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Hip fracture and cognitive impairment in older adults–integrated approaches to rehabilitation: a narrative review

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Fragility fractures, particularly hip fractures, represent a major public health concern among older adults and are associated with high morbidity, mortality, functional decline, and socioeconomic burden. Cognitive impairment is common in older adults with hip fractures and contributes to increased fracture risk, poor postoperative outcomes, delayed recovery, and higher rates of institutionalization. This review aimed to examine rehabilitation strategies for older adults with hip fractures, with a specific focus on considerations for those with cognitive impairment. Evidence suggests that individuals with mild-to-moderate cognitive impairment can achieve meaningful functional gains through structured, intensive, multidisciplinary rehabilitation programs incorporating progressive resistance training, balance and mobility exercises, and individualized approaches tailored to cognitive and physical abilities. However, the implementation of such programs is often hindered by insufficient staff training and awareness in dementia-specific rehabilitation, limited resources, and the lack of standardized protocols defining eligibility, intensity, and adaptation. Optimizing outcomes requires structured, tailored rehabilitation protocols, enhanced staff education, interprofessional collaboration, and proactive management of delirium and secondary fracture prevention through fracture liaison services, while concurrently addressing systemic barriers such as resource constraints. Integrated, coordinated care across the continuum is essential to maximize recovery, independence, and quality of life in older adults with hip fractures and cognitive impairment.

Keywords: Aged; Cognition disorders; Dementia; Hip fractures; Rehabilitation

Introduction

Fragility fractures typically result from low-energy trauma, defined as a fall from standing height or less, or from spontaneous fractures occurring at common sites such as the vertebrae, proximal hip, wrist, or humerus [1]. Although osteoporosis is clinically significant primarily because of fragility fractures resulting from decreased bone strength [1,2], it is important to recognize that most fragility fractures occur in individuals with only modest reductions in bone mass or even normal bone mineral density (BMD) [2]. This observation highlights that factors beyond BMD, such as bone geometry, microarchitecture, and other clinical risk determinants, play crucial roles in fracture risk [2]. Ultimately, fragility fractures represent a major consequence of both osteoporosis and aging, irrespective of BMD status.

Among fragility fractures, hip fractures are the most severe because of their high mortality, profound functional decline, and substantial healthcare costs. The 1-year mortality rate ranges from 20% to 24%, and approximately one-third of patients require nursing home care [3]. Functionally, only 40%–60% of survivors regain their pre-fracture mobility, and about 60% continue to need assistance 1 year later, underscoring the persistent challenges of recovery [3]. With the rapidly aging global population, the incidence of hip fractures is projected to increase sharply, amplifying the socioeconomic burden. In 2019, 1.4 million hip fractures occurred worldwide among individuals aged ≥50 years, and this figure is expected to rise to 4.5 million by 2050 [4]. The total healthcare cost per patient—including hospitalization, medical treatment, and social care—exceeds US$50,000 within the first year following a hip fracture [5]. In South Korea, which is projected to

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become a super-aged society by 2025 [6], the increase in hip fracture incidence is anticipated to be approximately 2.64 times higher than the global average [7]. Nationwide data from 2022 reported an incidence of 16.9 per 10,000 persons, with a strikingly higher rate of 100.7 per 10,000 persons among those aged ≥80 years [8]. In 2021, the 1-year mortality rate after hip fracture in individuals aged ≥50 years was 18.2% [8]. Economically, compound fractures, including hip fractures, accounted for the highest average medical expenditures (US$8,100), followed by isolated hip fractures (US$6,100) [9]. Patients with hip fractures incurred significantly greater direct medical costs than those without fractures. During the first year post-fracture, additional direct medical costs averaged US$2,514 per patient, with an additional US$264 in the second year [10], illustrating the enduring financial burden in older adults.

Multiple factors, including cognitive impairment, contribute to poor outcomes after hip fractures, further exacerbating the socioeconomic impact [11]. Cognitive impairment—ranging from mild deficits to severe dementia—becomes increasingly prevalent with age and is influenced by cardiovascular and neurological conditions, genetics, frailty, lifestyle, education, social engagement, and nutrition [12]. It is particularly common among older adults with hip fractures, with approximately 19% of patients having dementia and up to 40% exhibiting some degree of cognitive impairment [13]. Cognitive impairment not only increases the risk of hip fractures [13,14] but also worsens postoperative outcomes [11], complicates rehabilitation, and hinders recovery [13,15].

Given the high prevalence and significant impact of cognitive impairment on outcomes following hip fractures, this review aimed to explore rehabilitation strategies for older adults with hip fractures, emphasizing the role of cognitive impairment. The discussion highlights the importance of early identification and standardized assessment of cognitive status to guide individualized management strategies and improve functional recovery.

Ethics statement

As this study is a literature review, it did not require institutional review board approval or individual consent.

Hip fractures and cognitive impairment

Cognitive impairment is a well-recognized risk factor for hip fractures in older adults because it is associated with reduced physical function, multiple comorbidities, and polypharmacy, including the use of medications that increase fracture risk [13]. Compared with cognitively intact individuals, those with cognitive impairment exhibit a higher prevalence of osteoporosis and reduced access to preventive care, both of which contribute to an elevated risk of hip fractures [13]. In addition to serving as a risk factor, cognitive impairment independently predicts poor outcomes after hip fractures, including high rates of nursing home admission, mortality, recurrent fractures, and impaired functional recovery [11,14,16]. Older adults with dementia are particularly vulnerable, with a markedly increased risk of loss of walking ability and greater limitations in activities of daily living (ADLs) after fracture than those without dementia [14].

Cognitive impairment often coexists with other geriatric syndromes such as sarcopenia, frailty, and malnutrition [17], which are closely interrelated and collectively worsen outcomes after hip fracture. Patients with sarcopenia are 2.85 times more likely to have cognitive impairment (95% confidence interval [CI], 2.19–3.72) [18]. Conversely, cognitive impairment is more prevalent among patients with sarcopenia (odds ratio, 2.50; 95% CI, 1.26–4.92) [19], and nearly one-third of adults aged ≥65 years with cognitive impairment are affected by sarcopenia [20]. Malnutrition frequently develops after hip fracture and is more common among those with cognitive impairment [11]. Frailty, defined as an age-related decline in physiological reserves, not only increases the risk of hip fracture but also is associated with a heightened risk of dementia [21]. Collectively, these interrelated conditions are consistently linked to poor pre-fracture function, multimorbidity, and adverse outcomes.

Cognitive impairment exacerbates poor outcomes after hip fracture by limiting mobility, reducing physical activity, and impairing nutritional intake, thereby accelerating muscle weakness and atrophy [17,22,23]. Conversely, muscle weakness and atrophy associated with sarcopenia, malnutrition, and frailty further reduce physical activity—an essential determinant of brain health that supports brain volume preservation and memory-related neural function—and contribute to cognitive decline through mechanisms such as chronic inflammation, impaired cerebral blood flow, and disruptions in the muscle–brain axis mediated by dysregulated myokine secretion [24]. Patients with cognitive impairment are generally less likely to achieve early mobilization after hip fracture surgery compared with those without such impairment [25]. Walking, the primary focus of post-surgical rehabilitation, is a complex process requiring not only muscle strength, joint flexibility, and proprioception, but also cognitive functions such as executive function, attention, motor planning, concentration, memory, and learning [26]. Therefore, cognitive impairment, whether alone or combined with sarcopenia, frailty, and malnutrition, substantially increases vulnerability to poor out-

comes after hip fracture.

Patients with cognitive impairment are often perceived as having limited or no rehabilitation potential, leading to fewer referrals, reduced opportunities for mobilization, lower therapy intensity, and premature discontinuation of treatment [15,25,27]. These challenges are compounded by systemic limitations, including inadequate inpatient and outpatient rehabilitation resources, insufficient provider training, and the absence of dementia-specific rehabilitation protocols [15,25]. In a cross-sectional survey of rehabilitation providers in Australia and New Zealand, only 10% of acute care facilities reported having a specific rehabilitation protocol for individuals with dementia [28]. Moreover, memory deficits can hinder adherence to therapy—not due to unwillingness but to difficulty recalling instructions [25]—further restricting participation and functional gains. Combined with underlying physical vulnerabilities, these barriers contribute to poor functional outcomes and delayed recovery.

Rehabilitation in older adults with hip fracture

Effective recovery after a hip fracture requires not only timely surgical intervention, postoperative stabilization, complication prevention, and initial pain management, but also early, intensive rehabilitation aimed at restoring physical function. Beyond the acute phase, long-term management, including re-fracture prevention, sustained exercise programs, medication management, nutritional support, chronic disease control, and quality-of-life improvement, is essential [29]. Throughout this process, a multidisciplinary team comprising rehabilitation specialists, physicians, physical and occupational therapists, nutritionists, clinical nurse specialists, and social workers collaborates to support recovery while providing psychological support for patients and their families and establishing continuing social support networks after discharge [29]. Continuous rehabilitation should be integrated with secondary prevention within a coordinated care framework to ensure a seamless transition from acute treatment to post-discharge recovery [29].

Multidisciplinary rehabilitation during the acute phase has proven particularly effective in improving functional outcomes, reducing nursing home admissions, lowering healthcare costs, and decreasing mortality among older adults with hip fractures; therefore, it serves as a cornerstone of hip fracture management [30-32]. Delivered through an interdisciplinary, coordinated team, this approach provides intensive and integrated orthogeriatric care that combines structured physical therapy, early mobilization, education, and goal setting to facilitate early supported discharge [32]. It also promotes continuity of care through structured post-discharge coordination, such as fracture liaison services (FLSs) [33]. Rehabilitation interventions should be intensive, structured, individualized, and guided by standardized functional assessments [32]. Structured exercise refers to carefully designed interventions that target impairments, activity limitations, and participation restrictions. Such programs typically combine multiple components—progressive resistance training, balance exercises, functional mobility training, and weight-bearing activities—delivered at high frequency along with early mobilization, rather than relying solely on simple gait training [32].

An expanding body of clinical evidence supports the superior effectiveness of multidisciplinary rehabilitation compared with usual orthogeriatric care or basic exercise programs in acute settings. A recent randomized controlled trial (RCT) in South Korea [34]—the first to directly compare distinct rehabilitation strategies in older adults with hip fractures—demonstrated that comprehensive multidisciplinary rehabilitation was superior to conventional rehabilitation in improving ambulation and other functional outcomes over a 12-month follow-up. The program provided structured, high-volume, high-intensity interventions, including physical therapy (two 30-minute sessions per day for 10 days) and occupational therapy (4 days), consistent with previously reported intensive rehabilitation protocols and aligned with current clinical guidelines (e.g., 2 hours per day, 3 days per week; three 90-minute sessions daily, 7 days per week; or 60 minutes per day, 6 days per week) [32]. Similarly, a review by Beaupre et al. [35] found that very intensive physiotherapy (extended inpatient therapy with a home exercise program), intensive outpatient center-based rehabilitation (e.g., 45–90 minutes, 3 times per week), and progressive resistance training improved physical performance and reduced falls. Multidisciplinary programs that integrate intensive exercise with comprehensive management provide additional benefits, including better ADL performance and lower risks of mortality, institutionalization, and disability. Collectively, these findings highlight that rehabilitation effectiveness depends not only on its availability but also on ensuring adequate intensity, structure, and multidisciplinary integration to maximize recovery after hip fracture.

Recovery of gait and balance in older adults with hip fractures typically occurs within 6–9 months, whereas instrumental ADLs may take up to 1 year [36]. However, many survivors fail to fully regain their pre-fracture mobility and continue to require assistance with daily activities, with a considerable proportion eventually needing nursing home care [3]. This underscores that older adults with hip fractures often require prolonged recovery periods, and many continue to experience persistent functional lim-

itations. Depending on individual recovery trajectories, patients should be connected to ongoing rehabilitation programs and community-based support services to optimize long-term outcomes.

The FLS is a coordinator-based integrated model designed to prevent secondary fractures in patients with fragility fractures. Initially developed in the United Kingdom to address the rising incidence of such fractures, the FLS has since expanded worldwide, with more than 1,142 programs implemented across multiple regions since 2012 [37]. The FLS encompasses both acute management and secondary prevention by coordinating evaluation of the index fracture, assessment of underlying comorbidities, and initiation of early postoperative rehabilitation in acute hospitals. It also ensures ongoing fracture risk assessment, targeted treatment, and coordinated care as patients transition through post-acute services toward completion of their rehabilitation continuum. Evidence indicates that the FLS increases osteoporosis diagnosis and treatment rates, decreases fall and re-fracture incidence, reduces fracture-related morbidity and mortality [38], and lowers healthcare costs [39]. Considering the poor outcomes often observed in hip fracture patients—such as delayed functional recovery, prolonged hospitalization, and elevated re-fracture risk—the FLS model represents a critical strategy for improving outcomes across the entire continuum of care, from the acute hospital phase through post-acute rehabilitation after discharge.

Rehabilitation in older adults with hip fracture and cognitive impairment

Older adults with hip fractures and cognitive impairment are less likely to regain their pre-fracture functional level, and delivering effective rehabilitation can be challenging. Nevertheless, multiple studies have demonstrated that these patients can benefit significantly from structured, intensive rehabilitation interventions. A systematic review by Allen et al. [40] examined rehabilitation interventions in older adults with hip fractures and compared outcomes between those with mild-to-moderate dementia and those without cognitive impairment. Thirteen secondary analyses (5 RCTs and 8 cohort studies) conducted in early postoperative inpatient settings were included. Interventions commonly involved strength, range-of-motion, gait, and transfer training, as well as self-care activities. Owing to heterogeneity in participants, interventions, and outcomes, a meta-analysis was not feasible. Functional outcomes, most frequently measured using the Functional Independence Measure and Barthel index, showed no significant effect of cognitive status on recovery. Individuals with cognitive impairment achieved functional improvements comparable to those without impairment. Similarly, across 5 studies assessing ambulation with various measures, patients with mild-to-moderate dementia demonstrated gains similar to those of cognitively intact patients.

A recent Cochrane review included 7 trials [41]. Three compared enhanced inpatient care with conventional care, 2 evaluated enhanced care spanning inpatient and home settings, and 2 compared geriatrician- versus orthopedic-led inpatient care. None of the interventions were designed specifically for individuals with dementia; thus, the review's data were derived from subgroups of participants with dementia or cognitive impairment enrolled in RCTs assessing care models for older adults after hip fracture. The outcomes evaluated included ADLs and functional performance (4 trials); mortality (5 trials); postoperative adverse events including delirium (6 trials); and health and social care utilization measures such as length of hospital stay, readmissions, emergency visits, discharge destination, and medication use (6 trials). The review suggested that enhanced inpatient models of rehabilitation and care may reduce postoperative delirium and hospital length of stay in patients with dementia following hip fracture, although the available evidence remains limited.

A review of 4 RCTs by Beaupre et al. [35] investigating approaches to maximize functional recovery after hip fracture evaluated intensive inpatient rehabilitation in community-dwelling older adults with cognitive impairment compared with usual postoperative care. Patients with mild-to-moderate cognitive impairment benefited from higher-intensity interventions, demonstrating greater improvements in walking speed, functional performance, pain reduction, ambulation, and likelihood of returning to their pre-fracture residence. Although patients without cognitive impairment generally achieved higher absolute functional levels, both groups exhibited significant functional gains, indicating that cognitive impairment does not preclude the benefits of intensive rehabilitation.

A recent scoping review identified 17 studies examining rehabilitation interventions for adults with hip fractures and cognitive impairment, most of which included older adults with a mean age of ≥75 years [42]. Six studies enrolled only participants with cognitive impairment, while the others included mixed populations. The interventions were broadly classified into physical rehabilitation (e.g., standing, walking, range of motion, balance, and strength training) and comprehensive programs that incorporated discharge planning, patient and family education, and nutritional support. Delivery was primarily led by interdisciplinary teams, although 2 studies involved physiotherapists alone, and approximately half tailored interventions to individual needs. All programs were initiated in hospital settings, with several extending to

home-based or cross-sectoral components. The outcomes most frequently targeted physical function and ADL performance, with some studies additionally assessing mortality, readmission, length of stay, and quality of life. The findings were mixed: several studies reported improvements in walking ability, ADL performance, and reduced hospital stay, whereas others found no significant differences. Mortality outcomes were inconsistent. Notably, comparative analyses indicated that patients with and without cognitive impairment achieved largely similar functional outcomes, although one study reported poorer fall and emergency visit outcomes among those with cognitive impairment. Overall, the evidence underscores the potential of rehabilitation interventions to facilitate recovery in this population, while the heterogeneity in study design and outcome measures highlights the need for further research to establish standardized, evidence-based protocols.

Many patients with hip fractures and cognitive impairment require prolonged, coordinated post-discharge rehabilitation to achieve optimal functional recovery. However, the most effective rehabilitation and care model for this population remains unclear. A Cochrane review by Smith et al. [41] and a review by Chu et al. [43] evaluated largely overlapping studies on community-based rehabilitation after hip fracture. Chu et al. [43] reported that post-discharge, community-based interventions produced promising effects on physical function, mobility, and ADLs in older adults with cognitive impairment. Similarly, the Cochrane review found that enhanced interdisciplinary inpatient and home-based rehabilitation models improved functional performance and ADLs and reduced falls at 12 months [41]. Nevertheless, the evidence remains insufficient to recommend these models over conventional rehabilitation specifically for individuals with dementia. A systematic review by Resnick et al. [44] included 7 heterogeneous studies conducted in post-acute care settings, comprising 4 RCTs, a single-group pre–post study, a descriptive comparison, a matched case–control trial, a non-equivalent group trial, and a case report. Across these studies, patients with and without cognitive impairment demonstrated functional gains, although cognitive function itself did not improve. Most interventions produced outcomes comparable to those of usual care in terms of functional recovery, length of stay, and discharge destination. However, specific models—such as the patient-centered rehabilitation model for individuals with cognitive impairment, the cognitive geriatric unit, and augmented exercise programs—were associated with a greater likelihood of returning home and with improvements in gait, balance, mobility, and quality of life. These findings suggest that post-acute rehabilitation targeting patients with cognitive impairment is feasible and that intensive, structured exercise combined with innovative engagement strategies can optimize functional outcomes in this population.

Although cognitive impairment may limit complete functional recovery after hip fracture, patients with mild-to-moderate dementia can still benefit substantially from structured rehabilitation and should not be excluded from participation. This recommendation is consistently supported by recent systematic reviews [35,40,42-44] and clinical guidelines [32]. Interventions incorporating progressive high-intensity resistance training, balance exercises, weight-bearing activities, and functional mobility training have been shown to enhance mobility, ADL performance, pain management, and the likelihood of returning to independent living [32]. Standardized cognitive assessment is essential, as modifiable factors—such as medication optimization, complication prevention, and early mobilization [44]—can influence outcomes and enable individualized treatment planning. Multidisciplinary, tailored programs that potentially integrate cognitive therapies or technology-assisted interventions are also promising. Older adults with cognitive impairment often struggle to maintain or regain mobility and functional abilities after discharge, frequently requiring long-term care, extended hospital stays, and experiencing higher readmission rates [13]. Beyond early rehabilitation and intensive exercise during the acute phase, extended post-acute rehabilitation is crucial for optimizing recovery. Integrating the FLS with prolonged rehabilitation, structured discharge planning, and coordinated post-discharge care may further enhance functional and clinical outcomes. The studies included in the reviews discussed in this section are summarized in Table 1 (Supplement 1).

Management considerations for older adults with hip fractures and cognitive impairment

Delirium

Delirium is particularly common among older adults with hip fractures and dementia. Its occurrence is primarily influenced by advanced age and cognitive impairment and is precipitated by perioperative stress, hospital-related factors, polypharmacy, nutritional and fluid deficiencies, and systemic inflammation [45]. Delirium at the onset of rehabilitation can hinder postoperative weight-bearing, delay mobility recovery, and complicate effective therapy [25,46]. Given its reversible nature and substantial impact on functional outcomes, early recognition and proactive management are essential [47]. Effective delirium management can enhance rehabilitation potential, reduce the risk of long-term care placement, and decrease mortality [48]. Therefore, prevention and early intervention are integral components of post-fracture rehabilitation strategies for older adults.

Table 1. Summary of studies on rehabilitation in older adults with hip fracture and cognitive impairment included in the reviewed literature

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Watne et al. [S52][a] (2013), Norway	Randomized controlled trial	329 patients; intervention (ortho-geriatric ward): 163 (42 men, 26%); control (orthopedic ward): 166 (38 men, 23%)	Intervention: 84 (55–99); control: 85 (46–101)	Conventional recovery intervention: a traditional orthopedic ward with conventional rehabilitation.	Ortho-geriatric intervention: intervention group participants were transferred as soon as possible to the ortho-geriatric ward, stabilized there preoperatively, and transferred back to the same ward postoperatively for further treatment and rehabilitation.	Cognition (CDR+CERAD), ADL, NEADL, IQCODE, mortality, SPPB, delirium, complications, dementia (4 & 12 months), LOS	No significant differences were found between acute geriatric and orthopedic ward care in cognitive function at 4 months, delirium rates, or 4-month mortality. In a subgroup analysis, patients living at home pre-fracture and treated in the geriatric ward had better mobility at 4 months (SPPB median 6 vs. 4, P = 0.04). Overall, orthogeriatric care did not reduce delirium or long-term cognitive impairment, but improved mobility in community-dwelling patients.
Huusko et al. [S53][a),b),c),d),e),f] (2000), Finland	Randomized controlled trial	243 independently living patients with dementia; intervention: 120 (79 with MMSE < 24); control: 123 (67 with MMSE < 24); overall: 174 women, 69 men	Intervention: 80 (67–92); control: 80 (66–97)	Usual care rehabilitation in local hospitals consisted mainly of treatment by general practitioners and physiotherapists, with variable input from occupational therapists and rehabilitation nurses; all participants were encouraged to mobilize from the first POD.	Patients were referred to a geriatric ward for intensive, multidisciplinary rehabilitation that included staff training, early mobilization from the first POD, twice-daily physiotherapy, and daily activity practice with nursing support. Individualized schedules, weekly team meetings, and input from occupational and physiotherapists ensured tailored care. Ongoing communication with families was supported by educational materials. Discharge planning was coordinated through weekly discussions, with up to 10 physiotherapy-led home visits provided for those returning to independent living.	LOS, mortality, and place of residence 3 months and 1 year after surgery for hip fracture	LOS did not significantly differ between those with normal cognition or severe dementia. However, the intervention group had shorter LOS in mild (29 days vs. 46.5 days, P = 0.002) and moderate dementia (47 days vs. 147 days, P = 0.04). At 3 months, more patients in the intervention group lived independently (mild: 91% vs. 67%, P = 0.009; moderate: 63% vs. 17%, P = 0.009). At 1 year, independence was maintained in 77% (mild) and 62% (moderate) of intervention patients versus 76% (P = 0.092) and 33% (P = 0.1) in controls. Mortality did not differ. Overall, active geriatric rehabilitation facilitated earlier discharge and greater return to independent living in mild-to-moderate dementia

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Naglie et al. [S54][c),e)] (2002), Canada	Randomized controlled trial	280 patients, of whom 74 (26%) had cognitive impairment	Interdisciplinary care: 83.8 (6.9); usual care: 84.6 (7.3)	Usual care	Inpatient interdisciplinary care with complication prevention (delirium, urinary issues, constipation, pressure ulcers, polypharmacy), early mobilization, twice-daily PT, and early discharge planning vs. usual postoperative care.	Recovery of ambulation and transfers (modified BI); return to pre-fracture residence at 3 and 6 months	At 6 months, 17/36 (47%) of the intervention group and 9/38 (24%) of the control group were alive with no decline in ambulation, transfers, or residential status (P = 0.03). Among patients with dementia, a greater proportion in the intervention group maintained ambulation, transfers, and residence compared with controls.
Jones et al. [S55] [b)] (2002), Canada	Prospective cohort study	100 patients (83 women, 17 men); mean MMSE 25.4 ± 4.7	81.7 (7.6)	NA	Intensive rehabilitation including PT (approximately 1.5 hr/day) and OT (approximately 1.0 hr/day), 5 days per week, for 3 to 6 wk.	Physical and cognitive functioning (motor and cognitive FIM); Rehabilitation outcome for locomotion (MRFS)	Total FIM scores improved after discharge (P < 0.001) with the improvement in motor function (P < 0.001) not cognitive function (P < 0.443). Rehabilitation efficacy (P < 0.001) and efficiency (P < 0.001) improved with regard to participant function.
McGilton et al. [S56][b),e)] (2009), Canada	Longitudinal retrospective feasibility study	31 community-dwelling patients (58% women); 17 with impaired cognition (MMSE < 23) and 14 with normal cognition	87	NA	ACTED model-based rehabilitation program—early initiation, individualized assessment (dementia/delirium/depression), patient-centered goals, tailored therapy, behavioral symptom management, staff education	FIM (motor, cognition), discharge location (community/institution/acute care/death), rehabilitation efficiency (functional gain per inpatient day)	There were no differences between patients with and without cognitive impairment in LOS, rehabilitation efficiency, or motor and cognitive FIM scores. The majority of patients in both groups were discharged home (80%), while 11.8% of cognitively impaired patients were discharged to continuing care facilities.
McGilton et al. [S57]b),f) (2013), Canada	Nonequivalent quasi-experimental pre-post design	149 community-dwelling patients; usual care: 76 (30% with cognitive impairment); intervention: 73 (33% with cognitive impairment)	Usual care: 80.1 (6.7); intervention group: 82.5 (8.8)	Usual care	PCRM-CI: integrates rehabilitation management, dementia care, delirium prevention/management, staff education/support, and family/caregiver education/support	Mobility & locomotion (FIM mobility/locomotion subscales); motor function (FIM motor subscale); living situation (interview)	No difference in mobility gains was observed between PCRM-CI and usual care groups; however, intervention patients were more likely to return home after discharge (P = 0.02), indicating that interdisciplinary PCRM-CI can support successful rehabilitation in older adults with cognitive impairment after hip fracture repair.

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Moseley et al. [S58][b),c),d)] (2009), Australia	Randomized controlled trial	160 patients; high intervention: 80 (37.5% with cognitive impairment); low intervention: 80 (30% with cognitive impairment); overall, 54 patients (34%) had cognitive impairment	High intervention: 84 (8); low intervention: 84 (7)	Lower-dose exercise (30 min/day, mostly seated/supine; limited walking with aids) for 4 weeks, followed by home-based self-directed program	Higher-dose exercise (60 min/day × 16 wk): standing, weight-bearing (multidirectional stepping, sit-to-stand), progressed via reduced support/height blocks; initiated inpatient, continued at home with walking program.	Knee extensor strength, 6MWT; functional ability (PPME, sit-to-stand, gait aid, BI); balance (6 tests, self-report); pain, fear of falling (FES), QoL (EQ-5D); LOS, residential status, community service use, adverse events, treatment adherence	At 4 and 16 weeks, cognitively impaired patients in the high group had greater improvements in walking speed (+0.20 m/sec; +0.24 m/sec) and BI (+9; +17); by 16 weeks, they also showed better FES and EQ-5D scores, were more likely to walk unaided, and reported less pain vs. low group.
Rosler et al. [S59][b)] (2012), Germany	Case-control study	96 patients—48 with proximal femur fracture (prospective) and 48 matched controls (cognitive status, age, sex, surgical treatment); mean MMSE 14.5 ± 6.3 in both groups; 73% women	84.1 (7.8)	Conventional rehabilitation (PT, OT)	Specialized cognitive geriatric unit with environmental modifications (e.g., open wandering areas), comprehensive geriatric assessment, staff training (integrative validation, gerontological-psychiatric care), and higher nurse staffing (18.5 nurses/23 beds ≈1:1.5) vs. control ward (14 nurses/28 beds ≈1:2).	BI (function); Tinetti scale (gait/balance); LOS; LTC placement; medication use	LOS was significantly longer in the cognitive geriatric unit than in the conventional rehabilitation group. No group differences were observed in functional status, medication use, or discharge location. However, the cognitive geriatric unit group demonstrated significantly greater improvement in balance ($P = 0.003$).
Stenvall et al. [S60][c),f)] (2012), Sweden	Randomized controlled trial (subgroup analysis)	64 patients; intervention: 28; control: 36	Intervention: 81.0 (5.8); control: 83.2 (6.4)	Usual care	Multidisciplinary program with complication prevention (pressure ulcers, delirium, falls), nutritional assessment, pain management, and early mobilization with daily PT during hospitalization vs. usual care.	Fall incidence rate, walking ability, ADL, MMSE, modified OBS scale	Fewer falls occurred in the intervention group than in the control group (4% vs. 31%, $P = 0.008$); at 4 months, more participants in the intervention group regained independent walking (67% vs. 6%, $P = 0.005$) and pre-fracture functional independence (53% vs. 21%, $P = 0.027$).
Giusti et al. [S61][e)] (2007), Italy	Prospective cohort study	96 patients with dementia; intervention (institution-based rehabilitation): 55; control (home-based rehabilitation): 41	Intervention: 84.4 (6.9); control: 84.1 (5.4)	Home rehabilitation program	Institution-based rehabilitation	Functional recovery (BI) at 3, 6, and 12 months	Comparable recovery of ADL in patients with dementia receiving either home-based rehabilitation or institutional rehabilitation.

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Goldstein et al. [S62][e] (1997), USA	Prospective cohort study	58 patients; 35 with cognitive impairment (18 mild, 9 moderate, 8 severe)	84.0 (6.7)	NA	In-patient geriatric rehabilitation unit	Functional recovery (FIM) and discharge location at 1 month	Patients with impaired and normal cognition showed similar gains in FIM scores, and rates of return to the community did not differ between the 2 groups.
Heruti et al. [S63][e] (1999), Israel	Prospective cohort study	204 patients; 119 with available MMSE data; 54 identified with cognitive impairment	80 (7.1)	NA	Comprehensive in-patient interdisciplinary rehabilitation	Functional recovery (FIM motor subscale) at 1 month	Motor FIM scores were lower in patients with cognitive impairment. While absolute motor FIM gains were similar between impaired and normal cognition, relative functional gain was significantly reduced in patients in the lowest MMSE quartile.
Frances Horgan and Cunningham [S64][e] (2003), Ireland	Prospective cohort study	59 patients	80 (73–87)	NA	In-patient PT	Ambulation (EMS), discharge location at discharge	Patients with mild to moderate dementia achieved functional gains comparable to those with normal cognition regardless of PT intensity, whereas those with more advanced dementia did not. Cognitively impaired patients were less often discharged home and more often to nursing facilities.
Lenze et al. [S65][e] (2007), USA	Prospective cohort study	97 patients; SNF: 20 (51% with impaired cognition); IRF: 18 (31% with impaired cognition)	81.7 (8.8)	SNF	IRF	Functional recovery (FIM) at 2 and 12 weeks	Cognitive impairment had no overall effect on functional outcomes and did not alter the superior results of inpatient rehabilitation facilities over skilled nursing facilities.
Penrod et al. [S66][e] (2004), USA	Prospective cohort study	443 patients; 93 with cognitive impairment, 350 with normal cognition	81.4 (8.7)	NA	PT from day of surgery to POD 3 (early PT); number and duration of PT/OT sessions from POD 4 to 8 weeks post-admission (later therapy)	Ambulation (FIM locomotion subscale) at 2 and 6months	More PT exposure in the early days after hip fracture surgery was associated with significantly improved locomotion at 2 months post-admission

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Rolland et al. [S67][e),f)] (2004), France	Prospective cohort study	61 patients; 8 with impaired cognition (MMSE < 20), 23 with possible impairment (MMSE 20–27), and 10 without impairment (MMSE > 27)	MMSE < 20: 87.6 (7.2); MMSE 20–27: 83.9 (6.8); MMSE > 27: 77.6 (7.4)	NA	Rehabilitation in geriatric in-patient unit	Functional recovery (FIM, MRFS) at 2 months	No difference in FIM score change was observed between patients with and without cognitive impairment. Absolute FIM scores and MRFS were lower in cognitively impaired patients.
Uy et al. [S68][a),e)] (2008), Australia	Randomized controlled trial	11 patients, all women with impaired cognition; 3 in-patient multidisciplinary rehabilitation; 7 conventional rehabilitation	Intervention 83; control 80	Standard hospital treatment. Nursing home residents and those with limited disability were discharged once deemed orthopedically appropriate.	The inpatient multidisciplinary program included early postoperative nursing care to promote mobility and self-care, with physician assessment within 24 hours to guide individualized rehabilitation. Mobilization began after postoperative X-ray, targeting sitting out of bed the next day and walking the following day. Nurses supervised mobilization with physiotherapy input, supported by daily weekday sessions (ideally twice daily). Patients were reviewed 3–4 times weekly by orthopedic and rehabilitation physicians, and discharged to nursing homes as soon as feasible, with ongoing follow-up from the rehabilitation physician.	Functional recovery (BI) and gait velocity (Timed 2.44 m walk) at 1 and 4 months	Non-significant improvements were observed in BI and gait velocity in the intervention group.
Vidan et al. [S69][e)] (2005), Spain	Randomized controlled trial	319 patients; 78 with impaired cognition, 241 with normal cognition. Intervention: 155 (39 with impaired cognition, 25%); Usual care: 164 (39 with impaired cognition, 24%)	Intervention: 81.7 (7.8); usual care: 82.6 (7.4)	Usual care	Intensive multidisciplinary geriatric intervention	Functional independence (Katz ADL; FAC) at 3, 6, and 12 months	Patients without dementia showed greater gains in function and ambulation than those with dementia, although both groups improved.

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Al-Ani et al. [S70][f] (2010), Sweden	Prospective cohort study	246 patients with cognitive impairment; 19 died before discharge	84 (6.0)	NA	Postoperative PT began immediately, with standing on day 1 and assisted walking thereafter. Transfer to rehabilitation units was jointly decided by the physician and ward staff. Rehabilitation care was provided under the Health and Medical Services Act, while residential care under the Social Services Act had limited PT resources. In rehabilitation units, typically run or affiliated with Stockholm County Council, physiotherapists and occupational therapists provided daily activities.	ADL and walking ability at 4 and 12 months	ADL and preserved walking ability were associated with discharge to rehabilitation.
Chammout et al. [S71][f] (2021), Sweden	Prospective cohort study	98 patients with cognitive dysfunction; intervention group: 38; control group: 60	Intervention: 85 (4.0); control: 86 (6.0)	After surgery, patients were discharged directly to nursing homes, where rehabilitation depended on PT availability and staff capacity, with many lacking structured programs for femoral neck fracture patients.	Rehabilitation in the geriatric ward was individually tailored to cognitive status, with the goal of restoring walking ability before discharge. The average stay was 10 days prior to return to the nursing home.	Main outcomes: hip-related complications and reoperations. Secondary outcomes: return to previous walking status, mortality, HRQoL (EQ-5D), hip function (modified HHS), ADL (Katz index), hip pain and adverse events	The lack of geriatric rehabilitation was correlated with poorer outcomes overall and those who receive geriatric rehabilitation were less likely to be confined to a wheelchair or bedridden at the 1-year follow-up.

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Karlsson et al. [S72][†] (2020), Sweden	Randomized controlled trial (subgroup analysis)	103 patients; 57 in the GIHR group and 46 in the control group	83.9 (6.8); intervention: 84.5 (47.1); control: 83.2 (6.4)	Interdisciplinary rehabilitation based on comprehensive geriatric assessment provided individualized plans, staff engagement in daily activities, and structured discharge planning, with emphasis on preventing and managing postoperative complications. Physiotherapists and occupational therapists retrained patients in PADL, transfers, and walking. After discharge, patients were referred to primary care or, at 3 months, to geriatric outpatient rehab, while rehabilitation needs in residential care were communicated to facility therapists.	GIHR: After hospital-based rehabilitation, medically stable patients able to manage basic transfers were discharged early to continue up to 10 weeks of home-based rehabilitation. The GIHR team (nurse, occupational therapist, 2 physiotherapists, geriatrician, with social worker and dietician available) delivered individualized care including fall prevention, home modifications, ADL and device training, walking, and progressive strength/balance training (HIFE program). Medical care addressed complications, pain, and medication safety, while nutrition was assessed and optimized. The team worked closely with families and home/residential care providers.	LOS, readmissions, falls, mortality, ADL performance, and walking ability at discharge, 3, and 12 months	Interdisciplinary home rehabilitation and in-hospital geriatric care showed comparable outcomes for falls, mortality, ADL, and walking ability at 3 and 12 months, with no differences observed between participants with and without dementia.
Kazuaki et al. [S73][†] (2019), Japan	Retrospective cohort study	43,206 patients with dementia	Age distribution (n, %): 65–74 yr: 1,913 (4.4%); 75–84 yr: 12,905 (29.9%); 85–94 yr: 24,339 (56.3%); ≥ 95 yr: 7,371 (17.1%)	NA	Postoperative rehabilitation: 1 rehabilitation unit = 20 minutes; patients could receive up to 9 units per day	ADL (BI), LOS, discharge location	Earlier, more frequent, and higher daily doses of postoperative rehabilitation in acute-care hospitals were independently associated with better ADL recovery at discharge after hip fracture surgery in patients with dementia.
Paul-Dan et al. [S74][†] (2019), Romania	Retrospective cohort study	178 patients with dementia (64 men, 114 women); partial weight-bearing: 72; total weight-bearing: 106	81.5 (74–96)	Early mobilization with assisted standing and walking using an assistive device; partial weight-bearing permitted.	Early mobilization with assisted standing and walking using an assistive device; full weight-bearing permitted.	1-year mortality	Patients with total weight-bearing who were discharged to a rehabilitation facility had a better recovery (pre-fracture level) and 1-year survival rate

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Raivio et al. [S75][f] (2004), Finland	Retrospective cohort study	98 patients with dementia (MMSE < 24); 72.4% women	80.2	NA	PT 30 min/day, 5 days/wk, with guided self-exercises on weekends. Nurses were rehabilitation-oriented. Therapy included strengthening, walking, and balance training	Independent walking ability (with or without aids) in the rehabilitation ward within 6 weeks, and total days of active rehabilitation with a physical therapist	Strict weight-bearing restrictions may impair rehabilitation outcomes and may be more severe for patients with dementia
Seitz et al. [S76][f] (2016), Canada	Retrospective cohort study	11,200 with dementia; no rehabilitation: 4,494; CCC: 2,492; HCR: 1,157; IPR: 3,075	No rehabilitation: 85.4 (6.7); CCC: 84.8 (6.4); HCR: 83.2 (6.8); IPR: 83.7 (6.3)	No rehabilitation	CCC: Low-intensity, long-duration inpatient rehabilitation (similar to US skilled nursing facilities); HCR: In-home physiotherapy and OT after hip fracture surgery; IPR: Highest-intensity rehabilitation	LTC admission, mortality, risk of repeat falls and fractures	Postoperative rehabilitation was associated with decreased risks of LTC placement and mortality
Shyu et al. [S77][a),d),f] (2013), Taiwan	Randomized controlled trial (post-hoc analysis)	160 patients; interdisciplinary rehabilitation: 79 (including 24 women and 3 men with probable dementia); conventional rehabilitation: 81 (including 16 women and 8 men with probable dementia)	Probable dementia (interdisciplinary 81.3; Conventional 81.7)	Non-interdisciplinary rehabilitation with no continuity of care between providers or across settings. Inpatient rehabilitation consisted of only 3 physical therapy sessions, with no in-home rehabilitation. No additional details on the conventional program were reported	Interdisciplinary recovery program: Geriatric consultation (preoperative and postoperative assessment of medical and functional issues, surgery timing, prophylaxis, nutrition, urinary and delirium management); Rehabilitation (individualized, starting day 1 post-surgery, daily inpatient sessions with nurse/physician plus twice-daily PT, followed by 3 months of home rehab with monthly nurse visits and PT follow-up); Discharge planning (nurse-led assessment, referrals, home safety evaluation, environmental modifications).	Walking ability (pre/post-fracture, Chinese BI), ADL (Chinese BI), falls, mortality, ER visits, readmissions, institutionalization—assessed at 1-, 3-, 6-, 12-, 18-, and 24-month post-discharge.	Cognitively impaired individuals benefited from our interdisciplinary intervention by improving their walking ability and physical function during the first 2 years following discharge.

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Tseng et al. [S78][f] (2021), Taiwan	Randomized controlled trial	152 patients with cognitive impairment; intervention: 76; control: 76	81.8 (7.13)	PT typically started on POD 3, focusing on walker use and bed transfers. Patients were discharged after 5–6 days without a home assessment, and follow-up needs were referred by the primary nurse to the hospital discharge nurse. No in-home rehabilitation or nursing care was provided post-discharge.	Modified family-centered model based on Interdisciplinary care model [S77] with a family caregiver-training component. Caregivers received 2 in-home training sessions (delivered by trained research nurses) during the fourth and fifth home visits (at 1- and 1.5-month post-discharge) to help identify and manage patients' behavioral problems and symptoms.	Self-care ability (Chinese BI), nutritional status, HRQoL, and self-rated health)—assessed 1, 3, 6, and 12 months	Physical recovery of patients with hip fracture and dementia did not improve, but caregivers' self-efficacy and competence was improved.
Freter et al. [S79][a] (2017), Canada	Pragmatic (quasi-randomized) clinical trial	283 patients; intervention: 144 (30 men, 21%); control: 139 (40 men, 29%). Probable dementia (intervention: 48; control: 29)	Intervention: 83.2 (7.0); control: 82.5 (10.0)	Regular postoperative care: admitted to control ward, not provided with delirium-friendly postoperative care	Delirium-friendly postoperative care: patients were admitted to the intervention ward and managed with PPOs including delirium-sensitive options and dosing for nighttime sedation, analgesia, and nausea, with attention to timely catheter removal and bowel management.	Delirium, haloperidol use, LOS, hospital mortality, discharge destination, complications—assessed POD 1–5 and at discharge	Orthopedic nurses adhered reasonably well to delirium-friendly postoperative care. Among 283 participants, 42% developed postoperative delirium, with significantly lower rates in the intervention group (33% vs. 51%, P = 0.001). The effect was more pronounced in those with preexisting dementia (60% vs. 97%, P < 0.001).

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Table 1. Continued

Article	Study design	Participants		Interventions		Outcomes	Results
		No.	Age (yr)	Control group	Intervention group		
Marcantonio et al. [S80][a] (2001), USA	Randomized controlled trial	126 patients; intervention (geriatrician-led): 62 (13 men, 49 women); control (orthopedic-led): 64 (14 men, 50 women)	Intervention: 78 (8.0); control: 80 (8.0)	Orthopedic-led recovery program, with pre- and postoperative management by the orthopedic team. Internal medicine or geriatric consultation was reactive, rather than proactive as in the geriatrician-led group	Geriatrician-led recovery program included consultation preoperatively or within 24 hours postoperatively, followed by daily visits. Protocol-based recommendations (max 5 initially, 3 at follow-up) addressed oxygenation, fluid/electrolyte balance, pain, medication review, bowel/bladder regulation, nutrition, early mobilization/rehabilitation, complication prevention/management (cardiac, embolic, respiratory, urinary), environmental optimization (glasses, hearing aids, clocks, calendars, radios, soft lighting), and delirium management.	Total cumulative incidence of delirium throughout the acute hospital stays	Delirium occurred in 32% of intervention patients vs. 50% of controls (RR, 0.64), with 1 case prevented per 5.6 patients. Severe delirium was reduced to 12% vs. 29% (RR, 0.40). LOS was similar (median 5±2 days). The greatest benefit was seen in patients without pre-fracture dementia or ADL impairment. Proactive geriatrics consultation was feasible, well-adhered to, and significantly reduced delirium but not hospital stay.
Bellelli et al. [S81][b] (2006), Italy	Case report	1 patient	An 82-year-old woman with severe Alzheimer's disease	NA	BWST training involving stepping on a motorized treadmill while unloading a percentage of a person's body weight using a counterweight harness system.	Function (BI); gait and balance (Tinetti scale)	The patient showed no functional or cognitive improvement with conventional training during the first 12 days. After initiating BWST, endurance and function (walking, chair rise, balance) improved, with a Tinetti score of 16/28 and BI of 49/100 at discharge on day 36, which was maintained at 6 months post-fracture.

Values are presented as number or mean (standard deviation or range) unless otherwise stated.

CDR, clinical dementia rating scale; CERAD, Consortium to Establish a Registry for Alzheimer's Disease battery; ADL, activities of daily living; NEADL, Nottingham extended ADL index; IQCODE, informant questionnaire on cognitive decline in the elderly; SPPB, short physical performance battery; LOS, length of stay; MMSE, Mini-Mental State Examination; POD, postoperative day; PT, physical therapy; BI, Barthel index; NA, data not available; FIM, Functional Independence Measure; MRFS, Montebello rehabilitation factor score; ACTED, Assessment, Patient-Centered Goals, Treatment, Evaluation, and Discharge; OT, occupational therapy; PCRM-CI, Patient-Centered Rehabilitation Model for Cognitive Impairment; 6MWT, 6-minute walking test; PPME, physical performance and mobility examination; FES, fall efficacy scale; QoL, quality of life; EQ-5D, EuroQol-5 Dimension; LTC, long-term care; OBS, organic brain syndrome; EMS, elderly mobility scale; SNF, skilled nursing facility; IRF, in-patient rehabilitation facility; FAC, functional ambulation category; HRQoL, health-related quality of life; HHS, Harris hip score; GIHR, Geriatric Interdisciplinary Home Rehabilitation; PADL, personal activities of daily living; HIFE, high-intensity functional exercise; CCC, Complex Continuing Care; HCR, Home-Care Rehabilitation; IPR, Inpatient Rehabilitation; ER, emergency room; PPOs, preprinted postoperative orders; RR, relative risk; BWST, body weight–supported treadmill.

References for the studies in this table are provided in Supplement 1: [a]Included in a review by Smith et al. [41]. [b]Included in a review by Resnick et al. [44]. [c]Included in a review by Beaupre et al. [35]. [d]Included in a review by Chu et al. [43]. [e]Included in a review by Allen et al. [40]. [f]Included in a review by Cadel et al. [42].

A high-quality clinical practice guideline reported moderate evidence supporting multicomponent, non-pharmacological interventions delivered by an interprofessional team trained in delirium management [49]. These programs emphasize assessing at-risk patients, monitoring behavioral changes or fluctuations, and referring to trained providers for diagnosis. Preventive strategies include adequate pain management, facilitated mobility through therapy, and engagement in meaningful activities. A Cochrane review also indicated that enhanced inpatient rehabilitation and care models may reduce postoperative delirium [41]. Physical therapists should actively participate in interprofessional, multicomponent programs throughout hospitalization for at-risk older adults undergoing hip fracture surgery to prevent delirium [32].

Prevention of secondary fractures

The occurrence of any fragility fracture, regardless of location, doubles the risk of subsequent fractures [38], with the highest risk observed within the first 2 years [50]. Anti-osteoporosis medications (AOMs) are effective in preventing recurrent fractures; however, only 10%–20% of patients with fragility fractures receive AOM therapy [50]. Individuals with mild cognitive impairment or dementia experience pronounced disparities in both the diagnosis and treatment of osteoporosis [25]. No clinical guidelines specifically address osteoporosis screening in this population, and although professional societies recommend screening for adults aged ≥65 years, implementation remains inconsistent. Challenges include the technical difficulty of performing dual-energy X-ray absorptiometry scans—which require patients to remain still in specific positions and may be unfeasible for those with cognitive impairment—and the limited applicability of most fracture risk prediction tools, which do not account for cognitive comorbidities. Treatment disparities are also evident: patients with cognitive impairment are less likely to receive pharmacologic therapy, including AOMs and vitamin D, and adherence to oral medication regimens is particularly challenging.

The FLS has been shown to promote and support adherence to AOMs. In a review by Cianferotti et al. [38], the FLS was associated with increased rates of BMD testing (relative risk [RR], 2.45; 95% CI, 1.86–3.23), therapy initiation (RR, 1.91; 95% CI, 1.58–2.29), and adherence (RR, 1.54; 95% CI, 1.03–2.31), as well as reduced risks of subsequent fractures (RR, 0.65; 95% CI, 0.53–0.79) and mortality (RR, 0.68; 95% CI, 0.48–0.96) compared with standard care or non-attenders. Although tailored guidelines are still needed to direct osteoporosis screening and simplify treatment regimens for patients with cognitive impairment—thereby reducing medication burden and improving therapeutic outcomes—the FLS remains an effective model for secondary prevention in older adults with hip fractures and cognitive impairment.

Optimizing post-hip-fracture rehabilitation in older adults with cognitive impairment

Patients with cognitive impairment should not be excluded from post-hip-fracture rehabilitation. Rehabilitation programs should be tailored to address both cognitive and functional needs through individualized strategies that incorporate clear communication, cueing, and task repetition. Qualitative evidence indicates that staff education, mentoring, and strong interdisciplinary collaboration are essential to equip healthcare professionals with the knowledge, skills, and confidence necessary to effectively rehabilitate this population [51]. Structured mentoring sessions, regular team huddles, and debriefings create opportunities to exchange strategies, sustain staff morale, and foster a supportive, patient-centered culture of care [51].

Individualized rehabilitation is critical; "one-size-fits-all" approaches are ineffective [51]. Comprehensive geriatric assessments, continuity of staffing, and flexible, creative engagement—such as incorporating meaningful activities or adapting therapy to align with patient preferences—enhance participation and functional progress [51]. Early and continuous discharge planning, involving patients, families, and community resources, further promotes safe transitions and empowers caregivers through education and trial home stays.

Effective clinical decision-making requires standardized criteria or protocols to determine rehabilitation eligibility, intensity, and adaptation; however, such guidance remains limited. Systemic barriers, including resource constraints, insufficient dementia-specific training, and inconsistent access criteria, must be addressed through targeted education initiatives and institutional support.

Cost and resource considerations are equally important. Although intensive, high-frequency exercise programs are demonstrably effective, they may not be feasible in all healthcare settings because of financial limitations and the high prevalence of older adults with hip fractures. The feasibility and acceptability of such interventions vary across institutions and patient populations, underscoring the need for resource-efficient, scalable, and adaptable models of care.

In summary, rehabilitation for older adults with cognitive impairment should be structured, adaptable, and well-supported—grounded in staff education, interprofessional collaboration, standardized protocols, and evidence-based guidelines. By tailoring interventions to cognitive and physical capacities and addressing

systemic barriers, meaningful functional recovery and improved quality of life are achievable even in this vulnerable population.

Conclusion

Older adults with hip fractures and cognitive impairment experience slower postoperative recovery, greater rehabilitation challenges, and accelerated long-term functional decline. Nevertheless, evidence consistently demonstrates that tailored, structured, intensive, and multidisciplinary rehabilitation can produce meaningful improvements in mobility, ADLs, and reintegration into community life. To optimize outcomes, rehabilitation programs must be strengthened through dementia-specific staff training, interprofessional collaboration, and proactive management of delirium and secondary fracture prevention. Addressing systemic barriers—such as limited resources, inconsistent protocols, and inequitable access—is essential for developing scalable, sustainable, and equitable models of care. Future research should focus on refining rehabilitation frameworks and secondary prevention strategies specifically designed for older adults with cognitive impairment, thereby reducing care disparities and improving long-term functional and quality-of-life outcomes.

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Conceptualization: JYL. Data curation: SKL. Methodology: SKL. Project administration: JYL. Funding acquisition: SKL. Writing–original draft: SKL. Writing–review & editing: SKL, JYL.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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Data availability

Not applicable.

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Supplementary materials

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