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Physical Rehabilitation Outcomes in Patients with Dementia Following Hip Fracture Surgery: A review

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Abstract

Background: Dementia patients were reported of having high risk for hip fracture. Rehabilitation programs were still being debated for this vulnerable population and the recovery outcomes in this frail elderly population are varied, thus evidenced-based outcomes for this issue are needed.

Objective: To investigate rehabilitation programs, especially on physical function outcomes in patients with dementia following hip fracture surgery.

Method: PubMed, Scopus and MEDLINE (EBSCO) databases were searched from January 2000 to June 2020 concerning rehabilitation intervention program in dementia patients who received hip surgical treatment. The studies included have the following criteria, (1) investigating physical outcomes of rehabilitation programs (2) Randomized controlled trials (RCTs) study design, (3) study involving dementia patients following hip fracture surgery (4) English full-text journal.

Results: Six studies were included in this review. Most study focused on interdisciplinary or multidisciplinary rehabilitation program. Physical outcomes of rehabilitation programs seem to improve physical function, maintaining physical ability for ambulation, and decrease the risk of falls in mild or moderate dementia patients following hip fracture surgery. However, the physical function of older persons with dementia confirmed to be lower than those without dementia.

Conclusion: Rehabilitation may show benefit for physical function in elderly with mild or moderate dementia following hip fracture surgery, and this population needs to be included in the clinical rehabilitation program. Investigating and establishing the strategies to improve outcomes for dementia population is needed for future study.

Keywords: rehabilitation, dementia, hip fracture, surgery, randomized controlled trials, review

INTRODUCTION

Hip fracture is increasing as the aging population trend get bigger (Nations, 2020). The worldwide hip fracture incidence is expected to rise for more than 4 million (Rapp et al., 2019), and projected over 50%

of all hip fractures in Asia on 2050 (Cheung et al., 2018). Hip fracture incidence increased for elderly with dementia (Friedman et al., 2010; Jeon et al., 2019), about 55% of hip fracture incidence was associated with dementia (Tsai et al., 2014; Wang et

al., 2014).

Surgical treatment for hip fractures represents the standard of treatment (Lee & Elfar, 2014). However, successful surgical treatment in older persons who have hip fracture surgery often result in permanent disability and dependency (Toussant & Kohia, 2005). In addition, moderate dementia patients often become dependent and require long term care facilities (e.g., nursing homes care), and resulted in the longest hospital care and family's economic burden (Kim et al., 2016; Maravic et al., 2005). Dementia patient who require hip-fracture surgery should be carefully monitored for the initial 4-month period following the surgical treatment (Wantonoro et al., 2020)

Studies have shown that the effectiveness of rehabilitation program for dementia patients who received hip surgical treatment is varied. Rehabilitation was reported to improve the recovery following hip surgery (Bandholm et al., 2018; Di Monaco et al., 2009) including physical function in hip fractured person with dementia status (van Wyk et al., 2014). However, another studies reported that dementia patient with hip fracture were reported to have less favorable outcomes (Gruber-Baldini et al., 2003), and higher surgical complications (Kassahun, 2018) such as infection, joint problem, and second surgery (Wantonoro et al., 2020). Other studies have also suggested that this vulnerable group was excluded from intensive rehabilitation programs (Larsson et al., 2019; Peeters et al., 2016). Thus, evaluation of rehabilitation program of dementia patients following hip fracture surgery has become increasingly important. Therefore, the purpose of this study was to review the rehabilitation programs, especially the physical outcomes in dementia patients following hip fracture surgery and make evidence-based conclusions.

METHODS

Search Strategy: PubMed, Scopus, and MEDLINE (EBSCO) databases were searched from January 2000 to June 2020 regarding rehabilitation approach in dementia patients following hip fracture surgery, using the following keywords: "rehabilitation" OR "intervention" AND "cognitive impairment" OR "dementia" AND "older" OR "elderly" AND "hip fracture" OR "femoral neck

fracture" OR "femoral head fracture" OR "sub capitals fracture" AND "surgery". The studies were included in our research if they met the following criteria (1) investigating rehabilitation interventions program (2) there were restrictions on the study design, randomized controlled trials (RCTs) study design only, (3) evaluating at least physical function outcomes (4) the study included dementia patients following hip fracture surgery (5) English full-text journal. The study was registered with the International Prospective Register of Systematic Reviews (PROSPERO) with registration number CRD42020143516.

Article Evaluation: the title of the articles was identified by two independent reviewers (W and ES). Abstracts and full texts of potential studies were screened to be included in this review by two independent reviewers (W and EKS). One researcher (SW) checked the uncertainty concerning the inclusion of the studies.

Data Extraction and validity Assessment: The included articles were extracted using a standardized data-extraction form (table 1). Newcastle–Ottawa Quality Assessment Scale for Cohort Studies (NOS) was used for the validity assessment of the studies included (Allen et al., 2012; Wells GA, 2011). All studies included in this review were in a good-quality study level.

Strategy for data synthesis: Narrative approaches adopting Popay et al. (2006) were conducted, by simply describing and summarizing the main features of included studies, investigation of similarities and differences between studies, assessing the results of each study systematically and comprehensively, highlighting the important characteristics of the studies which were relevant, such as important similarities or differences (for example, in study design, populations, interventions or other elements) (Popay et al., 2006)

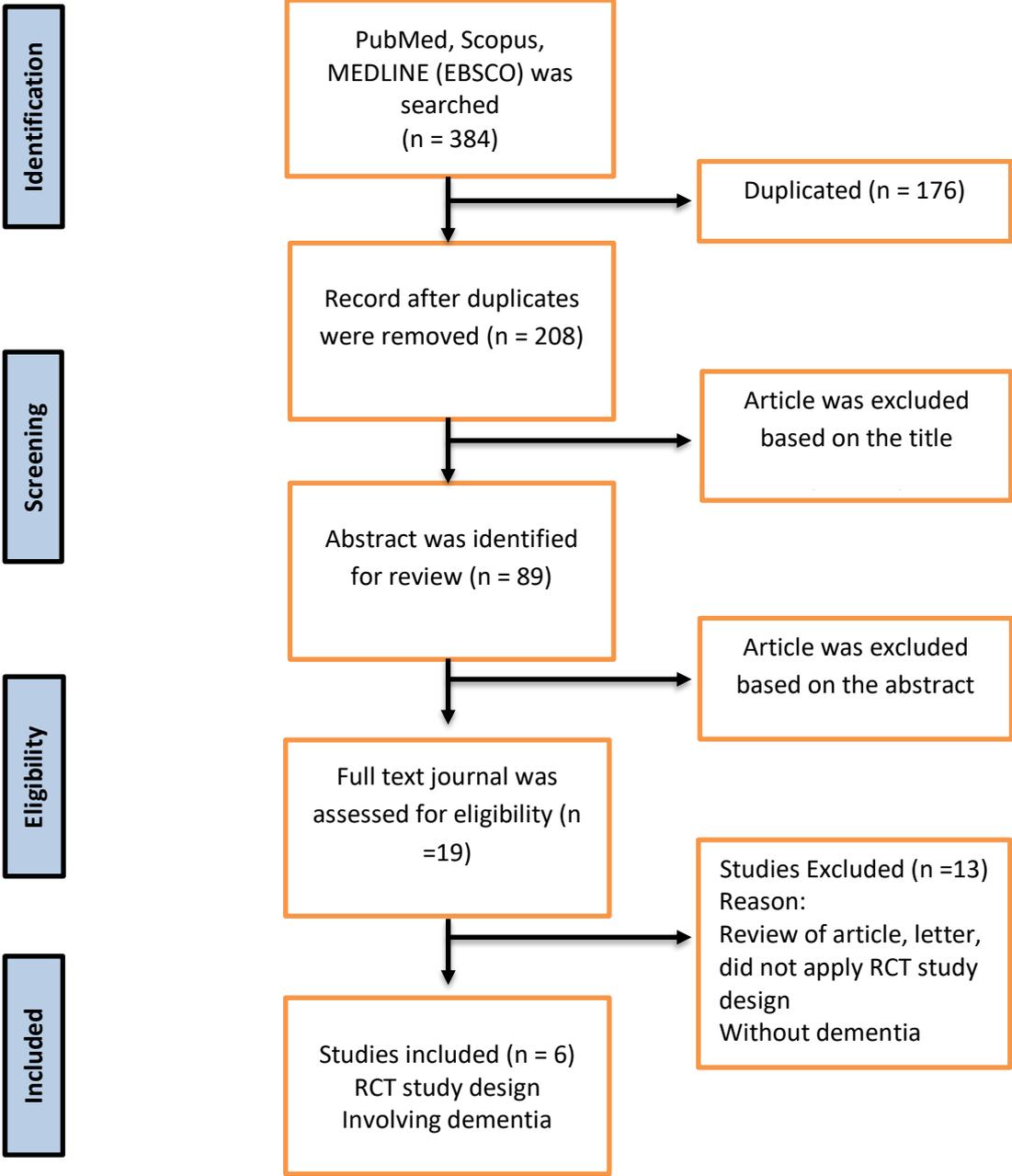


Figure 1. Flow diagram of the review process

Table 1 Studies Included in the Review

Study/authors/year	intervention	Sample size	Mean age, y	Dementia assessment	Follow-up	outcome
(Huusko et al., 2000)	geriatric program rehabilitation In-patient vs. usual postoperative care	n = 243 (132 with cognitive problem [68 mild, 36 moderate, 28 severe]; 97 normal)	Control: 80 (66–97). intervention: 80 (67–92);	MMSE	3 rd months and 1 st year	Discharge location; mild to moderate cognitive problem was improved to independent living.
(Karlsson et al., 2016)	Geriatric Interdisciplinary Home rehabilitation	n = 205 (103 (50.2%); dementia: 57 (53, 3%) intervention group; 46 (46,9%) control group)	Intervention: 83.2 (SD 6.9) control: 82.6 (SD 6.4)	MMSE	3 rd month and 1 st year	There were benefits of the rehabilitation program for older person with dementia including the increased functional performance and ambulation, and the decreased risk of falls
(Naglie et al., 2002)	In-patient interdisciplinary vs. usual post-operative care	n = 280 (205 normal cognition; 74 impaired cognition)	interdisciplinary care: 83.8 (SD 6.9); usual care: 84.6 (SD 7.3)	SPMSQ	3 rd and 6 th months	Ambulation; dementia patients were stable for ambulation or transfers
(Stenvall et al., 2007)	Multidisciplinary intervention program	n =199 (135 normal: 64 cognitive problem)	Intervention: 82.3 (SD 6.6); control: 82.0 (SD 5.9)	MMSE	Hospitalization period	Patients with dementia showed significantly lower fall incidence
(Uy et al., 2008)	In-patient multidisciplinary rehabilitation program	n =10 (10 impaired cognition)	intervention group 83 control group: 80	SPMSQ	1 st and 4 th months	Barthel Index and gait velocity were not significantly improved for intervention group
(Vidan et al., 2005)	Intensive multidisciplinary geriatric intervention	n = 319 (241 normal cognition; 78 impaired cognition)	Intervention: 81.7 (SD 7.8); usual care: 82.6 (SD 7.4)	Goldman Scale	3 rd , 6 th months and 1 st year	Function; Those with cognitive problem had lower improvement in function than those with intact cognitive function, however both groups showed improvement. Ambulation; Those with cognitive problem had lower improvement in ambulation than those with intact cognitive function, but both groups improved.

SPMSQ=Short Portable Mental Status Questionnaire; MMSE = Mini Mental State Exam;

RESULTS

Based on the initial search of the database more than 384 articles were identified. The abstracts of the articles were reviewed, and we excluded articles which were not matched with the inclusion criteria (figure 1). Finally, six studies were included in this study review. The extracted elements including the characteristics such as intervention approach, study objectives, dementia assessment, follow-up period, and the results/outcomes of the study were summarized (Popay et al., 2006) in Table 1.

Cognitive Impairment: Cognitive impairment included in the studies were assessed using three types of instruments (see Table 1). The Mini Mental

State Examination (MMSE) was used in three studies (Huusko et al., 2000; Karlsson et al., 2016; Stenvall et al., 2007), two studies were assessed using the Short Portable Mental Status Questionnaire (SPMSQ) (Naglie et al., 2002; Uy et al., 2008) and one study used Goldman Scale to measure elderly cognitive impairment condition (Vidan et al., 2005). Five studies were included both with and without cognitive problem in their study. (Huusko et al., 2000; Karlsson et al., 2016; Naglie et al., 2002; Stenvall et al., 2007; Vidan et al., 2005). There was only one study having all participants with cognitive problem (Uy et al., 2008)

Interventions: Interdisciplinary intervention (Karlsson et al., 2016; Naglie et al., 2002) and multidisciplinary intervention care program (Stenvall et al., 2007; Uy et al., 2008; Vidan et al.,

2005) are the most used types of intervention for elderly who have cognitive problem and received hip fracture surgical treatment which were used in the included studies, however the detail of the types of interventions were not well described. The geriatric team consisted of geriatrician internist, nurses, social worker, neuropsychologist, occupational therapist, and physiotherapists. The interventions performed includes providing advice, physical training, listening to the patients, drug treatment, physiotherapy, occupational, speech therapy, helping with use of assistive equipment, and daily living aids (Huusko et al., 2000). The rehabilitation was individually designed according to the participant's own goals (Karlsson et al., 2016). The two studies included used interdisciplinary intervention program (Karlsson et al., 2016; Naglie et al., 2002) and another three studies included used multidisciplinary intervention care program (Stenvall et al., 2007; Uy et al., 2008; Vidan et al., 2005), and one of the study used geriatric rehabilitation program without stating the interdisciplinary intervention or multidisciplinary intervention care program (Huusko et al., 2000). Home based rehabilitation (Karlsson et al., 2016) and hospital setting (Huusko et al., 2000; Stenvall et al., 2007) confirmed as the place of the rehabilitation. Study sample size was from 10 respondents (Uy et al., 2008) to 132 respondents (Huusko et al., 2000). Elderly means someone aged between 80 years old (Huusko et al., 2000) and 84.6 years old (Nagle et al., 2002) in this included review study. The study follow-up period was varied among studies between hospitalization period (Stenvall et al., 2007) and one year of follow-up (Karlsson et al., 2016; Vidan et al., 2005).

Intervention program outcomes: Generally, the included studies informed that there were benefits of both interdisciplinary intervention and multidisciplinary intervention care program for elderly with cognitive problem and received hip fracture surgical treatment such us patients with mild to moderate dementia recovered the ability of activity of daily living, decrease the length of hospital stay (Huusko et al., 2000), improved functional recovery and ambulation, and decreased risk of falls (Karlsson et al., 2016; Naglie et al., 2002; Stenvall et al., 2007), and the studies confirmed those with dementia showed lower improvement in

physical function than those without dementia, but both groups improved in functional and ambulation performance (Vidan et al., 2005); it indicated that the programs improved the physical function of older persons with dementia problem and it also means that the intervention program had benefit for this vulnerable population, including older person with mild to moderate cognitive problem (Huusko et al., 2000). However, one study (which solely included the cognitive problem in the sample) informed that there was *non-significant* improvement in gait velocity and Barthel index for intensive multidisciplinary geriatric intervention compared to usual treatment (Uy et al., 2008). This systematic review found the evidence of the benefit of the rehabilitation program for this population, especially in ambulation. Three studies with and without cognitive impairment confirmed the interdisciplinary or multidisciplinary intervention (including geriatric team) improved the ambulation of older person who received hip surgical treatment with cognitive impaired problem (Karlsson et al., 2016; Naglie et al., 2002; Vidan et al., 2005), and decrease the length of hospital stay resulting in the patients returned to their independent living faster (Huusko et al., 2000). In addition, based on the setting of the intervention program, both hospital setting and home-based program intervention (home visit follow-up) were found to be beneficial for older person with dementia (mild to moderate) who had received hip surgery, such as improved functional recovery and ambulation, and decreased risk of falls (Huusko et al., 2000; Karlsson et al., 2016; Stenvall et al., 2007).

In addition, different types of rehabilitation and outcome measures were found. Geriatric program rehabilitation of In-patient with mild to moderate cognitive problem increased the independency of daily living ability (Huusko et al., 2000). Geriatric Interdisciplinary rehabilitation increased functional performance, ambulation or transfer also decreased the risk of falls (Karlsson et al., 2016; Naglie et al., 2002). Multidisciplinary rehabilitation showed significantly lower fall incidence, improved physical function and ambulation (Stenvall et al., 2007; Uy et al., 2008; Vidan et al., 2005).

DISCUSSION

Hip fracture incidence is increasing in aging global

population, meanwhile there is lack of evidence in optimizing the recovery through rehabilitation of hip surgical treatment among older person with cognitive problem. Our review found six randomized controlled trials studies examining physical functional including subjects with some degree of dementia. However, if the studies were not homogeny in types of rehabilitation interventions program, variety of assessment tools, study settings, outcome measures, and follow-up periods, then meta-analysis could not be performed. Despite this heterogeneity, however, the randomized controlled trials studies have shown that the rehabilitation program for older person with mild to moderate dementia seem to have benefit in functional performance.

This review study informed that the rehabilitation program gave positive impact to this vulnerable population especially in early mobilization or ambulation. Almost all of studies included, concludes that the intervention programs have benefit for older person who had received hip surgery, including older person with dementia (mild to moderate level of cognitive problem); where it shown an improvement in the ambulation. Ambulation is the ability to move from place to place, with or without assistive devices with low-intensity activity, ideal for recovery condition from a surgery or other hospitalization. Ambulation is very important in reducing complication (Kenyon-Smith et al., 2019), while delayed ambulation is associated with poor function, pneumonia and increase in the length of hospital stay (Kamel et al., 2003); early mobilization would accelerate functional recovery after hospital discharge. However, the previous study stated that worse cognitive problem was a negative predictor for the success of the ambulation program (Cecchi et al., 2018). All studies included in this review involved mild to moderate cognitive problem, therefore, older person with severe cognitive problem needed to be evaluated by the future studies.

In addition, Hospital and home-based settings were found as the setting type used in this review. It indicate that imminence action and follow-up intervention program are needed and are beneficial for this population. Older person with cognitive impairment who received hip surgical treatment

and received specialized inpatient multidisciplinary or interdisciplinary rehabilitation intervention showed an improved physical daily living ability and had stable condition for ambulation and transfers compared to usual postoperative treatment (Allen et al., 2012; Huusko et al., 2000; Vidan et al., 2005). This study findings are supported by the recent review of Allen et al., (2012); Muir and Yohanes (2009) who found that people with cognitive problem who received intensive inpatient rehabilitation after surgical treatment of a hip fracture had improvement in physical function (Allen et al., 2012; Muir & Yohannes, 2009). Another study reported, that home based exercise program (follow-up) shown an improvement in physical function (Latham et al., 2014). This result proved the benefit of follow-up rehabilitation for older person with dementia problem and hip surgery after hospital discharge. We need to consider developing immediate (Wantonoro et al., 2020) intervention and long term care program for this population in order to improve general physical functions.

This review found only one study by Uy et al., (2008) which solely focused on cognitively impaired individuals. This study compared older person with cognitive problem in the intervention group and control group and reported that the trend for improvement in Barthel Index and gait velocity in the intervention group compared to the control group (Uy et al., 2008) was not significant. However, the numbers of sample were too small (3 respondents in intervention group and 7 respondents in control group), in this case the author decided that strong conclusion cannot be made. Indeed, the study informed to develop feasible protocol to provide an interdisciplinary rehabilitation for older people with hip fracture and cognitive problem. However this study implied that, there were no positive impact of interdisciplinary rehabilitation for older persons with cognitive problem following surgical hip treatment and thus no strong conclusion was made in this study (Uy et al., 2008). Other study reported unclear outcomes in which treatment and rehabilitation interventions achieved the best outcomes for dementia population (Smith et al., 2020). Then future study with randomized control trial in all cognitive problem respondents is needed to be done in order to make strong conclusion.

The limitations of our review; although RCTs study provide the highest level of evidence, however five relevant RCTs studies in this review did not only include cognitive problem in the study. They included patient with intact cognitive condition in the study, and in this case strong conclusion cannot be drawn for older person with cognitive problem. However, our review highlighted the paucity of information; the intervention program for older persons with cognitive problem following surgical hip treatment are proven to be beneficial for them. We found that most of the research focused on interdisciplinary or multidisciplinary rehabilitation of hospital and home base setting. Moreover, the protocol was found to be varied among study and the detail of types interventions were not well described. This review study would help to guide further research, in specific strategy programs for older person with dementia following surgical hip treatment.

CONCLUSIONS

This study reported the effectiveness of intervention program for older person with dementia who received hip surgery (mild to moderate dementia status). Both interdisciplinary or multidisciplinary rehabilitations improved patient's ambulation, decreased in risk of fall and finally improved physical function including the dementia patients, but the current finding is insufficient to determine the benefit for people with moderate to severe dementia with post hip fracture surgery. The best strategies between interdisciplinary and multidisciplinary outcomes cannot be concluded in this study. However, due to some benefits of the treatment, this frail population (mild to moderate dementia patients) needs to be included in the rehabilitation or intervention program. Investigating and establishing the strategies to improve outcomes for dementia population are needed for future study.

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