



Fall Risk Assessment in People with Diabetic Peripheral Neuropathy

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INTRODUCTION

Diabetes affects nearly 20.8 million people in the US.¹

Greater than 50% of these people have diabetic peripheral neuropathy (DPN).²

Peripheral neuropathy increases fall risk.^{3,4}

- Somatosensory changes of the peripheral nerves.
- Results in gait and balance problems.

There are a myriad of fall risk assessment tools used to determine fall risk.

- Many have been validated for older adults⁵ and other diagnoses, including stroke⁶, Parkinson's disease⁷ and vestibular disorders⁸.
- None have been validated for people with DPN.

No research has specifically identified risk factors for falls in people with DPN.

- Aim 1** Compare the validity of selected fall risk assessment tools for people with DPN.
- Aim 2** Identify risk factors for falls in people with DPN.

METHODS

Participants: 36 persons (21 male, 15 female)

	Mean	StDev	Range
Age	57.3	6.1	42 – 65
BMI	35.2	7.9	22 – 55

Inclusion Criteria:

- 40 - 65 years old
- Have diabetic peripheral neuropathy
- Able to walk without person-assistance

Exclusion Criteria:

- Untreated major depression
- Uncorrected visual deficits
- Other integumentary, musculoskeletal, neurological or vestibular problems that might influence fall risk

METHODS (continued)

Fall History Assessment:

- Fall definition given to participant: Coming to rest unintentionally on the ground or other level, not as the result of a major intrinsic event or overwhelming hazard.⁹
- Asked if have fallen, how many times and to describe circumstances surrounding each fall.
- If unable to describe, fall not counted.
- *Faller* = 2 or more falls in the previous year
- *NonFaller* = < 2 falls in the previous year

Fall Risk Assessment (FRA) Tools:

- 1) **Functional Reach Test (FRT)**¹⁰
 - 5 times (last 3 scored, mean used for data analysis)
 - Outcome: distance reached in cm
- 2) **Timed Up and Go (TUG)**¹¹
 - 3 times (last 2 scored, mean used for data analysis)
 - Outcome: time to complete in sec
- 3) **Berg Balance Scale (BBS)**¹²
 - 14 static and dynamic balance tasks
 - Each item scored 0 to 4, maximum score = 56
- 4) **Dynamic Gait Index (DGI)**¹³
 - 8 walking tasks
 - Each item scored 0 to 3, maximum score = 24

Other Outcome Measures:

Sex, Age, BMI, Beck Depression Inventory II, Quality of Life Questionnaire Diabetic Neuropathy Version, Pain ratings, SAFFE (Survey of Activities and Fear of Falling in the Elderly), PASE (Physical Activity Scale for the Elderly), HbA1c, Michigan Neuropathy Screening Instrument, Assistive Device Score, Ankle ROM, Ankle Strength, Ankle Proprioception, and Tibial, Peroneal and Sural nerve conduction studies.

Statistical Analysis:

Aim 1 Validity Comparison

- Sensitivity: proportion of Fallers identified by the FRA tools as having fall risk
- Specificity: proportion of NonFallers identified by the FRA tools as NOT having fall risk
- ROC curve analysis to determine modified cut-off scores

Aim 2 Identify Risk Factors

- Independent Samples t-test
- Logistic Regression (Dependent Variable = Fall Status) with significant variables from t-test

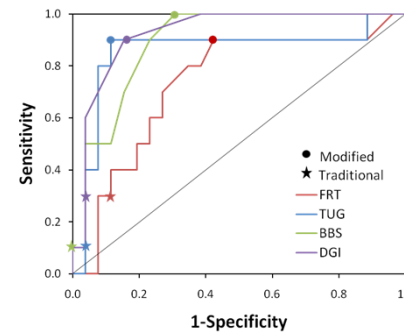
RESULTS

Aim 1 Validity Comparison

Fallers (n = 10), NonFallers (n = 26)

Traditional Cut-off Scores	Sensitivity / Specificity	Modified Cut-off Scores	Sensitivity / Specificity
FRT < 25.4	0.30 / 0.89	FRT ≤ 32.5	0.90 / 0.58
TUG ≥ 13.5	0.10 / 0.96	TUG ≥ 10.7	0.90 / 0.89
BBS < 45	0.10 / 1.00	BBS ≤ 53	1.00 / 0.65
DGI ≤ 19	0.30 / 0.96	DGI ≤ 22	0.90 / 0.85

ROC Curves



A comparison of Sensitivity and Specificity using the Modified versus Traditional cut-off scores for the FRT, TUG, BBS and DGI.

Aim 2 Identify Risk Factors

Differences between Fallers and NonFallers

	Faller	NonFaller	p-value
PASE	78.67 ± 45.98	146.53 ± 74.63	0.012*
SAFFE	7.50 ± 1.08	8.54 ± 1.39	0.041*

* p<0.05, significant difference

All other outcome measures were not significantly different between Fallers and NonFallers.

Logistic Regression

	B	Wald χ^2	p-value	Odds Ratio
PASE	-0.018	5.109	0.024*	0.982
SAFFE	0.927	4.166	0.058	0.521

* p<0.05, significant association

DISCUSSION

Aim 1 Validity Comparison

Using traditional cut-off scores *none* of the FRA tools would be clinically useful due to poor sensitivity.

Modified cut-off scores greatly increased sensitivity of these tools (between 2- and 9-fold) while only moderately reducing specificity.

Aim 2 Identify Risk Factors

Of all outcome measures, the PASE best explained the difference between Fallers and NonFallers.

- A 1-point ↓ in the PASE score = 1.8% ↑ in the odds of being a Faller.

Physical activity is touted as important for people with diabetes; this idea is supported as it relates to fall risk in people with DPN.

Limitations: retrospective nature, small sample size, limited generalizability.

SUMMARY

This was the first study to compare validity of 4 commonly used fall risk assessment tools in people with DPN. The TUG and DGI demonstrated the greatest validity using modified cut-off scores and may be useful components of a comprehensive fall risk assessment program. Physical activity level, as measured by the PASE, appears to significantly contribute to faller status in people with DPN. Additional studies that are prospective in nature and use larger, more heterogeneous samples of people with DPN need to be conducted to confirm and expand on these new but preliminary findings.

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