The Impact of Falls on Motor and Cognitive Recovery after Discharge from In-Patient Stroke Rehabilitation

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Background: Falls are common among community-dwelling stroke survivors. The aims of this study were (1) to compare motor and cognitive outcomes between individuals who fell in the 6 months' postdischarge from in-patient stroke rehabilitation and those who did not fall, and (2) to explore potential mechanisms underlying the relationship between falls and recovery of motor and cognitive function. *Methods:* Secondary analysis of a prospective cohort study of individuals discharged home from in-patient rehabilitation was conducted. Participants were recruited at discharge and completed a 6-month falls monitoring period using postcards with follow-up. Nonfallers and fallers were compared at the 6-month follow-up assessment on the Berg Balance Scale (BBS), the Chedoke–McMaster Stroke Assessment (CMSA), gait speed, and the Montreal Cognitive Assessment (MoCA). Measures of balance confidence and physical activity were also assessed. *Results:* Twenty-three fallers were matched to 23 nonfallers on age and functional balance scores at discharge. A total of 43 falls were reported during the study period (8 participants fell more than once). At follow-up, BBS scores ($P = .0066$) and CMSA foot scores ($P = .0033$) were significantly lower for fallers than for nonfallers. The 2 groups did not differ on CMSA leg scores ($P = .049$), gait speed ($P = .47$), or MoCA score ($P = .23$). There was no significant association between change in balance confidence scores and change in physical activity levels among all participants from the first and third questionnaire ($r = .27$, $P = .08$). *Conclusions:* Performance in balance and motor recovery of the foot were compromised in fallers when compared to nonfallers at 6 months post discharge from in-patient stroke rehabilitation. **Key Words:** Stroke—accidental falls—rehabilitation—recovery.

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Introduction

Compared to individuals with severe stroke, those with moderate stroke tend to benefit more from in-patient stroke rehabilitation,[1-3] where patients receive specialized care from an interdisciplinary team. Patients typically attend in-patient rehabilitation in the subacute phase after stroke (i.e., less than 3 months post stroke), and most recovery takes place in the first 3-6 months after stroke.[4] The majority of stroke survivors attending in-patient rehabilitation (64%-83%) are discharged to community living.[3,5,6] Thus, functional recovery, demonstrated by the improved ability to perform activities (e.g., activities of daily living and motor tasks),[7] continues after discharge. In addition, there is evidence that mobility can continue to improve with ongoing physical activity in the chronic phase of stroke recovery (i.e., more than 6 months post stroke).[8]

Individuals with stroke are at a high risk of falls,[9] and the highest rates (37%-73%) seem to occur within the first 6 months after discharge from hospital.[10-12] Several studies have investigated risk factors for falls among community-dwelling stroke survivors[10,11,13-15]; however, only a few have documented the consequences of falling beyond injury. Falls may have psychological sequelae, such as fear of falling, which was reported in 88% of stroke survivors who fell in the community,[16] and impaired balance self-efficacy, which has been shown to predict physical function and perceived health status after stroke.[17] Falls and fear of falling among individuals with stroke can result in activity restriction,[18] and reduced social activity and depression.[10] These consequences can put an individual at further risk for falls by accelerating deconditioning, and lead to a loss of independence,[9] which may limit cognitive recovery through reduced participation and engagement in everyday activities. It is not yet known what the implications of falls and their consequences are on the functional level of individuals returning home from rehabilitation hospital after stroke. Thus, because of the potential for fear and decreased physical and social activity, it is possible that even falls that do not result in a physical injury may adversely affect continued motor and cognitive recovery after stroke.

The primary objective of the present study was to compare motor and cognitive outcomes between individuals who fell in the 6 months' postdischarge from in-patient stroke rehabilitation and those who did not fall. We hypothesized that individuals with stroke who fell in the community would have worse motor and cognitive outcomes (i.e., functional balance, motor recovery of the lower extremities, gait speed, and cognitive status) than those who did not fall when assessed 6 months after discharge from hospital. The secondary objective was to explore potential mechanisms underlying the relationship between falls and recovery of motor and cognitive function. It was hypothesized that poor motor and cognitive outcomes would be associated with decreased balance confidence and reduced physical activity levels.

Methods

Study Design

The present study involved secondary analysis of a prospective cohort study,[19] which aimed to determine if measures of reactive balance control, as assessed at discharge from in-patient rehabilitation, predicted falls in the 6 months' postdischarge among individuals with stroke. Recruitment took place on the stroke rehabilitation unit at the Toronto Rehabilitation Institute—University Health Network between October 20, 2010, and March 21, 2013. This study was approved by the Toronto Rehabilitation Institute Research Ethics Board, and all participants provided written informed consent.

Participants

Participants were recruited at discharge following a course of in-patient stroke rehabilitation if they ambulated independently, completed a balance assessment in a specialized clinic, and returned home after discharge (n = 95). For the purpose of the present study, participants were eligible for inclusion in the analysis if they returned to the hospital for a follow-up assessment at the end of the 6-month falls monitoring period (n = 65).

Falls Monitoring

Falls monitoring took place for 6 months post discharge; the participants were asked to report any falls or near falls using postcards mailed back to the investigators every 2 weeks. This prospective method of data collection is considered the "gold standard" for falls reporting.[20] All participants were mailed monthly newsletters to remind them to return their completed postcards. Additionally, a research assistant contacted participants by telephone if they did not return a postcard to ask if they had experienced any falls. A fall was defined as any time an individual came to rest unintentionally on the ground, floor, or other lower level.[6] Participants who fell were contacted by phone to complete a structured falls questionnaire, modified from the one used by Maki et al,[21] to gather more details about the circumstances surrounding the fall (e.g., what the participant was doing at the time, where, when, and how the fall occurred, and the consequences of the fall, if any). Falls and near falls were reclassified by study investigators according to the participant's description of the event, if necessary (e.g., participants reported a near fall when they lost their footing and lowered themselves into a chair; however, a chair is considered a lower level, and therefore this event was reclassified as a fall).