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Critical Appraisal of the Efficacy of Various Assessment Tools in Determining Fall Risk in the Elderly Individual with Parkinson Disease.

By: Gabriella Goshtigian

Date: 9/30/2014

Clinical Scenario

The patient who instigated this research is a 95 year-old woman with Parkinson Disease (PD) in the care of a skilled nursing facility 1 month after open reduction internal fixation of a left femur fracture following a fall in her home. The facility most commonly uses the Berg Balance Assessment and the Functional Reach Test to determine fall risk, tending to use the Functional Reach more often to conserve time.

Clinical Question

Is the Berg Balance Scale (BBS) a more accurate tool in predicting fall risk in the older patient with Parkinson Disease compared to the Functional Reach Test (FRT)?

P: Older Parkinson Disease patients

I: Berg Balance Test

C: Functional Reach Test

O: Predicting fall risk

Clinical Bottom Line

The purpose of this research, as it applies to this patient's case, was to determine whether the BBS was a more effective clinical test for predicting fall risk than the much less time consuming FRT, particularly in PD patients who are known to have postural control deficits. The study showed that while all tests used had strong levels of predictive validity, the BBS had a slightly higher level of specificity and positive LR. More notably, the research revealed that in any tests being used with PD patients, lower cutoff levels are recommended to avoid the possibility of a false negative and true fallers therefore not being identified. This alters the plan of care for this patient in that therapists should choose to take more time with the BBS and consider lowering recommended cutoff levels for non-PD patients in order to accurately assess fall risk in a population who is more inclined to fall. This will allow the therapist to be confident they are

accurately stratifying this patient’s fall risk and ensures the provision of necessary interventions and appropriate assistive devices to keep her safe before discharging her to her home.

Search History

Databases/Sites Searched	Search Terms	Limits Used
Medline - PubMed	Berg; Functional Reach; Parkinson Disease; Elderly	Clinical Trial, Systematic Reviews, Journal Article, Randomized Controlled Trial, Full text, published in the last 10 years, Humans, English.

Citation

Dibble, L.E. & Lange, M. (June 2006). Predicting Falls in Individuals with Parkinson Disease: A Reconsideration of Clinical Balance Measures. *Journal of Neurologic Physical Therapy*, 30 (2), 60-67. Retrieved from PubMed on September 27, 2014. <http://www.ncbi.nlm.nih.gov.une.idm.oclc.org/pubmed/16796770>

Summary of Study

Design: Cohort study

Setting: University of Utah Rehabilitation and Wellness Clinic

Participants: Fourty-five participants with a diagnosis of idiopathic Parkinson Disease aged 39-90 years old (mean = 69.94) and mean Hoehn and Yahr Level = 2.60. Twenty participants were categorized as non-fallers and 25 as fallers defined as self-reported 2 or more falls in previous 12 months. Inclusion criteria used: medically confirmed diagnosis of idiopathic PD, ability to ambulate at least household distances (50 feet) with no more than minimal assistance, and willingness and ability to participate in a balance exam and accurately report fall incidence, situations, and consequences. Exclusion criteria used: history of any other neurologic or orthopedic disorder that would affect ambulation or balance ability or any cognitive deficits that precluded cooperation with the procedures of the study.

Intervention: Personal interview was conducted with each participant and information including age, disease duration, Hoehn and Yahr Level, medications taken/schedule, and fall history was gathered. Prior to any interventions, physical exams were performed while patients were in the “on” phase of their medication cycle. The participants then performed 5 clinical balance assessments (with 5 minutes of rest in between) administered by 1 of 2 physical therapists who were not masked and specialized in treating

patients with PD. Two trials of the Functional Reach Test (FRT), Timed Up and Go (TUG) and Cognitive Timed Up and Go (CTUG) were performed and the mean was taken. Because of length, only one trial of the Berg Balance Scale (BBS) and Dynamic Gait Index (DGI) were performed.

Outcome Measures:

<u>Test (Cutoff Scores*)</u>	<u>Sensitivity</u>	<u>Specificity</u>	<u>Negative LR</u>	<u>Positive LR</u>
FRT 25.4cm 31.75cm	.54 .86	.95 .52	.30 (.15 - .59)	1.79 (1.31 – 2.45)
BBS 46 points 54 points	.41 .79	1.00 .74	.29 (.17 - .50)	3.07 (1.88 – 5.03)
DGI 19 points 22 points	.57 .89	.90 .48	.22 (.10 - .49)	1.86 (1.38 – 2.55)
TUG 13.5 sec 7.95 sec	.39 .93	.87 .30	.27 (.09 - .75)	1.31 (1.08 – 1.59)
CTUG 15 sec 18.5 sec	.35 .93	.96 .35	.23 (.018 - .61)	1.42 (1.15 – 1.77)

* First score is the previously reported cutoff, second score is new calculated cutoff with goal of maximizing sensitivity in use with PD patients.

Data Analysis: Statistical analysis of the data was performed and descriptive statistics were determined for demographic and disease-specific variables. Comparison of fallers vs. non-fallers for each balance test was performed using separated independent T-tests or Mann Whitney U tests. To determine appropriate cut-off scores and relative predictive values, sensitivity and specificity was determined for each test using cut-off scores reported in previous research. Sensitivity was calculated as the proportion of participants with a fall history that had a positive score. Specificity was calculated as the proportion of subjects without a fall history who had a negative test score. Negative and positive likelihood ratios (LR) were also determined for each test which describes the odds of being a faller given a certain test result. Receiver Operating Characteristic (ROC) curves were generated and the area under the curve (AUC) was calculated to quantify the clinical utility of each test.

Summary of Evidence

The results of the study slightly supported the use of the BBS over other tests although researchers suggested the use of multiple assessments as well as history as the best way to evaluate fall risk in PD patients. The results as seen in the table above show that while sensitivity, specificity, positive LR, negative LR, and AUC values are all strong with a good predictive validity, specificity (1.00/.74) and positive LR (3.07) were slightly better in the BBS. This information is relevant to the research question in that it supports the use of the BBS over the FRT. More importantly the research revealed that the cutoff scores recommended for the tests in previous studies with non-PD patients had a low sensitivity (<.60) which was improved when cutoff scores were raised. Because of this, researchers recommend the adjustment of cutoff scores to improve sensitivity while acknowledging this will in return cause a decrease in specificity.

Variable	Fallers (n=25)		Non-fallers (n=20)	
	Mean (sd)	95%CI	Mean (sd)	95%CI
Functional Reach Test (cm)	23.11 (8.12)	20.22-26.42	31.70 (5.61)	29.26-34.11
Berg Balance Scale (0-56)	46.40 (8.79)	43.21-49.87	54.69 (1.69)	53.96 -55.42
Dynamic Gait Index (0-24)	17.92 (4.36)	16.23-19.62	21.82 (3.42)	21.02-22.63
Timed up and Go (sec)	13.71 (6.02)	11.38-16.05	9.66 (3.18)	8.27-11.03
Cognitive TUG (sec)	21.45 (13.79)	16.10-26.80	11.29 (3.92)	9.60-12.99

***Table From Dibble, L.E et al.**

Additional Comments

In terms of validity, the internal validity is something that could be questioned because of the advanced age of these patients and therefore increased likelihood of a fall, regardless of their PD diagnosis. Although the researchers made sure to rule out any other pertinent medical history they only used cutoff scores from previous research in otherwise healthy individuals. I believe the internal validity could be improved if the same therapists were to administer and collect data for the same tests on healthy individuals also. Since the statistical data was greatly improved with adjusted cutoff scores, I believe this research has strong external validity and that altering the grading system for individuals with PD is a valid clinical recommendation. This however could also be improved with a larger and more diverse sampling of PD patients. The statistical data was thorough for both fallers and non-fallers but as previously mentioned I think the study could have been improved if data was collected on healthy individuals with tests being administered by the same therapists to avoid interrater variability. I found this study to be very

helpful in its application to a clinical experience with PD patients, especially to understand the trade off in sensitivity and specificity that comes with adjusted cutoff scores and risk stratification.

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