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Delirium is a risk factor for institutionalization and functional decline in older hip fracture patients

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ABSTRACT

Objectives: The risk of institutionalization and functional decline is substantial after a hip fracture. However, previous research has not established the extent to which delirium plays a contributory role.
Methods: Using a prospective design, we studied 207 hip fracture patients aged 65 and older, home-dwelling before the fracture. Patients were screened daily for delirium using the Confusion Assessment Method. Proxy information on pre-fracture cognitive function and function in activities of daily living (ADL) was obtained using the Informant Questionnaire on Cognitive Decline in the Elderly, 16-item version, and the Barthel ADL Index. After 6 months, the patients' functions in ADL measured by the Barthel ADL Index and place of living were registered.
Results: Delirium was present in 80 patients (39%) during the hospital stay. After 6 months, 33 (16%) were institutionalized. Delirium and lower Barthel ADL Index score were the main risk factors for institutionalization with an adjusted odds ratio (AOR) of 5.50 (95% CI = 1.77–17.11) and 0.54 (95% CI = 0.40–0.74) respectively. In patients able to return to their private home, the independent risk factors for functional decline were higher age (B = 0.053, 95% CI = 0.003–0.102) and delirium (B = 0.768, 95% CI = 0.039–1.497).
Conclusions: At 6 month follow-up, delirium constitutes an independent risk factor for institutionalization and functional decline in hip fracture patients living at home prior to the fracture.

Introduction

Delirium is a syndrome of acute cognitive impairment with fluctuating inattention, disorganized thinking and an altered level of consciousness [1]. The syndrome is one of the most frequent complications among elderly hospitalized patients, resulting in increased length of stay [2], and higher costs of care [3]. It is also associated with increased mortality [4–6] and functional decline [7], as well as an additional burden to the patient, hospital staff, and family carers. Hip fracture patients constitute a vulnerable group of patients, and most of the known risk factors for delirium such as cognitive impairment, sensory impairment, and chronic vascular diseases are frequently observed among hip fracture patients. The combination of a high number of predisposing factors and a serious fracture explains the high prevalence of delirium in hip fracture patients, reported up to 53% [8].

Previous studies indicate a relationship between delirium and poor outcomes like cognitive decline [9,10], death [4–6], and institutionalization [11]. However, delirium as a predictor for institutionalization has only been demonstrated in patients suffering from stroke [12] or heart failure [13], and among medical in-patients in general [14–18]. It remains unclear whether delirium is related to increased institutionalization among hip fracture patients. Previous studies have demonstrated an association between hip fracture and the risk of institutionalization [19,20], but these studies have not included assessments of delirium. Few studies have explored the effect of delirium upon institutionalization in hip fracture patients. One study was conducted on a mixed group of hip surgery patients, and excluded patients with dementia. The association between delirium and institutionalization in this study only reached statistical significance after an observation period of 38 months [21]. In a study by Marcantonio and colleagues, delirium was a risk factor for new nursing home placement at 1 month follow-up, but not after 6 months [22,23]. When exploring the relationship between delirium and institutionalization, it is recommended not to use institutionalization as a sole outcome, but rather a composite outcome that incorporates death [24] in order to avoid data errors represented by patients who have died and are no longer at risk of institutionalization [14,25]. Previous studies have often disregarded this recommendation.

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The functional decline after a hip fracture is substantial and less than 40% of hip fracture patients regain their pre-fracture level of independence after surgery [26]. An association between delirium and functional decline has been seen after 3 months in a heterogenous group of patients undergoing non-cardiac surgery [7], but the relationship has not been established in hip fracture patients. Marcantonio and colleagues identified delirium as a predictor for poor functional recovery 1 month after a hip fracture, but their study failed to prove statistical significance at 6 month follow-up [23].

Thus, the aim of this paper is first clarify the extent to which delirium poses a potential risk factor for institutionalization in hip fracture patients living in their own home prior to the fracture. To avoid data errors due to mortality, we will present the results with and without deceased patients. In addition, this study attempts to identify the extent to which delirium affects functional decline in patients able to return to their own homes post-fracture.

Method

Study design

This is a prospective 6-month follow-up study of hip fracture patients admitted to the Ullevaal Clinic of Oslo University Hospital and to Diakonhjemmet Hospital, both in Oslo, Norway. The current paper was a pre-planned secondary data analysis. The method of the study has been described previously [9,27,28].

Participants

All patients aged 65 and older, acutely admitted for a hip fracture during the year of 2006, were eligible for inclusion. Exclusion criteria were inability to speak Norwegian, length of stay less than 48 h, severe aphasia, head trauma, terminal illness, and prior inclusion in the same study for a previous hip fracture. In the current paper, only patients living at home prior to the fracture were included. Long-term outcomes after delirium are the focus in this paper and we have therefore excluded in-hospital deaths from the current analyses (n = 3). Using these criteria a total of 215 patients were included. 8 patients withdrew from the study during the 6-month period. Thus, 207 patients were included in the analysis (Fig. 1).

Procedures and measurements

Two researchers and three study nurses performed all the assessments and collection of data during the hospital stay. At admission, demographic data including age, sex, place of residence, marital status, and number of pre-fracture community care contacts were registered. The delirium assessments were performed using the algorithm version of the Confusion Assessment Method [29] (CAM, a validated tool detecting delirium based on recognition of the core delirium-symptoms: acute onset, fluctuating course, inattention, disorganized thinking, and altered level of consciousness). The delirium screening was accomplished every weekday through the fifth post-operative day or until discharge. The screening was standardized and included testing of orientation regarding person, time, place and situation, which in practice corresponds to the orientation part of the Mini Mental State Examination (MMSE) [30]. On the third day, the patients were tested using the full MMSE and the clock drawing test [31]. In CAM-positive subjects, the Memorial Delirium Assessment Scale (MDAS) [32], containing an orientation test, a short-term memory test, and a Digit Span task was conducted. Inter-rater agreement of the CAM scores was assessed using pair-wise comparisons between one investigator and two of the study nurses, who all together assessed 90.7% of the included patients. The inter-rater agreement was assessed in random sub-samples of 13 and 15 patients, both showing kappa values of 1.0. Based on the medical record, the participants' pre-fracture medications and diagnoses were recorded. The diagnoses were used to calculate each patient's Charlson comorbidity index [33]; a weighted index that takes into account the number and the seriousness of comorbid diseases. Any history of serious somatic diseases like stroke, diabetes, heart failure, Chronic Obstructive Pulmonary Disease (COPD), or cancer was registered as independent variables.

Information concerning pre-fracture cognitive function was collected from the patients' caregivers, using the Informant Questionnaire on Cognitive Decline in the Elderly, Short Form (IQCODE-SF) [34], a validated tool mapping cognitive changes during the last 10 years and up to 2 weeks before admission. An average score of 3.44 or greater is recommended as an indicator of dementia [35]. In cases where proxy information was unavailable (n = 46), the diagnosis of pre-fracture dementia was made by an expert committee consisting of an experienced geriatrician and an experienced geriatric psychiatrist, based on medical records, anamnestic information from the patient and earlier cognitive tests when available (n = 26). Each of the two experts first classified each patient independently, and in cases of initial disagreement they discussed the patient until a consensus was reached. The caregivers also gave information on pre-fracture function in activities of daily living (ADL), using the Barthel ADL Index. The caregivers were instructed to answer the questionnaire based on the patients' level of function 2 weeks before the fracture. The score of this index range from 0 (completely dependent) to 20 (independent) [36].

Anemia at admission was calculated based on the criteria of the World Health Organization (WHO) [37], defined as a hemoglobin level below 13 g/100 ml in men and below 12 g/100 ml in women. The Body Mass Index (BMI) was also calculated during the hospital stay.

Outcomes

All included patients were identified in the National Population Register 6 months after the fracture. This register is consecutively updated in terms of mortality in the Norwegian population. Thereafter, all living patients were contacted and a home-visit was conducted by one of the authors (MK). The mean time to follow-up after the fracture was 7.3 months (standard deviation: 1.0). During the home-visit, the place of residence was registered.

For various reasons (see Fig. 1), home-visit was not conducted in 33 of the 179 patients still alive after 6 months; these patients were therefore not tested for cognition. Their place of residence was registered by telephone-interview or from the National Population Register.

In addition to institutionalization as a separate outcome, a composite outcome including mortality was used [24].

Functional status at 6 months was assessed using the Barthel ADL Index; the family caregivers provided this information in collaboration with the interviewer. Comprehensive cognitive testing was performed at the home-visits and the results from these assessments have previously been published [9]. In patients still living at home at 6 months, the Barthel ADL Index at 6 months was compared to the Barthel ADL Index score at admission.

Statistical analysis

All statistical analyses were conducted with the use of PASW Statistics 18, (SPSS, Inc., 2009, Chicago, IL). The analyses were performed in two sequences; first we examined the risk factors for institutionalization after 6 months, both as an independent outcome and as a composite outcome together with mortality. For the dependent variables, we first conducted bivariate analyses, and then used logistic regression analyses to identify the independent and statistically significant risk factors for the particular outcome. Second, we explored the risk factors of functional decline in patients still living at home at 6 months using linear regression.

In bivariate analyses, categorical data was analyzed using the chi square (χ^2) test. The Fisher's Exact test was used when the expected