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エビデンスに基づいたロコモティブシンドロームの対策における簡便な確認・介入方法の確立と普及啓発体制の構築に資する研究（19FA1017）

【疫学研究】

The Simple Mobility Tests Can Predict Usage of Assistive Device for Ambulation in Older People

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Abstract

Background: Assistive devices for ambulatory (ADA) are commonly administrated to improve mobility and gait independence. Non-healthcare providers, such as caregivers and family members, typically determine ADA usage. However, improper prescribing of ADA leads to poor patient outcomes. A simple screening test identifying the need for ADA that offers referrals to physical therapists (PT) for comprehensive evaluations will help non-healthcare providers properly prescribe ADA. ***Purpose/Objectives:*** Our purpose was to find the test that best predicts ADA and non-ADA using elderly patients in independent community-dwelling centers versus assistant-care beneficiaries.

Methods: A total of 85 older adults (81.6±8.2 years old) who underwent outpatient physical therapy participated in this study. They participated in a series of tasks to assess numeric pain scales, including Timed and Up and Go, handgrip, quadriceps strength, the 30-second Chair Rise Test, 5-meter fast gait speed, functional independence measure, and the Locomotive Syndrome Tests (Stand up test, 2-step test (2ST), and the Locomo-5 questionnaire). Mann-Whitney U tests were used to differentiate between ADA users and non-users. A logistic regression analysis was applied to examine which test best predicted ADA use for each clinical assessment. ***Results:*** A total of 80% of participants (n=68) used ADA. There were significant differences in all test variables between ADA and non-users (P=0.033-P<0.001), except for quadriceps strength, age, and pain (all P>0.05). A logistic regression analysis identified only 2ST was associated with the prediction equation (P=0.048), with a cut-off value of 93% of body height (Sensitivity: 72%, Specificity: 82%).***Discussion:*** Our results successfully showed that the selected measures could differentiate between physical function, balance, and ADL independence between ADA users and non-users. Only 2ST could predict the status of using ADA with the clinical threshold as 93% of body height. ***Conclusions:*** Our study showed that if comprehensive clinical evaluations are not available, the ability to make two large steps longer than 93% of body height can predict ADA usage. The 2ST can be recommended for non-PT clinicians with limited evaluation space to identify the need for ADA.

A．Purpose/Hypothesis

Physical therapists (PTs) often prescribe ADA for elderly patients as part of a plan of care. This comprehensive assessment includes evaluating

intrinsic abilities such as muscle strength, balance ability, and cognitive levels; extrinsic factors such as home and community environment for proper administrations; and psychological factors such as resistance against ADA usage. This evaluation, however, requires therapists to have clinical experience, training, and clinic environments.[1] These required professional-psychomotor skills for therapists are a concern in geriatric care because untrained individuals or non-PTs often prescribe ADA. Therefore, a set of simple tests for non-healthcare professionals will increase proper ADA prescription and lead to better patient outcomes.

This study's objective was to examine which physical examination tests can differentiate and predict status between ADA using and non-ADA using elderly patients in independent community-dwelling centers versus assistant-care beneficiaries. Once identifying the best test for ADA usage, we will have established the clinical validity. We hypothesized that performance-based LS tests will become potential screenings to determine ADA usage and will be able to predict the conditions of using ADA.[1]

B. METHODS

We conducted this study to prospectively assess physical functions and ADA usage in independent community dwellers who visited a rehabilitation clinic at Kameda-Medical Center in Chiba Prefecture, Japan. A total of 85 elderly patients participated in this study (women: n=54, age: 81.6±8.2 years old). Inclusion criteria included independent community dwellers 65-years-old or older currently undergoing outpatient geriatric-rehabilitation sessions supported by governmental community-care benefits. Exclusion criteria included people unable to ambulate independently at home or with cognitive impairments defined by the Mini-Mental State Examination Score (MMSE) below 21.

They participated in a series of tasks to assess numeric pain scales, including Timed and Up and Go, handgrip, quadriceps strength, the 30-second Chair Rise Test, 5-meter fast gait speed, functional independence measure, and the Locomotive Syndrome Tests (Stand up test, 2-step test (2ST), and the Locomo-5 questionnaire). Mann-Whitney U tests were used to differentiate between ADA users and non-users. A logistic regression analysis was applied to examine which test best predicted ADA use for each clinical assessment.

C. Results

Sixty-eight participants used ADA, which is 80% of the total participants. Women were more likely than men to use ADA (70.6%, P=0.007). There was no significant difference between non-ADA and ADA groups in the frequency of disability levels, receiving the support or care beneficiaries, or other demographic characteristics, such as age and anthropometry (P>0.05; **Table 1)**.

Table 2 indicates the clinical characteristics between ADA users and non-ADA users. ADA users demonstrated significantly slower TUG than non-ADA users (⊿:4.0, P<0.001). ADA users showed significant muscle weakness in handgrip (⊿: 23%, P=0.018) but not in quadriceps (⊿: 5%, p>0.05). Both GS and FIM were significantly different between groups as ADA users showed slower gait (⊿:0.39m/s, P<0.001) and severe disability in physical function (⊿:3.0, P=0.033). All LS tests showed significant differences between ADA and non-ADA users. The numeric score for the SUT was significantly lower in ADA users (⊿:1, P<0.001). The 2ST had a lower score in ADA users (⊿:0.37 P<0.001). The Loco-5 had a significantly higher ADA user score (⊿:5.0, P<0.001).

As a result of the logistic regression analysis, only 2ST [OR: 0.004 (95%CI: 0.00-0.96)] was associated with the prediction equation (P=0.048, **Table 3)**. According to predicted ADA use, when the ROC curve was created for 2ST, the AUC was 0.86 (95%CI: 0.76-0.95) with a cut-off value of 0.93 (Sensitivity: 72%, Specificity: 82%, **Figure 1)**.

Table 1 Comparison Between Two Groups of the Basic Attribute

Sociodemographic Data	**All Participants (n = 85)**	**No Assistive Aid (n = 17)**	**Assistive Aid (n = 68)**	***p-values***
Men, n (%)	31 (36.5)	11 (64.7)	20 (29.4)	.007[a]
Women, n (%)	54 (63.5)	6 (35.3)	48 (70.6)	
Age, median [interquartile range], y	84 [75.5-87]	78.0 [74.5-85.5]	84.0 [77.0-87.0]	.478[b]
Height, median [interquartile range], cm	153 [146-161.5]	157.9 [150.0-167.8]	152 [146.0-160.0]	.090[b]
Weightt, median [interquartile range], kg	52.8 [44.6-61.3]	58.1 [44.5-65.4]	51.7 [44.7-60.5]	.325[b]
Disability level Support Level, n (%)	54 (63.5)	7 (41.2%)	47(69.1%)	.419[a]
Disability level Care Level, n (%)	31 (36.5)	10 (58.8%)	21(30.9%)	
[a] X^2 test [b] Mann-Whitney U Test				

Table 2 Comparison between two groups of the physical functions

physical functions	All Participants (n=85)	No Assistive Aid (n=17)	Assistive Aid (n=68)	*p-values*
Pain during movement [a]	2 [0-4]	0 [0-5]	2 [0-4]	.458
TUG,s	12. 8 [10.1-16.7]	9.5 [8.2-10.6]	13.5 [11.2-18.9]	<.001
HGS, kg	17.5 [14.3-22.1]	21.0 [18.6-26.2]	16.3 [13.6-21.9]	.030
WBI, kg/kg	0.37 [0.27-0.43]	0.42 [0.31-0.50]	0.37 [0.25-0.43]	.083
30sCRT, times	10 [8.5-12]	12 [9.5-13.0]	10 [8.0-12.0]	.046
Gait speed, m/s	0.96 [0.80-1.25]	1.26 [1.07-1.66]	0.87 [0.77-1.14]	<.001
FIM total score	118 [112-122]	119.0[117.0-123.0]	116.0 [110.0 - 121.0]	.033
SUT	2 [1-3]	3 [3-4]	2 [1-2]	<.001
2ST	0.85 [0.60-1.02]	1.16 [0.94-1.24]	0.79 [0.51-0.96]	<.001
Loco-5	9 [6-12.5]	6 [2-8]	11 [7-13]	<.001

All results are presented as median [interquartile range]

a Self-reported pain in the lower extremities during movement anchored with 0 (no pain at all) and 10 (unbearable pain)

Abbreviations: TUG, Timed Up &Go; HGS, Handgrip strength; WBI, Quadriceps Femoris (nomalized by body weight); 30sCRT, 30s Chair Rise Test; FIM, Functional Independence Measure; SUT, Stand up Test; 2ST, Two-step Test; Loco-5, Locomo-5 checklist.

Table 3. As a result of logistic-regression analysis that assumed walk aid use or nonuse a dependent variable

Factor	Odds ratio	95%CI	*p-values*
Sex	4.88	0.456-51.76	.189
TUG	1.16	0.74-1.80	.521
HGS	0.99	0.85-1.16	.888
30sCRT	1.468	0.85-2.55	.173
Gait speed	0.41	0.02-9.42	.408
FIM	0.97	0.84-1.13	.734
SUT	0.40	0.15-1.09	.072
2ST	0.004	0.00-0.96	.048
Loko-5	1.18	0.95-1.47	.128

Abbreviations: CI, Confidence interval; TUG, Timed Up & Go; HGS, Handgrip strength; 30sCRT, 30s Chair Rise Test; FIM, Functional Independence Measure; SUT, Stand up Test; 2ST, Two-step Test; Loco-5, Locomo-5 checklist.

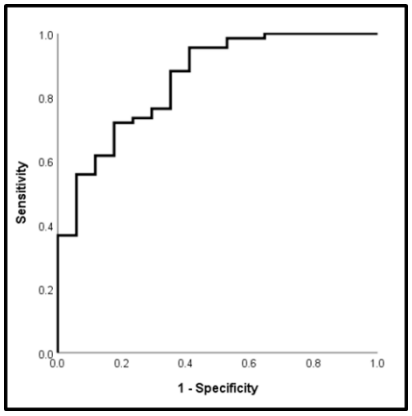

Figure 1 ROC curve of the 2ST about the use presence or absence of ADA.

D．Discussion

Our results showed that the selected measures could differentiate between physical function, balance, and independence in activity of daily living between ADA users and non-users. Interestingly, the differences were not observed in this cohort's age and pain levels. Among these tests, only 2ST could predict the status of using ADA by the score of 0.93, equal to 93% of their body height, with 72% of sensitivity and 82% specificity. This value is clinically meaningful because of its similarity to other ambulation thresholds. For example, the cut-offs above 96% of BH in 2ST are associated with the cut-off for the Japanese definition of frailty (1.0m/s).[2,3]

The 2ST score below 100% for BH was associated with falling and falling anxiety risks, which indicates that the 2ST can be a functional measure to reduce the risk of falling or increase community ambulation ability by using ADA.

2ST is often used to assess overall ambulatory ability due to significant correlations with self-selected and maximal walking speed and the six-minute walking test results.[2,4] This test can be performed in small spaces, including examination rooms, unlike general procedures with a pathway. Finally, the results normalized by body height without any ceiling-effects are innovative for evaluating ambulation regardless of gender and age differences.[5] This simple and easy test should be utilized in various healthcare settings, such as physician offices and care facilities, to determine patients' overall ambulation. It will increase PT referrals for a further comprehensive evaluation to prescribe ADA properly. However, implementation of 2ST as the standardized screening for ADA will promote inter-disciplinary collaborations that are significant needs for healthy aging in harmony with the original aim of endorsed the concept of LS.

E．Conclusions:

Our study showed that if comprehensive clinical evaluations are not available, the ability to make two large steps longer than 93% of body height can predict ADA usage. The 2ST can be recommended for non-PT clinicians with limited evaluation space to identify the need for ADA.

F．研究発表

1. 論文発表
   準備中
2. 学会発表
   準備中

G．知的財産権の出願・登録状況

1. 特許取得

該当なし

2. 実用新案登録

該当なし

3.その他

該当なし

H. 引用文献

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