The Berg Balance Scale - Determining its usefulness in the elderly.

A thesis by publication submitted for the degree of

Master of Philosophy

By

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Declaration of originality:

I hereby certify that this thesis is submitted in the form of a series of published papers of which I am a joint author. I have included as part of the thesis a written statement from each co-author attesting to my contribution to the joint publications. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

In addition, ethics approval from the University of Newcastle and North Coast Area Health Service Human Research Ethics Committees was granted for the clinical study presented in this thesis. Participants were required to read a participant information document and written informed consent was gained prior to data collection.

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Abstract

This thesis by publication examines the Berg Balance Scale (BBS), a balance assessment tool used globally by clinicians and researchers for varied clinical and non-clinical populations. Despite its extensive application, important aspects of the utility of the BBS remain to be determined. This thesis evaluated three of these properties: validity when applied in a rural, clinical population, reliability evaluated from previously published literature, and normative values as measured in the healthy aged.

The first published study investigated the BBS in the context of two rural hospitals. It aimed to describe predicted and measured balance changes in patients receiving physiotherapy in two rural hospitals and to explore the relationship between patients’ measured balance at discharge, carer availability and patients’ discharge destination. A strong relationship was discovered between the BBS at discharge and the probability of discharge to nursing home. The degree to which the balance of patients changed from the commencement of their physiotherapy intervention to their point of discharge displayed high variability and was very difficult to predict.

The study attempted to identify information available to hospitals at admission which might predict change in balance. The presence or absence of several diagnoses and health issues was recorded at admission. Although 13 such potential predictors where recorded, none of them was shown to be useful in predicting change in balance. Treating physiotherapists were asked at commencement of therapy to predict how much change in patients’ measured balance they anticipated and their estimates were accurate.

The findings of this study are valuable because they suggest that balance, as measured by the BBS is an important predictor of the need to enter nursing home care. These results also suggest that discharge planners and aged care assessment teams should give credence to the treating physiotherapist’s estimate of probable change in balance when planning hospital discharge destinations.

The second published study used a systematic review and meta-analysis of the published literature to assess the relative and absolute reliability of the BBS. It aimed to determine the inter rater and intra rater relative reliability and the absolute reliability of the BBS. The relative reliability of the BBS was found to be high. The pooled estimate of the relative intra-rater reliability of 0.98 (95% CI 0.97 to 0.99) and the pooled estimate of the relative inter-rater reliability was 0.97 (95% CI 0.96 to 0.98). The absolute reliability of the BBS was found to vary across the scale. The minimal detectable change with 95% confidence varied between 2.8/56 and 6.6/56, with the highest reliability found when the
BBS had scores near 56/56. No data was found describing the absolute reliability in the range 0-20/56. While the BBS has acceptable reliability, it may not detect a modest, clinically relevant change. These results are important because they provide guidance for clinicians using the BBS about whether a measured change in a balance score might be confidently interpreted as real change or whether it is likely to be measurement error.

The third study, accepted for publication used a systematic review and meta-regression analysis to assess the relationship between BBS and the age of healthy, community dwelling elderly people. It aimed to find the mean BBS scores of healthy elderly people, and how much the BBS scores of healthy elderly people vary with age. The findings of this analysis are robust for healthy elderly aged 70-80 years, being based on data from 1363 participants. Data analysis for people aged over 80 years is based on only 258 participants. The BBS demonstrated a ceiling effect when used in healthy people aged 70 years and younger, but declines at the rate of 0.75/56 points per year. As the age of healthy elderly people increases the variability in their BBS scores also increases. These findings provide guidance as to when the BBS should, and should not be used and offers a perspective on the meaning of BBS scores in elderly people and provide important normative information to allow clinicians to accurately determinate balance related to age.

In conclusion, this thesis provides new and robust insight about how balance, as measured by the BBS, relates to the ability to live in the community. Furthermore, it provides a perspective on whether a measured change in BBS is meaningful or not. Finally the research provides normative data on the BBS, to guide its appropriate implementation and interpretation of scores when applied to the elderly.