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New-Onset Depression Following Hip Fracture Is Associated With Increased Length of Stay in Hospital and Rehabilitation Centers

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Abstract

This article examines the coincident effects of new-onset depression post hip fracture on length of hospital stay, readmission rates, and incidence of infections in older adults. Participants were 101 hip fracture patients aged 60+ years; 38 developed depressive symptoms following their fracture. Infection rates, readmissions to hospital and rehabilitation units, and length of hospital stay were assessed over the 6 months post hip fracture from hospital and general practitioner notes. Patients who developed depression by Week 6 post fracture were likely to spend more time in hospital/rehabilitation wards ($p = .02$) and more likely to be discharged to a rehabilitation unit ($p < .05$). There were no group differences in readmissions or infection rates. New-onset depression coincident with hip fracture in older adults is associated with longer hospital ward stays and greater need for rehabilitation.

Keywords

depression, hip fracture, length of stay

Hip fractures are a growing problem for older adults, with U.K. rates predicted to increase to 117,000 by 2016 (Dennison, Mohamed, & Cooper, 2006). They also have considerable cost implications, estimated at £2 billion a year when acute care and subsequent care are included (NICE Guidelines, 2011). Furthermore, at least half of the individuals who have suffered hip fracture never regain their former level of function (Stevens & Olson, 2000), and discharge to full-time nursing facilities has been reported at 58% with only 14% being discharged back to their homes (Bentler et al., 2009). Post–hip fracture mortality in the United Kingdom has also been recorded as 33% at 1 year (Roche, Wenn, Sahota, & Moran, 2005), and depression is a common co-morbidity of hip fracture in older adults (Nightingale, Holmes, Mason, & House, 2001) with prevalence rates across 8 U.S. and U.K. studies of 9% to 47% (Holmes & House, 2000). However, with one exception (Voshaar et al., 2007), previous research has included patients with depression prior to hip fracture, so it is unclear to what extent hip fracture is associated with new-onset depression.

Depression affects the recovery of independence in walking ability at one-year (Morghen et al., 2011), as well as being associated with greater pain persistence (Herrick et al., 2004,), poorer rehabilitation participation (Lenze et al., 2004), increased risk of falling again (Lloyd et al., 2009), susceptibility to infectious disease (Kiecolt-Glaser & Glaser, 2002), and higher mortality rates (Nightingale et al., 2001). Thus, depression coincident with hip fracture may accelerate progression from health to frailty, a key concern for older adults (Cherniack, Florez, & Troen, 2007). Less is known about the effect of depression after hip fracture on outcomes such as length of hospital stay, readmission and infection rates, and rehabilitation stays. One study reported that depression was the most significant predictor of length of stay in a rehabilitation center (Hershkovitz, Kalandariov, Hermush, Weiss, & Brill, 2007), and others have shown that depression together with cognitive impairment predicts an increased likelihood of longer hospital stays (Holmes & House, 2000) and discharge to a nursing home (Lenze et al., 2004). In contrast, one group showed that only cognitive function and not depression predicted nursing home admission following hip fracture (Pautex, Jacques, Sant, Herrmann, & Chevalley, 2005), and neither predicted length of stay in an Italian study (Zanocchi et al., 2002). Longer stays in hospital and readmissions have

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considerable financial cost, thus identifying and treating factors such as depression, which may influence these rates, will have important cost as well as quality-of-life implications.

Data from our study on synergistic effects of hip fracture and depression on immunity in aging reveal that older adults who developed depression following their hip fracture had impaired immune function in comparison with healthy controls and non-depressed hip fracture patients (Duggal, Upton, Phillips, & Lord, 2013) as well as impaired physical function (Phillips, Upton, Duggal, Carroll, & Lord, 2013). Given the importance of depression for poor recovery in older adults, the present analysis of hip fracture patients sought to examine the association between depression post fracture and rehospitalization, length of hospital and rehabilitation stay, and infection rates.

Method

Participants

Participants were 101 older adults (81 female) with a mean (*SD*) age of 83.9 (7.88) years who were hospital inpatients following hip fracture. Participating hospitals were located in the West Midlands, UK. Inclusion criteria were that patients had fractured the neck of the femur (hip fracture), were 60 years of age or older, and did not meet the exclusion criteria. These included conditions or medications associated with the immune system (e.g., glucocorticoids and immunosuppressants), dementia, taking antidepressants, or having a previous diagnosis of depression before the age of 50 years. All participants were Caucasian. Patients were screened using hospital records, and suitable patients were provided with information about the study; after 48 hr, they were invited to participate.

Design and Procedure

The study was a longitudinal 6-month investigation comparing the physical and mental outcomes of depressed and non-depressed older patients following hip fracture. All participants provided written informed consent, and the study was approved by the local National Health Service (NHS) research ethics committee. Participants completed Geriatric Depression Scale (GDS; Yesavage et al., 1983) while in hospital and within 6 weeks of hip fracture. The GDS was specifically developed to screen the older population for depression (Yesavage et al., 1983). A score of 6 or above was used to categorize patients as "depressed" (Sheikh & Yesavage, 1986).

Sociodemographic data gathered included date of birth, height (m), weight (kg), whether suffering from chronic illness or taking ongoing medication, and occupational category of the previous main bread winner using the Registrar General's classification of occupations (OPCS, 1980). Socioeconomic status was calculated by creating a binary variable (manual/non-manual). Body mass index (BMI) was computed as kg/m^2. At 6 months, patients' medical notes were accessed to determine length of stay in hospital and rehabilitation units, the number of readmissions post discharge, and the number of infections since hip fracture.

Data Analysis

Differences between the depressed and non-depressed groups on the main demographic and operation-related variables were tested using chi-square and ANOVA as appropriate. To examine group differences in the key outcome variables (infection rate, length of stay, number of readmissions, site of readmission), ANOVA or chi-square was used. If any of the sociodemographic variables correlated with infection rates, readmissions, or length of stay, they were included as covariates in analyses predicting these outcomes from depression group.

Results

Reasons for withdrawal between Week 6 and Month 6 included death or being too unwell to be tested ($n = 17$), not being able to continue in the study for a variety of reasons including feeling they had too much to cope with already, or being non-contactable ($n = 18$). Two patients were excluded from analysis as they met the exclusion criteria (although this was not known at the time of testing).

In terms of sociodemographics, the groups were comparable on all of the key variables including age, gender, socioeconomic status, and BMI. Among the 101 patients, 49 (50%) were from manual occupational households, and the mean (*SD*) BMI was in the normal range, 23.2 (3.95) kg/m^2. Of those who participated, 38 (37%) were classified as having new-onset depression at Week 6 using the GDS-15. At Month 6 follow-up, data were available for 66 participants, 19 (29%) of whom were depressed.

The depressed group spent a significantly longer entire length of stay in hospitals, $F(1, 99) = 5.28$, $p = .02$, $\eta^2 = .051$, although the length of inpatient stay at the hospital their surgery took place at did not significantly differ, $F(1, 99) = 0.41$, $p = .53$, $\eta^2 = .004$. Hip fracture patients were significantly more likely to be discharged to a rehabilitation unit, $\chi^2(1) = 4.53$, $p = .03$, and there was a trend for an increased number of readmissions to hospital, $F(1, 88) = 3.59$, $p = .06$, $\eta^2 = .039$. However, depressed patients did not have a greater number of infections while in hospital, $F(1, 97) = 1.61$, $p = .28$, $\eta^2 = .012$. Although they had a higher mean number of infections in the 6 months following their hip fracture, this was not significant, $F(1, 74) = 0.74$, $p = .39$, $\eta^2 = .010$. For the 76 participants with a complete record of their infections over the 6-month follow-up period, 25 (33%) had a urinary tract infection, 7 (9.2%) had a chest infection, 7 (9.2%) had a wound infection, and 13 (17%) had other types of infections. These subgroups of infections were not significantly different between groups (see Table 1).

Table 1. Descriptive Data for Infections Rates and Health Service Length of Stay.

Hospital and rehabilitation data	Depressed at Week 6 *M* (*SD*)/*n* (%)	Not depressed at Week 6 *M* (*SD*)/*n* (%)	*p*
Length of inpatient stay	25.7 (20.27)	23.4 (16.87)	.53
Entire length of stay (including rehabilitation)	39.6 (29.4)	28.1 (19.9)	.02
Discharge to rehabilitation center	13 (34%)	10 (16%)	.05
Number of readmissions	0.6 (1.06)	0.2 (0.50)	.06
Infections during Neck Of Femur (#NOF) fracture admission	0.3 (0.51)	0.4 (0.64)	.28
Infections over 6-month period	1.0 (1.37)	0.8 (1.06)	.39
Number of Urinary Tract Infections (UTI)	0.5 (0.82)	0.5 (.94)	.87
Number of chest infections	0.2 (0.63)	0.1 (.21)	.60
Number of wound infections	0.2 (0.76)	0.1 (.29)	.36
Number of other infections	0.1 (0.31)	0.2 (.48)	.16

Note. Data can be accessed from the ESRC databank.

Discussion

This study shows for the first time that new-onset depression is associated with spending a longer time on health service wards including rehabilitation units, and being more likely to be discharged to a rehabilitation unit. Depressed patients did not have higher infection or readmission rates. However, this might reflect reduced power in the present study, which could be considered a limitation, as generally larger numbers are needed to pick up differences in infection rate.

One explanation for the increased rates of discharge to rehabilitation units might be the observed significantly poorer physical function of the depressed group at 6 weeks, reported elsewhere (Phillips et al., 2013). This is consistent with previous studies, possibly mediated by level of physical rehabilitation (Givens, Sanft, & Marcantonio, 2008; Lenze et al., 2004), although this was not measured in the present study. The total number of infections, and the type of infections experienced over the 6-month follow-up period, was not significantly different between groups. The proportion of participants who experienced UTIs (33%) is slightly higher than that previously reported of 21% during inpatient stay following hip fracture (Ranhoff, Holvik, Martinsen, Domaas, & Solheim, 2010). This difference may be because the infection data reported here are for 6-month follow-up rather than just during inpatient stay. This study indicates that these infections are not related to levels of new-onset depression. However, implications of this study are that it is important to identify new-onset depression following hip fracture, as depressed patients are at increased risk of longer stays in hospital and discharge to rehabilitation units resulting in loss of independence (Hershkovitz et al., 2007).

Conclusion

The implications for patients' well-being and the cost impact for health services suggest that depression screening should be integrated into the post-operative assessment and care of older hip fracture patients.

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