938 (Agung, 2006).

The data were analyzed using SPSS for Windows Version 18.0 (SPSS, Inc., Chicago, IL, USA). Linear regression models using the generalized estimating equation (GEE) approach (Liang & Zeger, 1993) were used to determine significant outcomes of trends in physical activities of daily living (PADLs) among elderly individuals before the intervention (T0=baseline) and at 1 month (T1), 3 months (T2), and 6 months (T3) after the intervention. In Model 1, the influence of time on outcomes was assessed by entering PADL scores for the four-time points (T0, T1, T2, and T3). In Model 2, the influence of time and personal variables as predictors of the functional status of PADLs was evaluated; the variables included age, sex, education level, and types of comorbidities.

Result And Discussion

Fifteen participants were included in this research, and one participant died before the 6-month follow-up. Ultimately, 14 participants with a mean age of 66.21 years (SD: 4.72) completed the questionnaires at T3. There were 4 male participants (26.7%) and 11 female participants (73.3%). Regarding education level, most participants had an elementary school education (7 participants; 46.7%), followed by a high school education (6 participants; 40%), junior high school education (1 participant; 6.7%), and a bachelor's degree (1 participant; 6.7%). Regarding comorbidities, 4 people had DM (26.6%), 3 people had had a stroke (20%), 5 people had hypertension (33.3%), and 3 people had congestive *heart failure* (20%) (Table 1).

The PADL subscale scores at T0, T1, T2, and T3 are shown in Table 2. The mean total PADL scores at T1, T2, and T3 increased significantly compared to those at T0 ($p<.001$), as shown in Table 3. In addition, all the mean PADL subscale scores increased; the lowest was for the climbing stairs subscale (Figures 1a and 1b). Variables that significantly affect changes in total PADL scores were examined using GEE analysis (Table 3). Age (β=-0.33; $p=.001$), diabetes mellitus status (β=-2.16; $p=.001$), stroke status (β=-5.78; $p=.001$), *and congestive heart failure* status (β=-10.68; $p=.001$) significantly affect PADLs, with hypertension as the baseline for comorbidities. Education level and sex did not significantly influence PADLs.

The world's population is aging,

Table 1. Sample Characteristics

Characteristics	Frequency (f) Mean (SD)	Percentage (%)
Age	66.21 (4.72)	
60-69 years	10	66.6
>70 years	5	33.3
Sex		
Male	4	26.7
Female	11	73.3
Education		
Elementary School	7	46.7
Junior High School	1	6.7
Senior High School	6	40.0
Diploma/Bachelor's degree	1	6.7
Disease		
Diabetes mellitus	4	26.6
Stroke	3	20
Hypertension	5	33.3
Congestive heart failure	3	20
Total	15	100.0

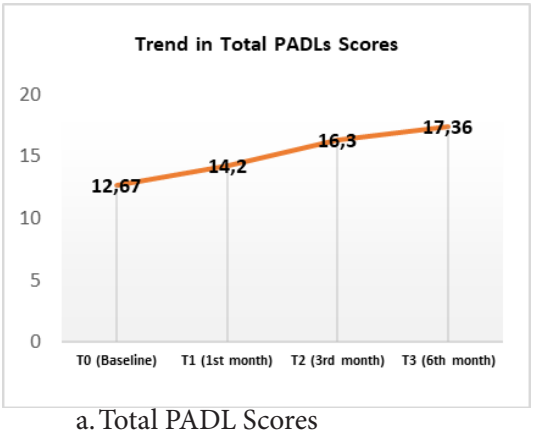
Table 2. Mean Total and Subscale Scores for PADL Status Before (T0=baseline) and 1 Month (T1), 3 Months (T2), and 6 Months (T3) Following Interdisciplinary Care and Changes in Scores from T0 by GEE Analysis

Functional Status	T0 (n=15) Mean (SD)	T1 (n=15) (mean, SD)	T2 (n=14) (mean, SD)	T3 (n=14) (mean, SD)
Total PADL score (range: 0-20)	12.67 (6.10)	14.20 (5.79)	16.3 (4.71)	17.36 (3.24)
Subscales				
Eating	1.53 (0.74)	1.60 (0.73)	1.64 (0.74)	1.85 (0.36)
Bathing	0.60 (0.50)	0.80 (0.41)	1.00 (0.00)	1.00 (0.00)
Grooming	0.86 (0.35)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
Dressing	1.40 (0.82)	1.53 (0.63)	1.64 (0.49)	1.64 (0.00)
Bowel control	1.53 (0.74)	1.66 (0.61)	1.85 (0.36)	1.85 (0.36)
Bladder control	1.53 (0.74)	1.66 (0.48)	1.85 (0.36)	1.85 (0.36)
Toileting	0.86 (0.63)	1.73 (1.16)	1.64 (0.63)	1.78 (0.42)
Transfer	1.40 (1.12)	1.73 (1.16)	2.00 (1.30)	2.28 (0.91)
Mobility	1.80 (1.27)	2.00 (1.13)	2.50 (0.85)	2.50 (0.85)
Climbing stairs	1.13 (0.74)	0.93 (0.70)	1.21 (0.80)	1.57 (0.64)

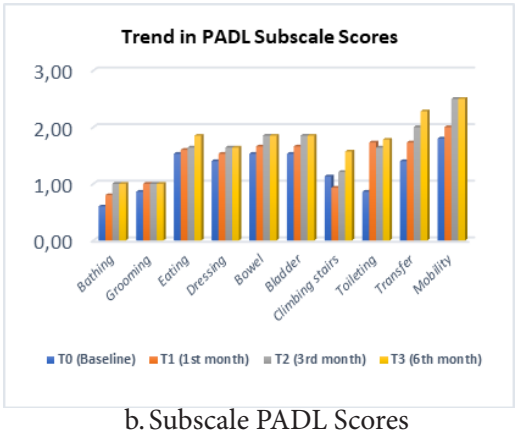
Table 3. Linear Regression with GEE for Models with Significant Predictors of Changes in PADL Functional Status

Variables	PADLs			
	β	95% CI		*p*
		Lower	Upper	
Model 1 (time)				
T0 vs. T1	1.53	0.61	2.45	.001
T0 vs. T2	3.33	2.26	4.39	.001
T0 vs. T3	4.36	2.68	6.04	.001
T1 vs. T2	1.85	1.05	2.64	.001
T2 vs. T3	1.00	0.13	1.86	.02
Model 2 (time x personal variables)				
Age	-0.33	-0.60	-0.07	.01
Sex	0.35	-1.10	1.80	.63
Education	-0.52	-2.69	1.63	.63
Comorbidities				
Diabetes mellitus	-2.16	-3.26	-1.07	.001
Stroke	-5.78	-8.51	-3.04	.001
Congestive heart failure	-10.68	-12.37	-8.99	.001

Note. GEE = generalized estimating equation; PADLs = physical activities of daily living; CI = confidence interval; T0 = before the intervention (n= 15); T1=1 month (n=15); T2 = 3 months (n=14); T = 6 months (n=14); hypertension as baseline for comorbidities



a. Total PADL Scores



b. Subscale PADL Scores

Figure 1. Total Scores and Subscale Scores for Physical Activities of Daily Living

and the incidence of chronic diseases and comorbidities is increasing. The functional, psychosocial, and nutritional status of older adults should be prioritized by healthcare providers (Canaslan *et al*., 2022). To evaluate long-term interdisciplinary care, this study included professional nurses, physiotherapists, and nutritionists who performed home visits during a 6-month follow-up. This study showed that home-based interdisciplinary team care may improve the overall PADLs of elderly individuals (elderly individuals with hypertension, stroke, diabetes, and *congestive heart failure*). This study included several professionals (nurses, physiotherapists, and nutritionists). Whereas a previous study reported that an integrated multidisciplinary program did not affect the daily activities of older stroke patients; however, the program in the present study showed some benefit of providing adequate care, although the difference was not statistically significant. An adaptation of the program is recommended to increase its feasibility and improve its effects (Vluggen *et al*., 2021). Home-based therapy can slow deterioration and improve the performance of activities of daily living among stroke patients; this might be an alternative approach for stroke patients who require long-term management (Pui Kei *et al*., 2020). Another study confirmed that a multidisciplinary intervention approach was effective in controlling blood pressure in elderly hypertensive patients (Woodham *et al*., 2020), and another study confirmed that family-based intervention programs were effective in improving glycemic control and wound healing, including in older people (Wuri Kartika *et al*., 2021).

This study confirmed the predictive factors for deterioration in physical activities of daily living for elderly individuals. Age, diabetes mellitus status, stroke status, *and congestive heart failure status* significantly influenced PADLs. This study showed that age and comorbidities were predictive factors for deterioration in PADLs among the elderly. Older age and an increasing number of comorbidities are independent predictors of in-hospital mortality for affected patients (Imam *et al*., 2020). Older age reduces physical and psychological competency and increases the risk for worse cognitive impairment and multiple chronic conditions (Jaul & Barron, 2017), increasing the complexity of healthcare provision and interventions (Singh et al., 2018). Elderly individuals become partially or fully dependent on other people (caregivers) and their physical and social environment. Moreover, PADL impairment is common among older patients with *congestive heart failure* and is associated with an increased risk of hospital readmission (Nguyen *et al*., 2021). Impairments in the physical dimension, especially fatigue and shortness of breath, were most common (Franzén *et al*., 2006). Elderly patients with *congestive heart failure* often complain of greater limitations when performing activities of daily living (Paneroni *et al*., 2021).

Education regarding long-term interdisciplinary care for family caregivers has been recommended to improve patient and

caregiver performance across sex, age, education level, and chronic disease status (Wantonoro *et al*., 2023). The key interdisciplinary feature of such a team is that members work together in the assessment and treatment of patients, including joint decision-making and goal-setting (Singh *et al*., 2018). Successful interdisciplinary long-term care for patients with multimorbidity requires the integration, understanding, and recognition of the interdependency of all individuals involved, including patients and family caregivers (Doornebosch *et al*., 2022). One study reported the need to revitalize long-term interdisciplinary care through interdisciplinary care practices, the clarification of role descriptions, optimized staffing, capacity building for all staff members, and commitment from all participants (Vellani *et al*., 2022). The sustainability of long-term interdisciplinary care requires innovation in individual, professional, patient, social, organizational, economic, and political contexts (De Coninck *et al*., 2023). Limitations of this study**:** This was an interdisciplinary home-based longitudinal study; thus, several limitations, such as the limited number of participants with normality distribution issues, the heterogeneous long-term care patients included in this study, and the lack of a comparison group, must be considered when interpreting the results.

Conclusions

Home-based interdisciplinary team care may maintain help elderly individuals maintain PADLs. Older age and the presence of comorbidities such as diabetes mellitus, stroke, *and congestive heart failure* were predictive of a worse prognosis regarding PADLs in elderly patients. Based on these limited results, the interdisciplinary team approach seems to help to prevent PADL deterioration. A subsequent investigation with homogeneous participants and a control group is suggested for future studies.

Acknowledgment

This study was funded by the Universitas 'Aisyiyah Yogyakarta Research Funding Program 2022-2023.

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