



DEPRESSION AND MORTALITY AFTER HIP FRACTURE: A NARRATIVE REVIEW OF CURRENT EVIDENCE

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ABSTRACT

Background

Hip fracture is a major cause of disability, loss of independence, and mortality among older adults. In addition to the physical consequences of the fracture, psychological disorders, particularly depression, may negatively influence recovery. However, the magnitude of the association between depression and mortality after hip fracture and the mechanisms involved remain incompletely understood.

Objective

To analyze the available evidence regarding the association between depression and mortality after hip fracture and to explore potential mechanisms involving functional recovery, frailty, sarcopenia, nutritional status, cognitive impairment, delirium, and complications.

Methods

A narrative review of the literature was conducted using PubMed/MEDLINE, prioritizing publications from 2015 to 2026 and including earlier studies considered relevant to the topic. Observational studies, prospective and retrospective cohorts, longitudinal studies, systematic reviews, and meta-analyses were considered. The available evidence was synthesized qualitatively.

Results

Depression is common after hip fracture and may persist during the months following the event. Several studies have reported an association between depression or depressive symptoms and poorer functional recovery, although findings have not been consistent across populations. Other studies have reported an association between depressive symptoms and increased mortality, although the magnitude of the association varies according to the population studied, timing of assessment, and definition of depression. The relationship is likely multifactorial and may be influenced by immobility, loss of strength, functional decline, complications, and loss of autonomy.

Conclusions

Depression is a relevant biopsychosocial component of prognosis after hip fracture. Although current evidence supports an association with increased mortality, it does not establish depression as a direct cause of death. Depression may represent both a potentially modifiable condition and a marker of overall vulnerability. Early identification and multidisciplinary management may contribute to more comprehensive care, whereas future studies should determine whether treatment of depression can modify functional recovery and survival.

KEYWORDS: Hip Fracture; Depression; Mortality; Older Adults; Frailty; Sarcopenia; Rehabilitation.

INTRODUCTION

Hip fracture is one of the most serious injuries affecting older adults and is associated with substantial loss of mobility, independence, and quality of life. In addition to its functional consequences, mortality remains elevated during the months and years following hip fracture, particularly among patients

with advanced age, comorbidities, cognitive impairment, frailty, and reduced pre-fracture functional capacity (1,2).

In this context, psychological factors have received increasing attention. Depression is common among older adults with hip fracture and may either predate the fracture or develop after the event. Hospitalization, pain, sudden loss of independence, fear of subsequent falls, and functional



limitations may contribute to the development or worsening of depressive symptoms (3–6).

The clinical importance of depression extends beyond psychological symptoms. Several studies have investigated the association between depression and functional recovery after hip fracture, with findings that are not entirely consistent across populations and methodologies (3,7–9). In addition, evidence suggests an association between depression or depressive symptoms and increased mortality (10–12).

However, this association requires careful interpretation. Patients with depression may simultaneously have advanced age, comorbidities, frailty, sarcopenia, cognitive impairment, malnutrition, and poorer baseline function. Therefore, depression may act as an independent risk factor, a marker of vulnerability, or part of a multifactorial pathway involving several determinants of prognosis.

The objective of this narrative review was to analyze current evidence regarding the association between depression and mortality after hip fracture and to explore potential mechanisms linking depressive symptoms with functional recovery and other determinants of prognosis.

METHODS

A narrative review of the literature was conducted using PubMed/MEDLINE. Publications from 2015 to 2026 were prioritized, while earlier studies were included when considered relevant to understanding the development of the available evidence.

Observational studies, prospective and retrospective cohorts, longitudinal studies, systematic reviews, and meta-analyses evaluating depression or depressive symptoms in older adults with hip fracture were considered, particularly those addressing mortality, functional recovery, rehabilitation, frailty, sarcopenia, nutritional status, cognitive impairment, and complications.

Given the narrative nature of the review, the studies were qualitatively synthesized, and no original meta-analysis was performed. Particular attention was given to the distinction between pre-existing depression and depressive symptoms developing after the fracture, as well as to potential confounding and mediating variables.

Depression in Older Adults With Hip Fracture

Depression is one of the most frequently investigated psychological problems following hip fracture. A systematic review and meta-analysis of 27 studies including 11,958 patients estimated an overall prevalence of depression of approximately 23% among older adults with hip fracture (4).

The development of depression is not limited to patients with a previous psychiatric history. In a prospective cohort of older adults without major depressive disorder at the time of fracture, 18 of 126 participants (14.3%) developed major depressive disorder during the subsequent six months. Eleven cases occurred before hospital discharge, while seven developed between 2 and 10 weeks after the fracture (5).

A structured scoping review including 55 studies identified depression as one of the most frequently investigated psychological factors after hip fracture and found that psychological conditions may influence recovery and other health outcomes. However, the authors emphasized that the

available literature is predominantly observational and subject to methodological limitations (6).

Therefore, depression should be considered a dynamic phenomenon that may precede the fracture, develop as a consequence of the event, or persist throughout recovery.

REVIEW OF THE EVIDENCE

Depression and Mortality After Hip Fracture

Available evidence suggests an association between depression and mortality after hip fracture. A meta-analysis of 18 cohort studies including 223,875 patients identified depression among several factors associated with increased mortality, with a pooled hazard ratio (HR) of 1.71 (95% confidence interval [CI], 1.43–2.05) (12).

A prospective Japanese study published in 2025 evaluated 175 patients after hip fracture surgery and used the Patient Health Questionnaire-9 (PHQ-9) to assess depressive symptoms. Higher depressive symptom scores were associated with poorer survival during six months of follow-up. The analysis reported an odds ratio of 1.15 (95% CI, 1.05–1.27) and a hazard ratio of 1.11 (95% CI, 1.00–1.23), with the latter result being at the borderline of conventional statistical significance (11).

Similarly, a nationwide Danish cohort study including patients undergoing hip fracture surgery found that dementia, depression, and other mental disorders were associated with adverse outcomes, including mortality. The magnitude of risk varied according to the specific mental disorder and outcome assessed, with particularly pronounced associations among patients with dementia (10).

Evidence from the general population also supports the prognostic relevance of depression. A Danish nationwide matched-cohort study demonstrated higher all-cause and cause-specific mortality among individuals with major depression compared with matched controls (13). Although these findings are not specific to patients with hip fracture, they provide a broader context in which depression may be associated with increased overall medical vulnerability.

Taken together, these findings support an association between depression and mortality but do not establish depression as a direct cause of death. Age, comorbidities, cognitive impairment, frailty, functional status, nutritional status, and social factors may simultaneously act as confounders, mediators, or effect modifiers.

Potential Mechanisms Linking Depression and Mortality

The relationship between depression and mortality is likely multifactorial. An integrative model suggests that depressive symptoms may be part of a trajectory characterized by reduced physical activity and rehabilitation participation, followed by loss of muscle strength and mass, functional decline, dependence, and increased vulnerability to complications.

Depression may also coexist with frailty, sarcopenia, malnutrition, and cognitive impairment. These factors are independently associated with reduced recovery and poorer outcomes after hip fracture (14–17).

Therefore, depression may simultaneously function as a marker of vulnerability and as a potentially modifiable component of a trajectory of decline. Current evidence does not



allow determination of how much of the observed risk reflects a direct effect of depression and how much reflects the accumulation of other adverse factors.

Depression, Immobility, and Functional Recovery

Functional recovery is one of the major determinants of prognosis after hip fracture. Depressive symptoms may be associated with lower physical activity, reduced motivation, and decreased participation in rehabilitation programs.

In a longitudinal cohort of 154 older adults with hip fracture, a history of depression was independently associated with poor functional outcome at four months, with an odds ratio of 2.94 (95% CI, 1.15–7.85) (7). However, the association was attenuated after adjustment for pre-fracture walking ability, highlighting the importance of baseline functional status as a potential confounder.

Other studies have reported associations between depressive symptoms and poorer functional outcomes, although findings have not been consistent across populations (3,9). In addition, Givens et al. demonstrated that depressive symptoms, cognitive impairment, and delirium were individually associated with adverse functional outcomes and that the coexistence of these conditions progressively increased the risk of decline in activities of daily living, loss of walking ability, institutionalization, or death (8).

The study by Shyu et al. demonstrated a high frequency of depressive symptoms during the first year after hip fracture, with a progressive reduction during follow-up and an important influence of pre-fracture function and social support (18).

Rehabilitation should therefore not be considered solely from a musculoskeletal perspective. Psychological status may influence a patient's ability to participate in and benefit from the recovery process.

Depression, Frailty, and Sarcopenia

Frailty and sarcopenia represent potentially important mechanisms linking depression with poor outcomes.

A systematic review of 11 studies involving 2,314 patients estimated a prevalence of sarcopenia of approximately 44% among older adults with hip fracture. Most included studies associated sarcopenia with poorer functional recovery, although evidence regarding mortality was more heterogeneous (14).

Frailty is also an important predictor of adverse outcomes. A systematic review and meta-analysis found that frailty was associated with increased mortality and functional decline after hip fracture (16).

Furthermore, the relationship between depression and sarcopenia appears to be bidirectional. A 2025 meta-analysis including 33 studies and 119,421 participants found associations in both directions: sarcopenia was associated with depression (OR, 2.40; 95% CI, 1.87–3.08), while depression was associated with sarcopenia (OR, 1.90; 95% CI, 1.44–2.50) (19). A previous meta-analysis also found an association between sarcopenia and depression, with an adjusted OR of 1.82 (95% CI, 1.16–2.86) (20).

These findings support the possibility of a clinical cycle in which depressive symptoms are associated with reduced activity and muscle loss, while weakness and loss of

independence may contribute to the persistence or worsening of depressive symptoms.

Muscle Strength and Vulnerability

Muscle strength may represent one of the links between psychological status and functional outcomes. Reduced physical activity associated with depressive symptoms may contribute to loss of strength, impaired mobility, and increased dependence.

Handgrip strength may therefore represent a simple indicator of functional reserve and vulnerability. A systematic review of predictors after hip fracture identified low handgrip strength and frailty among important predictors of poor functional outcomes and mortality (2). However, current evidence does not establish that reduced handgrip strength causally explains the relationship between depression and mortality after hip fracture.

Joint assessment of depressive symptoms, muscle strength, functional capacity, and frailty may provide a more comprehensive characterization of individual risk.

Depression and Nutritional Status

Nutritional status represents another potential component of this relationship. A review of 44 studies including 26,281 patients found a substantial prevalence of malnutrition among older adults with hip fracture and demonstrated associations with poorer functional outcomes and increased mortality (15).

A more recent systematic review and meta-analysis found an association between malnutrition and adverse outcomes after hip fracture, including mortality (17).

Depressive symptoms may contribute to nutritional deterioration through reduced appetite or decreased interest in food. Conversely, malnutrition may contribute to weakness, fatigue, sarcopenia, and reduced rehabilitation capacity.

This interaction suggests that nutritional status should be considered when assessing older adults with depressive symptoms after hip fracture.

Depression, Cognitive Impairment, and Delirium

Depression may coexist with cognitive impairment and delirium, conditions that can complicate recovery after hip fracture.

Cognitive impairment may reduce the ability to participate in rehabilitation, interfere with following instructions, and increase dependence. Delirium, in turn, is associated with poorer hospital and functional outcomes.

A systematic review and meta-analysis published in 2026 found an association between preoperative depressive symptoms and postoperative delirium in older adults undergoing surgery (21). However, this evidence was not specific to patients with hip fracture and should therefore be interpreted as indirect evidence.

The coexistence of depression, cognitive impairment, and delirium may represent a phenotype of greater vulnerability and may contribute to the functional risk observed after hip fracture.



Pre-existing Depression Versus Depression Developing After Hip Fracture

Distinguishing depression that predates the fracture from depression developing afterward is clinically important.

Pre-existing Depression

Pre-existing depression may reflect baseline vulnerability characterized by lower physical activity, reduced social participation, comorbidities, frailty, or cognitive impairment. In these patients, the fracture may represent an additional stressor imposed on an already reduced functional reserve.

A history of depression may also identify patients with reduced ability to adapt to the physical and psychological stress associated with hip fracture.

New-Onset Depression

Depression developing after the fracture may occur in association with sudden loss of autonomy, pain, hospitalization, fear of subsequent falls, changes in the social environment, and difficulty recovering previous function.

Lenze et al. reported that 18 of 126 older adults without major depression at the time of fracture developed major depression during the subsequent six months, corresponding to 14.3% of the cohort (5).

Depression after hip fracture should therefore be viewed as a dynamic process. Persistent symptoms may be particularly relevant from a prognostic perspective, whereas transient symptoms during hospitalization may partly reflect the acute response to trauma and the hospital environment.

Depression and Rehabilitation

The relationship between depression and functional recovery may generate a negative feedback cycle. Depressive symptoms may be associated with lower physical activity and rehabilitation participation, while loss of mobility and autonomy may contribute to persistence of depressive symptoms.

A systematic review and meta-analysis of eight clinical trials involving 1,146 participants found a trend toward reduced depressive symptoms with exercise-based rehabilitation after hip fracture, although the overall effect did not reach conventional statistical significance and substantial heterogeneity was observed across studies (22).

Similarly, a systematic review and meta-analysis of 17 trials involving 1,850 patients found generally high adherence to exercise programs after discharge, with pooled adherence of 88%. Programs lasting more than six months were associated with lower adherence; however, adherence was not clearly associated with improved functional outcomes (23).

These findings suggest that rehabilitation may provide an opportunity to address physical function and psychological well-being simultaneously, although there is currently insufficient evidence to conclude that interventions targeting depressive symptoms reduce mortality.

Detection and Management of Depression After Hip Fracture

Early identification of depressive symptoms may be incorporated into the comprehensive assessment of older adults

with hip fracture. Instruments such as the Patient Health Questionnaire-9 (PHQ-9) and geriatric depression scales may facilitate initial screening.

However, interpretation during hospitalization requires caution. Fatigue, sleep disturbance, reduced appetite, decreased activity, and impaired concentration may result directly from the fracture, surgery, pain, or hospitalization and do not necessarily indicate a major depressive episode.

Management should be integrated into a multidisciplinary model including adequate pain control, early mobilization, rehabilitation, nutritional assessment, prevention and treatment of delirium, optimization of comorbidities, and social support.

Although these measures may improve different components of prognosis, evidence remains insufficient to conclude that specific treatment of depression reduces mortality after hip fracture.

DISCUSSION

The evidence reviewed indicates that depression is common after hip fracture and is frequently associated with poorer functional recovery, although findings are not completely consistent across studies. Associations with mortality have also been reported, although their magnitude varies according to the population studied, definition of depression, timing of assessment, and variables included in statistical models (10–12).

One possible explanation is that depression forms part of a vulnerability phenotype characterized by frailty, sarcopenia, malnutrition, cognitive impairment, reduced baseline function, and loss of autonomy. In this context, depressive symptoms may simultaneously reflect underlying vulnerability and contribute to its persistence.

Functional recovery may represent one of the main links between depression and mortality. Reduced physical activity and rehabilitation participation may contribute to loss of strength, sarcopenia, and dependence. These conditions may subsequently increase susceptibility to complications and limit recovery.

Nutrition represents another potential mechanism. Depressive symptoms may be associated with reduced food intake and weight loss, while malnutrition contributes to weakness and muscle loss. The interaction between these processes may be particularly relevant in frail patients.

The coexistence of cognitive impairment and delirium adds further complexity. These conditions may limit participation in rehabilitation and are associated with poorer outcomes after hip fracture. Therefore, assessment of depression in isolation is unlikely to adequately characterize overall risk.

An important issue is the distinction between pre-existing depression and new-onset depression. The former may represent a marker of pre-existing vulnerability, whereas the latter may reflect the psychological and functional consequences of the fracture. Future studies should analyze these categories separately and also consider symptom persistence.



Limitations of the Current Evidence

The main limitation of the available literature is the predominance of observational studies. Heterogeneity in the instruments used to assess depression, timing of assessment, and definitions of mortality makes direct comparison between studies difficult.

Furthermore, studies have not uniformly adjusted for important factors such as pre-fracture function, frailty, dementia, comorbidities, nutritional status, and social circumstances. These variables may confound or mediate the observed association between depression and mortality.

Another limitation is that some studies used to understand mechanisms related to delirium or mortality were conducted in general older surgical populations rather than exclusively among patients with hip fracture. These findings should therefore be regarded as complementary rather than hip-fracture-specific evidence.

For these reasons, epidemiological associations should not automatically be interpreted as evidence of causality.

Future studies should use standardized assessments of depression, function, frailty, muscle strength, cognition, and nutritional status, while distinguishing between pre-existing, new-onset, and persistent depression. Prospective and interventional studies are also needed to determine whether modifying depressive symptoms produces clinically meaningful improvements in functional recovery or survival.

CONCLUSIONS

Depression is common after hip fracture and is associated with poorer functional recovery in several studies and, in some studies, with increased mortality. This relationship is likely multifactorial and influenced by the interaction among depression, frailty, sarcopenia, malnutrition, cognitive impairment, immobility, and loss of autonomy.

Although current evidence supports considering depression an important prognostic marker, it does not establish a direct causal relationship or demonstrate that treatment of depression reduces mortality. Depression may represent both a potentially modifiable condition and an indicator of overall vulnerability.

Early identification of depressive symptoms, integrated into a multidisciplinary approach including rehabilitation, nutritional management, pain control, and cognitive assessment, may contribute to more comprehensive patient care. However, prospective and interventional studies are needed to determine whether targeted treatment of depression can actually modify recovery and survival after hip fracture.

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Conflict of Interest

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