ORIGINAL RESEARCH

Factors Predicting Falls and Mobility Outcomes in Patients With Stroke Returning Home After Rehabilitation Who Are at Risk of Falling

Mandy Man-Di Ng, BSc Physio,[a] Keith D. Hill, PhD,[a] Frances Batchelor, PhD,[b] Elissa Burton, PhD[a]

From the [a]School of Physiotherapy and Exercise Science, Faculty of Health Sciences, Curtin University, Perth, WA; and the [b]National Ageing Research Institute, Parkville, VIC, Australia.

Abstract

Objective: To identify factors predicting falls and limited mobility in people with stroke at 12 months after returning home from rehabilitation.

Design: Observational cohort study with 12-month follow-up.

Setting: Community.

Participants: People with stroke (N=144) and increased falls risk discharged home from rehabilitation.

Interventions: Not applicable.

Main Outcome Measures: Falls were measured using monthly calendars completed by participants, and mobility was assessed using gait speed over 5m (high mobility: >0.8m/s vs low mobility: ≤0.8m/s). Both measures were assessed at 12 months postdischarge. Demographics and functional measures, including balance, strength, visual or spatial deficits, disability, physical activity level, executive function, functional independence, and falls risk, were analyzed to determine factors significantly predicting falls and mobility levels after 12 months.

Results: Those assessed as being at high falls risk (Falls Risk for Older People in the Community [FROP-Com] score≥19) were 4.5 times more likely to fall by 12 months (odds ratio [OR], 4.506; 95% confidence interval [CI], 1.71−11.86; P=.002). Factors significantly associated with lower usual gait speed (≤0.8m/s) at 12 months in the multivariable analysis were age (OR, 1.07; 95% CI, 1.01−1.14; P=.033), physical activity (OR, 1.09; 95% CI, 1.03−1.17, P=.007), and functional mobility (OR, .83; 95% CI, .75−.93; P=.001).

Conclusions: Several factors predicted falls and limited mobility for patients with stroke 12 months after rehabilitation discharge. These results suggest that clinicians should include assessment of falls risk (FROP-Com), physical activity, and dual-task Timed Up and Go test during rehabilitation to identify those most at risk of falling and experiencing limited mobility outcomes at 12 months, and target these areas during inpatient and outpatient rehabilitation to optimize long-term outcomes.

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Stroke is a prevalent medical condition among the adult population,[1] especially in people >65 years of age. Stroke affects approximately 62 million people worldwide,[2] and is the second leading cause of death and the third leading contributor to burden of disease globally.[3] In Australia, stroke was the eighth highest cause of burden of disease in 2011 overall,[4] and the total financial costs of stroke have been estimated to be A $5 billion in 2012 (approximately U.S. $3.7 billion, based on April 2017 conversion rates).[5] In addition, over a third of Australians with stroke reported a disability resulting from their stroke[6] (eg, incomplete use of limbs, restrictions in physical activity or work).[6] These disabilities have a negative effect on core daily activities (eg, mobility, self-care),[6] and also increase the risk of falling.[7]

Falls are common in people with stroke, who fall 1.5 to 2 times more than the age-matched older population without stroke.[8,9] After stroke, people commonly have physical, cognitive, and psychological impairments, which can increase their propensity to fall.[10] Some of these impairments include poor balance, the

presence of visual neglect, sensory loss, decreased muscle strength, increased muscle tone, and fear of falling.[10-13] Falls can result in serious consequences (eg, fractures), which are 2 times more likely in people with stroke compared with age-matched healthy adults.[14,15] Fractures are associated with decreased functional mobility and physical activity levels, and increased dependency in activities of daily living.[14] Other consequences of falls in the poststroke populations may include fear of falling and reduced confidence in mobility, which can have debilitating effects on the everyday life of people with stroke.[16]

In addition to the increased risk of falling, people with stroke have decreased mobility levels.[17] Mobility is defined by the World Health Organization as "the individual's ability to move about effectively in his/her surroundings."[18(p192)] Mobility impairments can persist in patients with stroke even at 1 to 3 years poststroke.[17,19] Mobility is vital for performing activities of daily living (eg, dressing, showering, walking, preparing meals).[20] In addition to the effects of normative age-related declines in mobility (eg, slower gait speed),[21] people with stroke >65 years of age also have impaired mobility because of the effects of stroke (eg, poststroke fatigue, increased oxygen cost of walking as a result of asymmetric gait patterns).[22,23] Several consequences of decreased mobility in this population include reduced independence in activities of daily living (eg, walking, dressing),[24] lower health-related quality of life,[25] sedentary lifestyles,[26] muscle atrophy and weakness,[27] and bone loss, particularly in the hemiparetic lower limb (hemi-osteoporosis).[28,29]

It is therefore important to investigate the factors influencing falls and mobility levels because people with stroke have increased risk of falling and decreased mobility levels with subsequent detrimental effects. To date, there has been no consensus in the literature in determining the factors that increase the risk of falls in people with stroke, with studies listing different factors.[11,12,30] One possible reason for the inconsistent results could be because these studies were undertaken in populations with different stroke severities and at different time points. The first 12 months after rehabilitation is an important time period because first falls and repeat falls are common throughout this period.[31,32]

A number of studies have examined factors which predict mobility outcomes in the first several years after returning home after stroke-related hospitalisation.[19,33-35] There is considerable variability in the duration posthospitalization used as the time point to predict outcomes (eg, 6mo, 12mo, several years), outcome measures used, and predictor variables. It is rare that the important and associated predictor outcomes included both mobility and falls. The first 12 months postrehabilitation is a critical time point because it has allowed sufficient time for adjusting back to the physical, psychological, and emotional demands of living at home with the effect of the stroke, recovery will have plateaued, and the negative effects of reduced activity and falls will be emerging. Although many falls by patients with stroke are repeat falls, some first falls occur beyond the 6-month time point. For these reasons, 12 months is considered an important time point for predicting falls and mobility levels in people with stroke.[36,37] To date, there

has been a paucity of research looking at the factors predicting both falls and mobility levels in people with stroke in the first 12 months after rehabilitation, using the same comprehensive baseline predictor dataset. The aim of this study was to identify factors predicting falls and mobility outcomes in people with stroke in the first 12 months after returning home from rehabilitation.

Methods

Study design

An observational cohort study was conducted using an existing dataset from a randomized controlled trial (RCT) carried out from October 2006 to November 2010.[38]

Participants

Study data were collected as part of a multicenter RCT, which aimed to determine the effects of a multifactorial falls prevention program in people with stroke who were returning home after rehabilitation.[38] Rehabilitation is defined by the World Health Organization as "a set of measures that assist, individuals, who experience or are likely to experience disability, to achieve and maintain optimum functioning in interaction with their environments."[39(p96)] Rehabilitation for this study refers to the subacute inpatient environment, once the patient had been transferred from the acute setting, but it does not include residential care or long-term care facilities. Participants were recruited from 9 health rehabilitation services across Melbourne and Adelaide, Australia.[38] Full details of the published RCT protocol and results are available.[38,40] Ethics approval for this study was obtained from Melbourne Health and Curtin University Human Research Ethics Committees.

Inclusion criteria

People with stroke (any type, except subdural stroke and malignancy-related infarct or malignancy-related hemorrhage), ≥45 years of age, who had been discharged home from rehabilitation and were evaluated to have increased falls risk, were included in the study (discharge from rehabilitation to other settings such as residential care was an exclusion criteria).[38] The inclusion age was originally ≥60 years; however, because of slow recruitment it was extended to include participants aged ≥45 years. Increased falls risk was determined by a score <49 on the Berg Balance Scale or a score <7 on the Step Test (lowest score between legs), or if the person had fallen during hospital admission.[38] These variables were shown in a previous study to predict multiple falls within the first 6 months after discharge from rehabilitation.[12] To manage costs of travel associated with home visits, people with stroke were excluded if they lived >100km from study sites.[38]

In the primary RCT study, 156 participants were randomized into 1 of 2 groups: nonintervention (falls education booklet and usual care) or intervention (home-based exercise program, falls risk minimization strategies, injury risk minimization strategies for those at high risk of fractures and a multifactorial intervention based on falls risk assessment findings, a falls education booklet, and usual care).[38] A physiotherapist with >5 years' experience in neurology/gerontology delivered the intervention, which included

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List of abbreviations:

CI	confidence interval
FROP-Com	Falls Risk for Older People in the Community
OR	odds ratio
RCT	randomized controlled trial
TUG	Timed Up and Go