

Mobility-related comorbidity index for the well elderly

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INTRODUCTION AND PURPOSE

Mobility is an important component of functional independence in the elderly. However, mobility limitations are commonly exhibited in the aging population secondary to the presence of musculoskeletal impairments and co-morbidities. It is understood that co-morbidities lead to declining mobility, but little is known about which co-morbidities lead to the greatest decline. The purpose of this study was to identify musculoskeletal impairments, co-morbid conditions and symptoms that are related to walking ability in the community-dwelling elderly population.

SUBJECTS

Subjects were a convenience of sample of 29 community dwelling older adults who were recruited from a physical therapy clinic and a senior center in Miami, FL. Subjects were 83% female with a mean age of 75 ±6.5 years. Subject characteristics can be found in Table 1.

METHODS

Subjects completed a questionnaire and a medical history which included reporting any co-morbid conditions and symptoms that were present in the previous year. Subjects were asked to rate their health on a scale of 0-10. Strength of the ankle plantarflexors was measured by the ability to perform 10 standing heel raises. Hip extensor strength was assessed by the ability to perform 10 bridges in the hooklying position. The 30-second chair stand test was administered and grip strength was measured using a hand-held dynamometer. Flexibility was assessed by measuring hamstring and ankle plantarflexor range of motion in the supine position. The six-minute walk test was the primary outcome measure of functional mobility and was performed along a rectangular course. Total number of comorbid conditions and reported symptoms were calculated for each subject. Spearman correlations were performed to investigate the relationships between total number of comorbid conditions, total number of symptoms, strength variables, flexibility variables and six-minute walk test. T-test analyses were performed to determine differences in six minute walk scores in those with and without specific medical conditions or symptoms. Linear regression analysis was performed using the backward deletion process to determine the best predictors of six minute walk scores.

TABLE1: Subject Characteristics

Characteristics	
Gender (n)	
Male	5
Female	24
Age, Mean (years)	75.1 ± 6.5
Marital status	
Single	2
Married	13
Widowed	12
Divorced	2
Smoker	
Never	23
No/ quit	2
Yes	4
Living condition	
Alone	9
With someone	20

TABLE 2: Mean values for medical, impairment and physical performance variables

Variable	Mean ± S.D.
Number of symptoms	4.3 ± 3.8
Number of co-morbidities	4.9 ± 2.7
Right grip strength (kg)	17.5 ± 7.8
Left grip strength (kg)	16.7 ± 5.9
Heel raises (0-40)	32.3 ± 8.3
Hip extension (bridging) (0-40)	29.8 ± 10.9
Right hamstring (°)	150 ± 20
Left hamstring(°)	159 ± 13
Right ankle(°)	7.8 ± 3.1
Left ankle(°)	7.3 ± 3.6
Chair stands	10 ± 3
Self-fitness report (0-10)	7.4 ± 1.8
Six- minute walk (ft)	1294 ± 367

TABLE 3: Correlation of each variable with six minute walk scores

Variable	Spearman's r	p-value
Number of symptoms	-0.72	<0.0001
Number of co-morbidities	-0.47	0.01
Right grip strength	0.26	0.18
Left grip strength	0.27	0.16
Heel raises	0.58	0.0009
Hip extension (bridging)	0.71	<0.0001
Right hamstring	0.21	0.27
Left hamstring	0.30	0.12
Right ankle	0.21	0.26
Left ankle	0.25	0.18
Chair stands	0.64	0.0002
Self- reported fitness	0.27	0.18

TABLE 4: Six minute walk scores for those with and without condition/ symptom

Comorbidity or symptom	Six minute walk for those with condition	Six minute walk for those without condition	p-value
Hypertension	1209	1399	0.17
Arthritis	1190	1422	0.09
Osteoporosis	1177	1347	0.26
Cough	1064	1435	0.006
Shortness of breath	892	1399	0.001
Inability to walk	865	1431	<0.0001
Arm weakness	1092	1371	0.06
Leg weakness	871	1455	<0.0001
Balance problems	1046	1388	0.02
Joint pain	1096	1479	0.003
Night pain	992	1409	0.004
Insomnia	1219	1347	0.36

TABLE 5: Linear regression model of Six minute walk score

Variable	Coefficient	Partial correlation	p-value
Number of symptoms	-39.2	0.55	0.0016
Age	-13.5	0.28	0.04
Hip extension	11.8	0.32	0.0032
r-square=0.75, p for F <0.0001			

RESULTS

Subject characteristics are found in Table 1. Average values for medical, strength, flexibility, and physical performance variables are found in Table 2. The results of correlation analysis are found in Table 3. Variables correlated to the six minute walk score include number of co-morbid conditions, number of symptoms, heel raises, hip extension, and chair stands. Average six minute walk scores between subjects with and without conditions or symptoms are found in table 4. Conditions or symptoms for which there was a difference in six minute walk scores included cough, shortness of breath, inability to walk, joint pain, and night pain. Results of the multiple linear regression to predict six minute walk are found in Table 5. The model explains 75% of the variance in six minute walk score and includes age, hip extension, and number of symptoms.

CONCLUSION

Elderly persons reporting a higher number of symptoms and co-morbid conditions have significantly decreased walking ability. The presence of cough, shortness of breath, and leg weakness in the previous year was related to significantly less distance covered on the six minute walk test. Objective measures of hip extensor and plantar flexor strength are also related to walking ability.

CLINICAL RELEVANCE

Walking ability is an important outcome of physical therapy intervention. It appears that symptoms, more so than co-morbid conditions, have a greater impact on an older adult's ability to walk. Physical therapists' scope of practice and expertise is centered on utilizing evidence-based techniques to treat impairments and symptoms to ultimately prevent disability. Therefore, while physical therapists may be unable to change the course of an individual's disease, they can treat the symptoms or impairments that most hinder walking ability such as hip extensor strength and shortness of breath.