Changes in Health-Related Quality of Life for Older Persons With Cognitive Impairment After Hip Fracture Surgery: A Systematic Review

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ABSTRACT

Background: Hip fractures in persons with cognitive impairments represent a major public health issue in older populations that often results in poor health-related quality of life (HRQoL).

Purpose: The aim of this systematic review was to examine the changes in HRQoL in older, cognitively impaired patients with hip fracture who had received surgical treatment.

Methods: A literature search of PubMed, Scopus, MEDLINE, PsycINFO, and CINAHL (EBSCO) databases was conducted for studies published up to July 2018 that addressed the issue of HRQoL in cognitively impaired patients with hip fracture after surgery. Studies that met the following criteria were included: Patients with hip fracture were over 60 years old and had cognitive impairment or dementia, patients had undergone hip fracture repair surgery, HRQoL was determined using standardized questionnaires, a descriptive or interventional methodology was used, and the full-text article was available in English.

Results: A primary search of databases yielded 1,528 studies, 621 duplicates were removed, and the remaining 907 abstracts were screened. Thirty-four full-text articles were deemed relevant for full review; of these, 10 articles met the criteria for inclusion in the review. Cognitive impairment was found to impact negatively on the patients’ HRQoL after hip fracture surgery (n = 809). Severity of cognitive impairment was correlated with deterioration in HRQoL after hospital discharge. When compared with prefracture measures of HRQoL, the greatest deterioration in HRQoL post-surgery occurred during the first 4 months after discharge. Impacts on HRQoL for patients with cognitive impairment at later time points differed depending on type of hip fracture and type of surgical treatment. However, for most of the patients, HRQoL remained relatively unchanged at 6, 12, and 24 months postdischarge.

Conclusions: We recommend nursing care interventions for older persons with cognitive impairment be initiated immediately after surgery for hip fracture to prevent a significant decline in HRQoL. Further examination of interventions that are effective in maintaining HRQoL for these patients such as interdisciplinary care is necessary. In addition, the influences of hip fracture type and surgical approach on changes in HRQoL suggest a need for further investigations to determine what contributed to the observed inconsistencies in the outcomes.

KEY WORDS: health-related quality of life, cognitive impairment, hip fracture.

Introduction

Hip fracture is a major public health issue because of the rise in older adult populations in countries around the world (Dhanwal, Dennison, Harvey, & Cooper, 2011; Kanis et al., 2012). The presence of cognitive impairment in older persons is associated with an increased risk for hip fracture (Wang et al., 2014) that may be as high as 55% (Seitz, Adunuri, Gill, & Rochon, 2011). Hip fracture has been reported to be three times greater for older persons with cognitive impairment than without this condition (Friedman, Menzies, Bukata, Mendelson, & Kates, 2010). The presence of cognitive impairment for patients with hip fracture impacts hospitalization (Gruber-Baldini et al., 2003) and has been shown to be associated with less favorable outcomes, including a greater risk of long-term-care admission, a greater risk of death (Mitchell, Harvey, Brodaty, Draper, & Close, 2016), and poorer health-related quality of life (HRQoL; Seitz et al., 2016). Moreover, studies have suggested that older persons with cognitive impairments are not likely to recover to full pre-hip-fracture function and may not be good candidates for intensive rehabilitation programs (Kos, Burger, & Vidmar, 2013; Peeters et al., 2016). However, other studies have shown that rehabilitation may improve physical function and decrease...
complications and mortality for hip-fractured persons with mild-to-moderate cognitive impairment (Van Wyk et al., 2014).

HRQoL focuses on aspects of an individual’s physical or mental health that are affected by the presence of disease or by treatment (Ebrahim, 1995; Karimi & Brazier, 2016). HRQoL has been an important, subjective clinical parameter used to assess the effects of illness and the outcomes of treatment (Shyu, Lu, & Liang, 2004). Assessments of HRQoL have been employed to measure the impact of hip fractures and the efficacy of interventions such as surgery on patient outcomes (Gambatesa et al., 2013; Peeters et al., 2016). Studies have shown that lower levels of HRQoL predict higher morbidity and mortality in older populations (Friedman et al., 2010; Kroenke, Kubzansky, Adler, & Kawachi, 2008). In addition, the presence of cognitive dysfunction has been shown to negatively impact HRQoL and functional capacity (Chang, Yang, Chang, Chou, & Huang, 2017; Kim, Park, & An, 2019), with this impact increasing the severity of impairment (Pan et al., 2015). Thus, the evaluation of HRQoL has become increasingly important. Although limitations in cognitive abilities are barriers to accurate self-assessments of HRQoL (Orgeta, Edwards, Houlsome, Orrell, & Woods, 2015; Trigg, Jones, & Skevington, 2007), persons with mild-to-moderate cognitive impairment have shown a satisfactory response rate when HRQoL instruments such as the generic EuroQoL-5 Dimensions (EQ-5D) instrument (Ankri et al., 2003; Hoe, Orrell, & Livingston, 2010; Selai, 2001) and the Short Form-12 (SF-12; Ware, Kosinski, & Keller, 1996) were used.

Rehabilitation has been found to improve recovery after hip surgery (Chang, Lin, et al., 2017). Although reviews of studies on rehabilitation outcomes for older persons with hip fracture have been conducted (Dyer et al., 2016; Resnick et al., 2016), those specifically targeting studies addressing the HRQoL of cognitively impaired persons with hip fracture are limited. In addition, the incidence of surgical complications for persons with cognitive impairment is higher than for patients without cognitive impairment (Kassahun, 2018). Exploring changes in and factors influencing HRQoL for cognitively impaired patients with hip fracture after surgery may provide an understanding of clinical patterns and predictors of HRQoL, which may then be used to develop more timely and effective nursing and interdisciplinary care interventions and improve outcomes for this vulnerable group. Therefore, the purpose of this study was to perform a systematic review of the literature to identify changes in HRQoL in older cognitively impaired patients with hip fracture who had received surgical treatment.

Methods

Data Sources

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (Moher et al., 2015) guided this systematic review. A search of the following electronic databases was conducted: PubMed, Scopus, MEDLINE, PsycINFO, and CINAHL (EBSCO). The study was registered with the International Prospective Register of Systematic Reviews (registration number: CRD42016052878).

Search Strategy

The search period ranged from the time of inception of each database to July 2018 (inclusive). Studies were retrieved using the following keywords: “quality of life” OR “health-related quality of life” OR “well-being” OR “health outcome” OR “outcome” OR “health status” AND “cognitive impairment” OR “cognitive disorder” OR “dementia” OR “amnestic” OR “Alzheimer’s” AND “older persons” OR “older” OR “elderly” AND “hip fracture” OR “femoral neck fracture” OR “femoral head fracture” OR “intertrochanteric fracture” OR “sub capitals fracture” AND “surgery.”

Included and Excluded Studies

Studies were included in this literature review if they met the following eligibility criteria: (a) involved patients with hip fracture over 60 years old with cognitive impairment who had undergone hip fracture surgery (studies that compared persons with and without cognitive impairment were also included to explore the influence of cognitive impairment on the continuous deterioration or changes in HRQoL in older persons with hip fractures); (b) measured HRQoL using questionnaires that addressed the respondents’ physical, psychological, and social dimensions and reflected the World Health Organization’s definition of health (Peeters et al., 2016); (c) used a descriptive or interventional design; and (d) the full-text article was available in English. The exclusion criteria were as follows: comments (such as blogs and electronic newspapers), reviews, letters, guidelines, and protocols.

Study Selection

Two researchers examined the article titles and abstracts for eligibility. Subsequently, the full texts of the potential studies were screened to determine final eligibility for inclusion in this review. Uncertainty concerning the inclusion of the studies was checked by a third researcher. In addition, reference lists of included articles were screened for eligible studies that were not found in the search.

Data Extraction

The first author extracted the data of the included studies, which were verified by a coauthor. Information was collected regarding the title of the study, year, authors, country, study design, study sample, type of fracture, follow-up period, cognitive function measures, the HRQoL assessment instrument, HRQoL mode assessment, and the conclusion.

Quality Assessment and Risk Bias of the Studies

The quality of the included studies was assessed by two researchers independently using a 17-item checklist of predefined
criteria that was established by Peeters et al. (2016). In this checklist, each item is assigned a value of 0 or 1. If the description of the item is sufficient, a value of 1 is assigned. If the item is insufficiently described, a value of 0 is assigned. The quality of the studies is then assessed based on the percentage of the criteria with a score of 1. Studies with at least 70% of the 17 criteria with a score of 1 (i.e., ≥12 points) are deemed “high quality,” those with between 50% and 70% with a score of 1 are deemed “moderate quality,” and those with less than 50% with a score of 1 are deemed “low quality.” The risk bias of the included studies was evaluated using the Cochrane risk of bias tool.

**Results**

The initial search identified 1,528 studies, of which 621 were duplicates and removed. The remaining 907 abstracts were screened. Of these, 34 full-text articles were deemed eligible for full-text review. After reviewing the 34 full-text articles, 10 studies were included in the systematic review. Figure 1 shows the flow diagram of the selection process. These 10 studies were divided into two groups. One group of studies compared changes in the HRQoL of older patients with and without cognitive impairment after surgery (n = 7; Table 1). The second group focused on patients with moderate-to-severe cognitive impairment and compared changes in HRQoL according to fracture type and surgical approach (n = 3; Table 2). Characteristics, quality, sampling, and impact on HRQoL for the included studies are described below.

**Characteristics of the Included Studies**

Of the studies in Table 1, three were conducted in Sweden (Ekström et al., 2009; Söderqvist et al., 2006; Tidermark et al., 2002), one study was conducted in Canada (Beaupré et al., 2012), one was conducted in the United Kingdom (Griffin et al., 2015), one was conducted in Israel (Karni et al., 2014), and one was conducted in Germany (Buecking et al., 2014). Two of the studies in Table 2 were conducted in Sweden (Blomfeldt et al., 2005; Hedbeck et al., 2013) and one was conducted in Turkey (Avci et al., 2016).

Of the 10 included studies, a retrospective design was used only for the study conducted by Avci et al. (2016); the remaining nine were prospective. Four studies included 60 patients (Beaupré et al., 2012; Blomfeldt et al., 2005; Hedbeck et al., 2013; Karni et al., 2014), and the largest sample size was 456 patients (Griffin et al., 2015). The mean age of participants ranged from 74 years (Avci et al., 2016) to 86.9 years (Beaupre et al., 2012). Postsurgical follow-up periods varied in the studies in Table 1, with the German study (Buecking et al., 2014) having the shortest (at time of discharge from an acute care hospital); one follow-up was at 1 month (Karni et al., 2014), three were at 12 months (Beaupre et al., 2012; Griffin et al., 2015; Söderqvist et al., 2006), and two were at 24 months.

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**Figure 1.** Flow diagram of the systematic review process.
(Ekström et al., 2009; Tidermark et al., 2002). All of the follow-up periods in Table 2 were 24 months postdischarge (Avcı et al., 2016; Blomfeldt et al., 2005; Hedbeck et al., 2013). All of the 10 included studies found that cognitive impairment negatively impacted patients’ HRQoL after hip fracture surgery (n = 809). Of the seven studies on hip-fractured persons with and without varying degrees of cognitive impairment (Table 1), one study compared the HRQoL of older women after hip fracture (Karni et al., 2014), two studies investigated the HRQoL of older persons with mild and moderate cognitive impairment (Ekström et al., 2009; Tidermark et al., 2002), and four included patients with moderate or severe impairment (Beaupre et al., 2012; Buecking et al., 2014; Griffin et al., 2015; Söderqvist et al., 2006). All of the three studies in Table 2 assessed HRQoL relative to hip fracture types and surgical approach (Avcı et al., 2016; Blomfeldt et al., 2005; Hedbeck et al., 2013). These findings are discussed below.

### Quality of the Included Studies

The 17-item checklist (Peeters et al., 2016) used in this study to assess the quality of the included studies is shown in Table 3. The overall methodological quality of the included studies was moderate, with a mean quality score of 11.9 and a quality range of 10 (moderate) to 14 (high). The assessment of HRQoL among older persons with hip fracture and cognitive impairment/dementia was deemed as high quality in seven studies, namely, Avcı et al. (2016), Beaupre et al. (2012), Blomfeldt

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**TABLE 1.**

**Studies on Changes in HRQoL in Older Persons With and Without Cognitive Impairment After Hip Fracture Surgery**

| Author (Year)/Country | Study Quality | Study Purpose | Study Design | Sample/CI vs. No CI |
|-----------------------|--------------|--------------|-------------|--------------------|
| 1. Beaupre, Jones, Johnston, Wilson, & Majumdar (2012)/Canada | 12 | Measure 1-year post-hip-fracture functional recovery, HRQoL, and mortality in nursing home residents | Prospective longitudinal cohort study | N = 60 CI (n = 51) No CI (n = 9) |
| 2. Buecking et al. (2014)/Germany | 10 | Identify independent factors correlated with HRQoL after hip fracture | Prospective observational cohort study | N = 402 CI • Mild (n = 134) • Moderate (n = 71) • Severe (n = 62) No CI (n = 132) No CI or mild CI |
| 3. Ekström, Németh, Samnegård, Dalen, & Tidermark (2009)/Sweden | 12 | Report the long-term outcome for patients with subtrochanteric fractures treated with a cephalomedullary nail with special regard to HRQoL | Prospective cohort study | N = 87 No CI or mild CI |
| 4. Griffin, Parsons, Achten, Fernandez, & Costa (2015)/United Kingdom | 12 | Report 1-year patient-reported outcomes of a prospective cohort of patients | Prospective cohort study | N = 456 CI (n = 136) |
| 5. Karni, Bentur, & Ratzon (2014)/Israel | 10 | Identify the impact of cognitive impairment on participation and HRQoL of women ≥ 65 years old after hip fracture | Prospective study | N = 60 CI (n = 30) No CI (n = 30) |
| 6. Söderqvist, Miedel, Ponzer, & Tidermark (2006)/Sweden | 11 | Assess cognitive function with a validated instrument as a useful patient management adjunct | Prospective trial study | N = 213 CI • Moderate-intact (n = 163) • Severe (n = 50) |
| 7. Tidermark, Zethraeus, Svensson, Törnvikst, & Ponzer (2002)/Sweden | 12 | Investigate the functional outcome and HRQoL according to EQ-5D after a femoral neck fracture treated with IF in relatively healthy elderly patients | Prospective clinical study | N = 90 No CI or mild CI |

**Note.** HRQoL = health-related quality of life; CI = cognitive impairment; MMSE = Mini-Mental State Examination; SPMSQ = Short Portable Mental Status Questionnaire; AMTS = Abbreviated Mental Test Score; EQ-5D = Euro-QoL-5 Dimensions; SF-12 = Short Form-12.
et al. (2005), Ekström et al. (2009), Griffin et al. (2015), Hedbeck et al. (2013), and Tidermark et al. (2002), and as moderate quality in three studies, namely, Buecking et al. (2014), Karni et al. (2014), and Söderqvist et al. (2006). As shown in Table 4, all of the studies included a measure of high-risk bias.

### Measures of Cognitive Impairment and Health-Related Quality of Life

**Measures of cognitive impairment**

Measurement tools for cognitive assessment varied. Four studies used the Mini-Mental Status Examination (MMSE; Avci et al., 2016; Beaupre et al., 2012; Buecking et al., 2014; Karni et al., 2014), five studies employed the Short Portable Mental Status Questionnaire (SPMSQ; Blomfeldt et al., 2005; Ekström et al., 2009; Hedbeck et al., 2013; Söderqvist et al., 2006; Tidermark et al., 2002), and one study used the Abbreviated Mental Test Score (AMTS; Griffin et al., 2015).

### Measures of health-related quality of life

Only one study used the SF-12 instrument, developed byWare et al. (1996), to measure HRQoL (Karni et al., 2014). The remaining nine studies used the EQ-5D. Assessment modes for HRQoL also varied as a result of the study population. Participants with severe cognitive impairment were assessed using proxy reports from a close relative or a caregiver (Avci et al., 2016; Blomfeldt et al., 2005; Hedbeck et al., 2013).

| Age, Mean (SD) | Cognitive Questionnaire | HRQoL Questionnaire (Assessment) | Follow-Up Period | Conclusion |
|---------------|-------------------------|----------------------------------|-----------------|------------|
| 86.9 (8.1)    | MMSE                   | EQ-5D proxy report              | 12 months       | One-year survivors with documented dementia (n = 23) had a significant loss of HRQoL at 3 months and remained relatively unchanged at 6 and 12 months postsurgery. |
| 81 (8)        | MMSE                   | EQ-5D patient report             | Measured        | Low MMSE (MMSE 0–9) and moderate MMSE (MMSE 10–19) were significantly associated with a lower EQ-5D index at discharge (p < .001) |
| 82.5 (7.8)    | SPMSQ ≥ 3 correct answers = no CI | EQ-5D patient report | 24 months       | The EQ-5D index score decreased significantly at 4 months (p < .001) with no change at the 12- and 24-month follow-up (0.53 [p < .001] and 0.52 [p < .05], respectively) |
| 83.1 (8.7)    | AMTS                   | EQ-5D patient and proxy report   | 12 months       | At 1 year, HRQoL was significantly lower than preinjury for all patients. However, those with CI (AMTS ≤ 8) had significantly lower HRQoL than those with AMTS > 8. |
| 83 (5.6)      | MMSE                   | SF-12 Face-to-face interviews/patient report | 1 month | HRQoL was lower 1 month after discharge for both physical and mental components. No differences between patients with and without CI (p > .001). |
| CI = 48 (5.88) Non-CI = 82.1 (7.1) | | | | Patients with CI had significantly lower EQ-5D at enrollment and at each follow-up (p < .001); deterioration in HRQoL was continuous. EQ-5D improved for patients with moderate-intact CI between 4 and 12 months of follow-up (p < .05). |
| • Severe = 86.1 (5.5) Moderate-intact = 82.8 (6.7) | SPMSQ Severe cognitive dysfunction ≤ 3 correct answers | EQ-5D patient report or proxy report, if SPMSQ < 3 correct answers | 12 months | There was a substantial decrease in HRQoL according to EQ-5D for all patients after hip fracture surgery compared with prefracture. The decrease was significantly larger among patients with fracture healing complications. |
| 80 (7.3)      | SPMSQ ≥ 3 correct answers = no CI | EQ-5D patient report | 24 months       | |
et al., 2013). Self-reports were used for studies with patients without cognitive impairment or mild-to-moderate cognitive impairment (Buecking et al., 2014; Ekström et al., 2009; Söderqvist et al., 2006). One study employed self-reports for patients without cognitive impairment and proxy reports as needed for patients with mild-to-moderate impairment (Griffin et al., 2015).

A meta-analysis was not performed because of the high degree of heterogeneity in criteria and instruments used to classify cognitive impairment, HRQoL assessments (i.e., self-report, proxy, or both; patient self-report; family or caregiver reports), clinical heterogeneity of hip fracture type and surgical method, and the diverse outcome measures.

Changes in Health-Related Quality of Life After Surgery
All of the included studies assessed changes in HRQoL by comparing prefracture measures with postoperative follow-up measures. A significant decline in HRQoL occurred at or near the 4-month follow-up (Ekström et al., 2009; Hedbeck et al., 2013; Söderqvist et al., 2006). All of the included studies in this systemic review (Tables 1 and 2) showed that older persons with hip fracture and cognitive impairment had a poorer HRQoL score after hip fracture surgery.

The studies in Table 1 showed differences in HRQoL for patients with and without cognitive impairment after hip fracture surgery. Karni et al. (2014) reported that older women with and without mild cognitive impairment had low scores on the physical and mental components of the SF-12 one month after discharge from a surgical rehabilitation facility. Although there were no significant differences in HRQoL between groups, participation scores on the Israeli Assessment of Participation of Adults were significantly greater for women participants with no cognitive impairment ($p < .001$). Söderqvist et al. (2006) found that severity of cognitive impairment was correlated with deterioration in HRQoL after hospital discharge. Patients with cognitive impairment (SPMSQ score < 3) had a significantly lower HRQoL at the time of enrollment than patients with SPMSQ scores $\geq 3$ (no impairment or mild-to-moderate impairment). In addition, at each follow-up over a 12-month period, HRQoL continued to deteriorate for patients with cognitive impairment. In contrast, patients with scores $\geq 3$ on the SPMSQ achieved significant improvements in their EQ-5D index scores between the 4- and 12-month follow-up evaluations ($p < .05$). The study by Griffin et al. (2015) found that HRQoL at 1 year after hip fracture surgery was significantly lower than the prefracture HRQoL for all patients and that patients with severe cognitive impairment (AMTS $\leq 8$) had significantly lower scores for HRQoL at all time points than their peers with AMTS scores $> 8$. Buecking et al. (2014) found higher cognitive impairment (determined by low scores on the MMSE) to be associated with a lower EQ-5D index score at discharge (MMSE 0–9: $\beta = -0.238$, $p < .001$; MMSE 10–19: $\beta = -0.294$, $p < .001$). Furthermore, patients with moderate cognitive impairment were found to have a lower EQ-5D index at discharge than their peers with intact cognition (Buecking et al., 2014).

Influence of type of hip fracture and surgical approach on health-related quality of life
All of the three studies in Table 2 compared HRQoL among different hip fracture types and surgical approaches in persons with moderate-to-severe cognitive impairment. Blomfeldt et al. (2005) and Hedbeck et al. (2013) compared the surgical approaches of hemiarthroplasty (HA) and internal fixation (IF) on femoral neck fractures, whereas Avci et al. (2016) compared

### TABLE 2.

**Studies on Changes in HRQoL in Older Persons With Moderate-to-Severe Cognitive Impairment After Hip Fracture Surgery: Hip Fracture Types and Surgical Approach**

| Author (Year)/Country | Study Quality | Surgical Approach | Hip Fracture Type | Study Design | Patients (n) |
|-----------------------|---------------|-------------------|-------------------|--------------|--------------|
| Avci et al. (2016)/Turkey | 14 | HA vs. PFN vs. DHS | IC | Retrospective analysis | $N = 155$ HA = 44 PFN = 54 DHS = 57 |
| Blomfeldt, Törnkvist, Ponzer, Söderqvist, & Tidermark (2005)/Sweden | 13 | HA-U vs. IF | Femoral | Prospective randomly allocated | $N = 60$ HA-U = 30 IF = 30 |
| Hedbeck et al. (2013)/Sweden | 13 | HA-C vs. IF | Femoral | Prospective randomized controlled trial | $N = 60$ HA-C = 30 IF = 30 |

Note. HRQoL = health-related quality of life; HA = hemiarthroplasty; PFN = proximal femoral nail; DHS = dynamic hip screw; IC = intertrochanteric; MMSE = Mini-Mental Status Examination; EQ-5D = Euro-QoL-5 Dimensions; HA-U = hemiarthroplasty-uncemented; IF = internal fixation; Femoral = femoral neck; SPMSQ = Short Portable Mental Status Questionnaire; HA-C = hemiarthroplasty-cemented.
HA, proximal femoral nail, and dynamic hip screw on intertrochanteric fractures. Although types of hip fracture and surgical treatments for the studies varied, both factors impacted the HRQoL of patients at 4 months after surgery.

The impacts on HRQoL at later time points were found to differ based on the type of fracture and treatment. Hedbeck et al. (2013) found that patients treated with IF for femoral neck fractures had a higher percentage of reoperations (23%) than those treated with HA (3%; \( p = .05 \)) and a lower HRQoL (measured by EQ-5D) at 12 months than those who had received HA. However, the difference was no longer significant at the 24-month follow-up because of mortality. These findings are in contrast to those of Blomfeldt et al. (2005), who showed that the rate of hip complications was 30% (9/30) using IF and 23% (7/30) using HA for surgical repair of a femoral neck fracture. In addition, reoperation was required for 33% (10/30) of patients with IF and for 13% (4/30) of patients with HA (\( p = .067 \)). Although the percentage of complications requiring surgical repair did not significantly differ between the groups, patients who received HA using uncemented Austin Moore prosthesis had significantly worse HRQoL at the 24-month follow-up, based on EQ-5D index scores, than their peers who had received IF (\( p < .001 \)).

Findings for older persons with intertrochanteric hip fracture also differed (Avci et al., 2016). Although patients experienced a dislocation rate of 22.7% (10/44) and an infection rate of 18% (8/44), the EQ-5D scores at the 12-month follow-up were higher for those who received HA than for those who received proximal femoral nail and dynamic hip screw (\( p < .01 \)). However, at the 24-month follow-up, the EQ-5D scores for all of the groups were extremely low and did not differ significantly (\( p = .205 \)).

One of the studies (Ekström et al., 2009) in Table 1, which included patients with and without cognitive impairment, found the HRQoL in persons with cognitive impairment to be impacted by cephalomedullary nail surgery treatment for subtrochanteric fracture. Although only 8% required a reoperation, there was a decline in HRQoL that persisted long-term for patients treated for a subtrochanteric fracture with a cephalomedullary nail surgery approach. The EQ-5D index score decreased at 4 months (from 0.73 before the fracture to 0.53; \( p < .001 \)) and remained at the same level at 12 months (0.53; \( p < .001 \)) and at 24 months (0.52; \( p < .05 \)) postsurgery.

In summary, the findings of the included studies that examined the influences of fracture types and surgical approaches for older persons with cognitive impairment on changes in HRQoL varied. The inconsistencies in findings may have resulted from additional complications experienced by the participants such as dislocation, infection, and reoperation, all of which may influence postsurgical HRQoL outcomes.

### Discussion

This is the first systematic review designed to provide an extensive overview of postoperative HRQoL in older persons with cognitive impairment who have experienced hip fracture. This review study identified 10 studies in the literature that examined changes in HRQoL in older cognitively impaired patients with hip fracture who had undergone surgery. The studies were all of high (\( n = 7 \)) or moderate (\( n = 3 \)) quality. Seven compared patients with and without cognitive impairment and three compared patients with moderate-to-severe cognitive impairment according to fracture type and surgical approach. The studies collectively address populations of patients in multiple countries. Half of the studies were conducted in Sweden. Nearly all (90%) of the studies used a prospective approach.
Measures of Health-Related Quality of Life

All of the studies determined changes in HRQoL by comparing presurgical and postsurgical (follow-up) measures. Nine of the 10 included studies used the EQ-5D to measure HRQoL. This scale has shown high reliability between participant scores and proxy scores for mild and moderate levels of cognitive impairment and performs better than dementia-specific measures (Aguirre, Kang, Hoare, Edwards, & Orrell, 2016). Of the five studies that used self-report measures to assess HRQoL in patients with and without mild-to-moderate cognitive impairment, Karni et al. (2014) used the SF-12, whereas the others (Buecking et al., 2014; Ekström et al., 2009; Söderqvist et al., 2006; Tidermark et al., 2002) used the EQ-5D. However, in Buecking et al. (2014), no assessments were obtained from patients who could not self-report because of their cognitive impairment. One study used both proxy and self-report methods to assess HRQoL because participants included both individuals with and without moderate-to-severe cognitive impairment (Griffin et al., 2015). Although these disparate assessments may have impacted this review, a general decline in HRQoL was observed for older persons with hip fracture and cognitive impairment after hospital discharge, regardless of whether data were collected by proxy or self-reported.

The EQ-5D was found to have a satisfactory response rate, and its short completion time makes it feasible for assessing HRQoL (Hounsome, Orrell, & Edwards, 2011; Naglie et al., 2006; Selai, 2001). Juárez-Cedillo and Sánchez-Arenas (2015) showed that the reliability of the EQ-5D is sufficient for use in populations with and without dementia for the following dimensions: mobility, self-care, usual activities, pain/discomfort, and depression. The EQ-5D is easy to use and suitable for use in a routine clinical setting, which makes it a useful tool for outcome measures in clinical trials and recovery from hip fracture for elderly patients (Parsons, Griffin, Achten, & Costa, 2014; Shyu et al., 2004; Tidermark, Bergström, Svensson, Törnkvist, & Ponzer, 2003), including those with cognitive impairment (Kunz, 2010; Parsons et al., 2014; Wolfs et al., 2007).

### TABLE 3.
**Quality Assessment of the Included Studies: Assessment Study Checklist, Established by Peeters et al. (2016)**

| Item | Avci et al. (2016) | Beaupre et al. (2012) | Blomfeld et al. (2005) |
|------|------------------|---------------------|-----------------------|
| 1. A description is given of (HR) QOL and/or health status by describing at least the domains and/or the importance of the subjective experience of the patient. | 1 | 1 | 1 |
| 2. A reason is given for choosing a certain questionnaire. | 1 | 1 | 1 |
| 3. A distinction is made between (HR) QOL and health status. | 0 | 0 | 0 |
| 4. A description is included of at least two sociodemographic variables (e.g., age, sex, ambulatory status). | 1 | 1 | 1 |
| 5. A description is present of at least two clinical variables (e.g., type of hip fracture, postoperative complications). | 1 | 1 | 1 |
| 6. Inclusion and/or exclusion criteria are provided. | 1 | 1 | 1 |
| 7. The study describes potential prognostic factors by using multivariate analyses or structural equation modeling. | 0 | 0 | 0 |
| 8. Participation rates for patient groups are described, and these rates are exceeding 75%. | 0 | 0 | 0 |
| 9. Information is given about the ratio nonresponders versus responders. | 1 | 0 | 0 |
| 10. The study size is consisting of at least 50 patients (arbitrarily chosen). | 1 | 1 | 1 |
| 11. The collection of data is prospectively gathered. | 1 | 1 | 1 |
| 12. The design is longitudinal. | 1 | 1 | 1 |
| 13. The process of data collection is described (e.g., interview or self-report). | 1 | 1 | 1 |
| 14. The follow-up period is at least 6 months. | 1 | 1 | 1 |
| 15. The loss to follow-up is mentioned and < 20%. | 1 | 0 | 1 |
| 16. The results are compared between two groups or more (e.g., health population, groups with hip fracture patients), and/or results are compared with at least two time points (e.g., longitudinally or pre- vs. post-treatment). | 1 | 1 | 1 |
| 17. A psychometrically sound (health-related) QOL or health status questionnaire is used. | 1 | 1 | 1 |
| **Total score** | **14** | **12** | **13** |

Note. (HR) QOL = (health-related) quality of life.
Although self-assessments are considered the “gold standard” in estimating HRQoL, self-reports have been seen as barriers to measuring HRQoL in patients with varying degrees of cognitive impairment (Orgeta et al., 2015; Selai, 2001). Varied assessment modes including self-reporting and proxy have been used with hip-fractured patients with cognitive impairment to measure their HRQoL. Many measures of QoL used in the literature are based on proxy assessments or observations of people with dementia rather than on self-ratings (Bowling et al., 2015). Proxy reports are standard when working with persons with a cognitive disorder (Hedbeck et al., 2013). However, Coucill, Bryan, Bentham, Buckley, and Laight (2001) found that proxy reports of HRQoL are not always in agreement with self-reports of persons with dementia. Other reports have shown poor agreement between HRQoL scores for persons with dementia and ratings provided by family carers (Kahle-Wrobleski et al., 2016; Orgeta et al., 2015). Hence, the mode of assessment should be considered when drawing conclusions regarding HRQoL in persons with cognitive impairment/dementia.

### The Influences on Health-Related Quality of Life of Fracture Type and Surgical Approach

The outcomes of the three studies on hip-fractured patients with severe cognitive impairment were inconsistent in terms of postoperative HRQoL. Type of hip fracture and surgical approach differed among the three studies. Avci et al. (2016) reported that patients with intertrochanteric fracture treated with HA had better HRQoL at 1-year follow-up than those who had received treatment with a proximal femoral nail or dynamic hip screw. The two studies on patients with femoral neck fracture had different outcomes depending on surgical treatment: Hedbeck et al. (2013) found that patients treated with cemented HA had better HRQoL than those treated with IF. In contrast, Blomfeldt et al. (2005) found that IF resulted in a better HRQoL than the surgical approach of uncemented HA. These findings suggest that fracture type and surgical approach in older persons with moderate-to-severe cognitive impairment may respectively impact HRQoL significantly.

### Table: QoL for Cognitively Impaired Patients With Hip Fracture

| Buecking et al. (2014) | Ekstrom et al. (2009) | Griffin et al. (2015) | Hedbeck et al. (2013) | Karnie et al. (2014) | Söderqvist et al. (2006) | Tidermark et al. (2002) |
|------------------------|----------------------|----------------------|----------------------|----------------------|--------------------------|--------------------------|
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 0                      | 0                    | 0                    | 0                    | 0                    | 0                        | 0                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 0                      | 1                    | 1                    | 1                    | 0                    | 0                        | 1                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 0                      | 0                    | 0                    | 0                    | 0                    | 0                        | 0                        |
| 0                      | 0                    | 0                    | 0                    | 0                    | 0                        | 0                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 0                      | 1                    | 1                    | 1                    | 0                    | 1                        | 1                        |
| 0                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 0                      | 0                    | 0                    | 0                    | 1                    | 0                        | 0                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 1                      | 1                    | 1                    | 1                    | 1                    | 1                        | 1                        |
| 10                     | 12                   | 12                   | 13                   | 10                   | 11                       | 12                       |

Ekstrom et al. (2009) Griffin et al. (2015) Hedbeck et al. (2013) Karnie et al. (2014) Söderqvist et al. (2006) Tidermark et al. (2002)
The diversity in surgical approaches for treating various types of hip fractures for patients with cognitive impairment makes it difficult to determine the influences of these factors on HRQoL. Therefore, further studies are required to provide additional data.

Patients with femoral neck fracture who received IF had more complications and reoperations than those who received HA (Blomfeldt et al., 2005; Hedbeck et al., 2013). Although HA was preferred for intertrochanteric fracture treatment, patients with severe cognitive impairment were affected by higher dislocation rates (22.7%) and infection rates (18%; Avci et al., 2016). The deterioration of HRQoL in older persons with cognitive impairment/dementia who experienced hip fracture was significantly greater among patients with fracture healing problems (Tidermark et al., 2002). Reoperation is often required in patients who experience problems with healing. However, reoperation was found to negatively impact HRQoL. Those patients with failed IF were required to undergo at least one reoperation and experienced a further significant reduction in HRQoL in older persons with cognitive impairment/dementia who experienced hip fracture (Tidermark et al., 2002). Reoperation resulted in higher treatment and hospital stay costs for all patients (Frihagen et al., 2010). Although the percentage of patients requiring a reoperation for IF (23%) was higher than of those requiring HA (3.4%; Blomfeldt et al., 2005), these rates were lower than those reported in the Cochrane review (reoperation rate of 36% for IF), regardless of patient cognitive function (Parker & Gurusamy, 2006).

The search strategy used in this study has significant rigor and strength. However, several limitations should be considered. First, the high-risk bias of the included studies may have reduced the validity of their findings. Second, a meta-analysis was not conducted because of the heterogeneity of measurement instruments for cognitive impairment, clinical characteristics, and HRQoL assessment. Future reviews that include studies with a low-risk bias for changes in postoperative HRQoL in persons with cognitive impairment are suggested.

### Conclusions

Aging populations face increasing numbers of older persons with cognitive impairment who experience hip fracture and require surgery. In light of this, the findings of this study have several clinical implications for current and future populations. Older persons with cognitive impairment who require hip fracture surgery should be carefully monitored during the initial 4-month period after surgery. The postoperative changes in HRQoL that were reported in the reviewed studies suggest that this critical period requires increased attention immediately after surgery and that providing this increased attention may help significantly reduce current related postsurgery declines in HRQoL. Moreover, healthcare providers should develop strategies and interventions to effectively ameliorate the reduction in HRQoL experienced by this population. Developing clinical nursing care programs that focus on physical rehabilitation as well as emotional support after hip fracture surgery may reduce the costs of care per quality-adjusted-life-years for hip-fractured persons with cognitive impairments. Future studies are recommended to develop and test timely nursing and interdisciplinary care models to optimize the quality of care.

### TABLE 4. Summary of Bias Risk Assessed Using the Cochrane Risk of Bias Tool: Low Risk (+), High Risk (−), and Unclear (0)

| Item                                | Avci et al. (2016) | Beaucroft et al. (2012) | Blomfeldt et al. (2005) | Buecking et al. (2014) | Ekstrom et al. (2009) | Griffin et al. (2015) | Hedbeck et al. (2013) | Karnie et al. (2014) | Söderqvist et al. (2006) | Tidermark et al. (2002) |
|-------------------------------------|--------------------|--------------------------|-------------------------|------------------------|-----------------------|----------------------|-----------------------|-----------------------|------------------------|--------------------------|
| 1. Random sequence generation       | −                  | −                        | 0                       | −                      | −                     | +                    | −                     | −                     | −                      | −                        |
| (selection bias)                    |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 2. Allocation concealment           | −                  | −                        | +                       | −                      | −                     | −                    | 0                     | −                     | −                      | −                        |
| (selection bias)                    |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 3. Binding of participants personnel| −                  | −                        | 0                       | −                      | −                     | −                    | 0                     | −                     | −                      | −                        |
| (performance bias)                  |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 4. Binding of outcome assessment    | −                  | −                        | 0                       | −                      | −                     | −                    | 0                     | −                     | −                      | −                        |
| (detection bias)                    |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 5. Incomplete outcome data          | +                  | −                        | −                       | −                      | −                     | −                    | +                    | 0                     | −                      | −                        |
| (attrition bias)                    |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 6. Selective reporting              | +                  | +                        | +                       | −                      | −                     | +                    | +                    | 0                     | −                      | −                        |
| (reporting bias)                    |                    |                          |                         |                        |                       |                      |                       |                       |                        |                          |
| 7. Other bias                       | 0                  | 0                        | 0                       | 0                      | 0                     | 0                    | 0                     | 0                     | 0                      | 0                        |

(Avci et al., 2016; Blomfeldt et al., 2005; Hedbeck et al., 2013).
provided to older persons with cognitive impairment who face the possibility of hip fracture surgery.

**Author Contributions**

Study conception and design: WW, WYK  
Data collection: WW, WYK  
Data analysis and interpretation: WW, WYK  
Drafting of the article: WW, WYK  
Critical revision of the article: YILS

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