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Assessment of functional capability and on-going falls-risk in older institutionalized people after total hip arthroplasty for femoral neck fractures

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ABSTRACT

Purpose: To estimate functional capability and attendant falls-risk in older institutionalized people after total hip arthroplasty (THA) for femoral neck fractures.
Methods: The study population comprised 149 consecutive patients (F104, M45; mean age 83.4 years) who were permanent residents of nursing care facilities four weeks after THA for femoral neck fractures. Individual mental and functional capability status was assessed using the Mini Mental State Examination (MMSE), Timed Up and Go test (TUG) and Tinetti's Performance Oriented Mobility Assessment (POMA) which includes sub-scales for balance (B) and gait (G), in conjunction with identifying any concomitant disorders, reviewing individual pharmacotherapy and leisure time activities.
Results: The subjects' mean MMSE was 23.1 points, whereas in Tinetti's POMA they scored 19 points on average, which translated into a five-fold greater falls-risk, whereas average TUG scores of 23.9 s effectively corroborated this assertion. Multiple regression analysis effectively highlighted that TUG scores were strongly correlated with the actual number of concomitant disorders, number of regularly taken medications, and usual manner of spending leisure time.
Conclusions: Institutionalized older people after THA for femoral neck fracture continue to be exposed to high risk of recurrent, possibly injurious falls, which is closely correlated with significantly diminished individual functional capabilities.

1. Introduction

Falls and balance problems are major issues in older people (Cameron, Gillespie, & Robertson, 2012; Rubenstein & Josephson, 2002). Approximately 40% of seniors living in residential care facilities tend to sustain an accidental fall at least once a year, and many of them (up to 14% according to some studies) experience multiple falls every year (Lord, Sambrook, & Gilbert, 1994; Shumway-Cook, Ciol, & Hoffman, 2009). Wilson et al. found a rate of 1.74 falls/person-year, with the resultant injuries deemed serious enough to warrant hospital admission (Wilson, Himer, & March, 2011). Currie reported the falls range: 1.7–25 falls/1000 patient days (Currie, 2008; Chapter 10). Rubenstein et al. revealed that 8% of the institutionalized elderly who experienced accidental falls also sustained hip fractures as a direct result (Rubenstein, Josephson, & Osterweil, 1996). Those who fall in institutional care settings are far more likely to have their treatment of the hip fracture delayed (Khan, Khanna, Al-Salahi, & Parker, 2011).

According to Eurostat data (Injuries in the European Union 2009-Report), in the 27 EU member states accidental falls accounted for the largest proportion (29%) of fatal injuries sustained by the elderly aged 60 and over (Injuries in the European Union Statistics Summary, 2005–2007). As a rule, around 20% of institutionalized seniors suffer a resultant fracture of femoral neck (Lauritzen, 1996). Butler et al. reported that prevalence of hip

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fracture is 10.5 times greater in the institutional care settings than among the community dwelling elderly (Butler, Norton, Lee-Joe, Cheng, & Campbell, 1996).

Fall-related injuries tend to involve mainly the lower extremities (Pfortmueller et al., 2014); among the fallers 36.1% sustained fractures of the lower limbs (Senterre, Leveque, Di Pierdomenico, Dramaix-Wilmet, & Pirson, 2014). They usually account directly for adverse outcomes, ranging from minor bruises, through serious fractures, long-term incapacitation or disability, leading to permanent care-dependence, and death. Despite apparent gravity of such injuries, post-fall trauma is seldom the actual cause of death among the elderly. However, amongst over-65-year-olds injuries sustained through accidental falls are nevertheless believed to be its leading cause (Lauritzen, 1996).

The frequency of fall-related deaths tends to increase with age and the number of concomitant diseases. Maatta et al. reported that the main factors appreciably increasing the risk of hip fracture amongst the community dwelling elderly were low physical activity, impaired functional mobility and low body mass index (Maatta, Terho, & Jokinen, 2012). Mortality related to some types of trauma directly resultant from such falls, e.g. a femoral neck fracture, appears to be particularly high within the first six months of the actual incident, especially in men (Lauritzen, 1996).

In the USA the actual cost of treating fall-related injuries substantially contributes to overall expenditure incurred by public health care system. Almost 8% of over-70-year-olds who have suffered the fall-induced trauma are reported to end up in hospital emergency departments, of whom about 30% ultimately require full hospitalization (Lauritzen, 1996). Although early surgical treatment and physiotherapeutic intervention appears to be encouragingly effective in the elderly after full hospitalization (Tarazona-Santabalbina et al., 2012), mortality after hip fracture is higher in men than in women. One study put the likelihood of surviving a femoral neck fracture for one year at 73% in women vs. 60% in men (Tarazona-Santabalbina et al., 2012).

The present study aimed to estimate functional capability, as well as individual falls risk in older people living in nursing home facilities following total hip replacement (THA) for femoral neck fracture, with a view to assessing and mapping practical ways of addressing fall prevention issue within overall physical rehabilitation management.

2. Methods

Cross-sectional study spanned the period 2011–2013, and 149 participants were recruited into the study (F104, M45; mean age 83.4 years) four weeks after primary THA following proximal femoral fracture originally resultant from an accidental fall. All of them were already the residents of seven nursing home facilities which provided similar standards of care and living conditions. They had all undergone the same 4-week standard rehabilitation regimen, as routinely offered by the National Health Service after THA procedure. The data were collected in the period spanning 2011–2013, in each one of the 7 nursing home facilities, as a cross-sectional study and an introduction to a long-term evaluation. It follows that the patients' data must have been collected within a month of sustaining the fracture of the femur, and the actual dates of their arrivals back into the facilities serve as a good indication.

As a rule, within the first 5–7 days after the surgical intervention the patients were subjected to a physical rehabilitation regimen within the same hospital. Subsequently, they found their way back to the respective nursing home facilities where they already enjoyed the status of regular residents prior to sustaining proximal femoral bone fractures, where the rehabilitation regimen commended in the hospital was duly continued, i.e. 3 times a week – intensive 45 min long sessions, combined with twice-weekly less intensive sessions when the program was focused predominantly on rehabilitating their circulatory and respiratory systems, as well as on teaching them how to execute postural shifts safely and re-learning how to walk, with a view to mastering the skills required to prospectively walk safely unassisted by any walking aids. The physical rehabilitation program was spread over 4 weeks, in full conformity with pertinent provisions comprised in the National Health Service post-THA Rehabilitation Guidelines.

The following inclusion criteria were applied: aged $\geq$ 75 years, living in a nursing home facility, with mental capacity and physical condition sufficient to understand and complete the study assessments and give informed consent to participate. All tests were made in full consideration of individual history of accidental falls (i.e. against an interviewer-administered questionnaire addressing individual physical activity and the preferred ways of spending leisure time). A fall was construed as an "unintentional change in position causing an individual to land at a lower level, on an object, the floor, or the ground, other than as a consequence of sudden onset of paralysis, epileptic seizure, or overwhelming external force" (Gibson, Andres, Isaacs, Radebaugh, & Worm-Petersen, 1987). Functional Capacity was construed as Physical Functions (Sugimoto, Demura, & Nagasawa, 2014). TUG test was applied to assess movement ability/functional movement (Ahmed et al., 2003; Sakuma et al., 2014). POMA was carried out with a view to assessing the falls-risk.

Medical, overall mental/cognitive and physical function was assessed using the following standard evaluative procedures: Mini Mental State Examination (MMSE) (Crum, Anthony, Bassett, & Folstein, 1993; Folstein, Folstein, & McHugh, 1975), Katz Index Activities of Daily Living (ADL) (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963), Lawton/Brody Instrumental Activities of Daily Living (IADL) (Crum et al., 1993), Functional Reach Test (FRT) (Duncan, Weiner, Chandler, & Studenski, 1990), Timed Up and Go (TUG) (Podsiadlo & Richardson, 1991; Shumway-Cook, Brauer, & Woollacott, 2000), and Tinetti Performance Oriented Mobility Assessment, (including separate Balance [B] and Gait [G]) protocols, modified version) (Shumway-Cook et al., 2000; Tinetti, 1986). The Tinetti fall-risk test results indicated a five-fold greater falls-risk (Tinetti, 1986). The TUG test scores also corroborated their appreciable exposure to falls-risk, as any score over 14 s has been shown to increase overall falls-risk (Podsiadlo & Richardson, 1991). The principal focus rested on assessing the risk of accidental falls, as well as individual functional capabilities. All test procedures were fully compliant with widely acknowledged methods for each of the validated measures (Duncan et al., 1990; Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000; Tinetti, 1986). The study participants were interviewed individually in their own nursing home room by trained lay research assistants using an interviewer-administered questionnaire. The interview schedule included the Katz Index Activities of Daily Living (ADL) scale (Katz et al., 1963), Lawton/Brody Instrumental Activities of Daily Living (IADL) scale (Lawton & Brody, 1969) and fear of falling was assessed with *a* single item question. This is the Lawton scale modified by the author, spanning 0–24 points. The actual modification consisted in augmenting each question with the following: 0 – unable to carry out an activity, 1 – able to carry out an activity with a third party's assistance, 2 – able to carry out an activity with a some assistance from a third party, 3 – able to carry out an activity without any assistance whatsoever. Participants were asked about their preferred ways of spending their leisure time (that is non-structured, self-managed activity) over the past four weeks and categorized into two groups: 'typically sedentary' was defined as hardly any activity, or irregular, low-intensity activity, for example watching TV, going to the dining room for meals, on-site socializing with one's peers; 'moderate physical activity' was defined as regular, unassisted pursuit of both