

2017-12

# Physiotherapy interventions for people with dementia and a hip fracturea scoping review of the literature

Hall, Abi

<http://hdl.handle.net/10026.1/10888>

---

10.1016/j.physio.2017.01.001

Physiotherapy

Elsevier BV

---

*All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.*

# **Physiotherapy interventions for people with dementia and a hip fracture – a scoping review of the literature**

***AJ Hall<sup>a</sup>, IA Lang<sup>a</sup>, R Endacott<sup>b</sup>, A Hall<sup>a</sup> VA Goodwin<sup>a</sup>***

<sup>a</sup> NIHR CLAHRC South West Peninsula (PenCLAHRC), University of Exeter

<sup>b</sup> Centre for Health and Social Care Innovation, Faculty of Health and Human Sciences, Plymouth University

Corresponding author:

Abigail Hall, Room 1.34, South Cloisters, St Luke's Campus, Exeter, EX1 2LU

[ah577@exeter.ac.uk](mailto:ah577@exeter.ac.uk)

**WORD COUNT 2272**

## **KEYWORDS**

Hip fracture, dementia, physiotherapy, scoping review

## **ABSTRACT**

### **Background**

People with dementia are 2.7 times more likely to suffer a hip fracture than those without and their management is estimated to cost £0.92 billion per year. Yet there has been little focus on the effectiveness of interventions for this population.

### **Objective**

The aim of this scoping review was to summarise the current available evidence for physiotherapy interventions for people with dementia who fracture their hip as well as to identify gaps in the literature that may require further research.

### **Data Sources**

A systematic search of the following databases was undertaken - TRIP, CINAHL, Amed, Embase, PEDro, PsycINFO, Cochrane Library, Open Grey, Ethos, ISRCTN, Proquest, PROSPERO and UK Clinical Trials Gateway.

## **Study Selection**

Articles were included if they described an intervention which is considered within the scope of a physiotherapist and targeted those with both a hip fracture and dementia.

## **Synthesis Methods**

A narrative summary was then undertaken to describe the current state of the literature.

## **Results**

Twenty six studies were included, of which thirteen were observational, six RCTs, two qualitative, two surveys and three systematic reviews. Only nine studies focused explicitly on physiotherapy interventions.

## **Conclusion**

The findings of this scoping review suggest there is limited evidence to guide physiotherapists in the management of people with dementia who fracture their hip. No evidence was found about perceptions or experiences of patients in this group or of the physiotherapists involved in their care. Further research is needed to develop and evaluate physiotherapy interventions for people with dementia who fracture their hip.

## **FUNDING**

National Institute of Health Research: Research Capacity in Dementia Care programme

## Introduction

Despite reported improvements in surgical technique for the repair of hip fractures (1), the recovery of people who sustain a hip fracture is often complex and involves a challenging interaction of physical, psychological and social factors (2). Long-term functional recovery is frequently considered to be poor (3), and an estimated 27% to 59% of people move into permanent long-term care within the first year after fracture (4, 5).

The management of hip fractures can be more challenging if patients have dementia and it is estimated that people with dementia are 2.7 times more likely to sustain a hip fracture than sex- and age-matched controls without dementia (6). In people with a diagnosed dementia, hip fractures are the third most common cause of admission into an acute setting (7) and lead to high levels of mortality (8) and morbidity (9). It is estimated that, in the UK, 80,000 people will fracture their hip each year (10), costing £2.3 billion (11). Of these, it is suggested that 40% will have coexisting dementia (10), which equates to approximately 32,000 people at a cost of £0.92 billion per year.

It is suggested that people with dementia are frequently excluded from trials (12), with systematic reviews often excluding studies if the participants have any cognitive defects (13). Concerns were recently raised by the British Orthopaedic Association (BOA) in conjunction with the Chartered Society of Physiotherapy (CSP) about poor management of people who fracture their hip (14). This report highlighted, amongst other things, concern about the lack of emphasis placed on immediate post-operative physiotherapy.

National guidance suggests people should be offered a physiotherapy assessment and mobilised on the day after surgery and seen at least daily after this. Although the guidance does not specify that the latter needs to be undertaken by a physiotherapist, regular physiotherapy review is advised (15).

### **Scoping Review**

There is much debate about the aims and objectives of scoping reviews and systematic reviews (16) and about the methodology involved. The suggestion is that scoping reviews seek to explore the quantity and type of evidence in a broad area of the literature whereas systematic reviews aim to synthesize and evaluate the quality of evidence to answer a more specific research question (17) .

This scoping review was guided by the framework developed by Arksey and O'Malley (18) and follows 5 steps:

*i) Identify the Research Question*

*ii) Identify relevant studies*

*iii) Study Selection*

*iv) Chart the data*

*v) Collate, summarise and report the results*

## **Aims and Objective**

The aim of this scoping review was to gain a clear understanding of the current evidence base surrounding physiotherapeutic interventions for people who sustain a hip fracture and also have dementia. A scoping review should be undertaken to determine the value of undertaking a full systematic review (19), and forms part of the complex interventions framework (20).

The research objectives of this review were to:

- 1) Summarize the current evidence base of physiotherapy interventions for people with dementia who fracture their hip;
- 2) Identify gaps in the literature that may require further research.

### ***i) Identifying the Research Question***

To formulate a search strategy for this scoping review, the PICOT(S) method was employed as described by Sackett and colleagues (21).

**P** (Population) – people with any form of dementia who suffer a hip fracture

**I** (Intervention) – a physiotherapy intervention which could be carried out within the standard scope of a physiotherapist (22)

**C** (Comparator) – any comparator; no comparator

**O** (Outcomes) – functional ability, quality of life, participation, experiences,

attitudes towards physiotherapy interventions, any physical or self-reported outcome measures (such as wellbeing or fear of falling)

**T** (Time) – all studies were considered, studies were not limited according to time of follow-up

**S** (Study design) – any study design were considered, excluding papers published only as conference proceedings/abstracts, or where only published in protocol stage

**ii) Identifying relevant studies**

**Search strategy**

In order to ensure a comprehensive search of the literature, the following databases were searched for articles: TRIP database, Cochrane Library (including ALOIS), Embase (via Ovid), Amed, PsycINFO (via Ovid), CINAHL, Medline (via Ovid), and PEDro. The databases were searched from creation until present day (July 2015) to ensure the historical context of the literature was obtained as well as ensuring all up to date articles were found. The search strategy was initially created in Medline and then translated into the other databases (see supplementary file). Following the initial database searches, grey literature searching took place using Open Grey, ProQuest and Ethos. Keywords focused on different types of dementia and terms related to physiotherapy, or aspects of physiotherapy that may be undertaken for this population. Search terms around the types of study or outcomes were not used to prevent limiting the search.

Hand searching was undertaken to ensure a comprehensive search was undertaken.

Backwards citation was undertaken by searching the bibliographies of included studies and forwards citation checking was achieved using the SCOPUS medical database.

### *iii) **Study Selection***

After completion of all database searches, the citations were compiled and entered into EndNote X7.1 bibliographic manager, where duplicate citations were removed. The first stage screening was of titles and abstracts (16) and was done independently by two reviewers (AJH and AH). Disputes were discussed and consensus reached between reviewers. Should resolution of disputes not have been achieved, a third expert reviewer (VG) would have been consulted. Full text copies were obtained and then independently screened by the two reviewers, allowing consensus to be reached about the articles to be included in the review. Following retrieval of these articles, hand searching was undertaken to ensure comprehensiveness.

### *iv) **Charting the data***

Unlike systematic reviews, whereby a full and comprehensive critical appraisal of the literature is required (23), the purpose of the scoping review is to map the relevant literature (24), so data were collected from the articles as suggested by Arksey and O'Malley (18). A data extraction tool was created to collect data from each study including the included participants, aims of the study, intervention delivered, outcomes



of the study and time points, as well as the study design. The data extraction tool was piloted with five articles of varied methodological approaches in order to ensure it would gather the correct information. Piloting the data extraction form led to some alterations in order to ensure effective data collection, which was then used for the remaining studies (see supplementary file). Data were extracted by one reviewer (AJH) and then checked by a second (VG) to ensure accuracy.

**v) Collating, summarizing and reporting**

Following data extraction, a narrative synthesis (18) was undertaken to describe the articles included in terms of the type of study, the intervention delivered and also the participants included in the study. Overall, this sought to describe the evidence available and identify the gaps in the current literature base.

**Results**

***Types of Study***

Following study selection (additional file 2) twenty six papers were included in the scoping review: three systematic reviews (25-27), six randomised controlled trials (RCTs) (28-33), thirteen observational studies (2, 34-45), two qualitative surveys (46, 47), and two qualitative studies (45,46).

The three included systematic reviews (25-27) all focused on multidisciplinary rehabilitation rather than physiotherapy in isolation. Only one of these (26), made reference to the specific physiotherapy input, with the authors determining that it was difficult to isolate the role of physiotherapy from other interventions. They indicated that there was insufficient evidence to draw conclusions as to the effectiveness of multidisciplinary rehabilitation (26, 48). The majority of studies included in these systematic reviews were observational, with the exception of one, which considered only RCTs for inclusion (48).

Six relevant RCTs were included in this review (28-33), of which only one sought to establish the effectiveness of a physiotherapy intervention (29), instead they focused on physiotherapy within a multidisciplinary team intervention . Similarly of the thirteen observational studies included in this review, approximately half involved cohorts of patients receiving a multi-disciplinary intervention.

Two qualitative interview studies (49, 50), and two studies using qualitative surveys (46, 47), were included. One of these studies (49) used semi-structured interviews with next of kin in order to determine which conditions were deemed necessary to achieve successful outcomes. The same author also used non-structured diaries (50) and semi-structured surveys (46) to determine how the cognitive status of patients affected the experience of the rehabilitation process for next of kin or proxies.

No qualitative studies were found that focused on the experiences of physiotherapy for people with dementia who fracture their hip. Furthermore, no studies were found on the specific experiences of physiotherapists treating this population.

### ***Intervention***

Despite all studies stating they included physiotherapy as part of the intervention, a significant number of the articles failed to describe the physiotherapy input in sufficient detail that it would be reproducible. A further three articles described the intervention as being - “normal physiotherapy” (50), “standard physiotherapy” (36), or physiotherapy that was “left to the discretion of the physiotherapist” (51).

Several studies reported that people should be encouraged to stand on the first post-operative day and then mobilised after this as able (28, 44, 45, 52), however the exact nature of this was not described in any detail.

While many of the studies failed to describe the physiotherapy intervention in any detail those that did described it as having components of strengthening (42, 47, 53), functional exercises (29), range of movement exercises (2, 54), gait re-education (2, 28, 53, 54), balance (43) and transfer practice (42). Other studies state that the physiotherapy intervention was part of the MDT intervention and failed to describe the

physiotherapy in detail (38, 40, 51). Only one of these studies incorporated pre-operative strengthening exercises for the non-fractured limb (45).

Despite lacking detail about the intervention, one study (35), described the novel use of body-weight supported treadmill walking for a single severely demented subject. The use of equipment to aid mobility and balance after hip fracture may be considered an important factor, however only three of the included studies commented on the use of mobility aids (42, 45, 55).

The location of the intervention was described by all studies, with the majority (fifteen) of studies involving physiotherapy being provided on a rehabilitation unit. A further five were undertaken on an acute orthopaedic ward or geriatric wards (28, 30-32, 43). Only one study (33), involved participants in nursing homes, while two RCTs (29, 31), and one qualitative (50), study followed the whole patient journey from acute to community settings.

### ***Participants***

Only two of the RCTs sought specifically to study participants with dementia and hip fracture (32, 33). Similarly, only two of the observational studies included only participants with dementia (44, 51). All of the other studies performed post-hoc analyses or pre-planned subgroup analyses of the participants with dementia. Indeed, a

total of 2915 participants were included in the studies, of whom it was reported only 838 had dementia.

The majority of studies included in this scoping review involved participants with mild to moderate dementia. Two RCT's included participants in this classification, reporting that cognition had no effect of functional gain (34, 56). A further two RCT's (30, 31), included participants with a similar classification of dementia, but sought to determine the effectiveness of interdisciplinary input.

Four observational studies were included in the review which targeted participants with mild to moderate dementia (38, 45, 57, 58), reporting contrasting evidence for the outcomes. All but one of these studies (58), reported positive outcomes for people within this classification. Only two qualitative studies included this severity of dementia and explored the beliefs of carers about the effect of cognition on the rehabilitation process (46, 49).

Less studies involved participants with severe dementia. However, three RCT's were included in the scoping review which did target this population (32, 33, 41). Again, the results are contradictory with no conclusive evidence to support physiotherapy interventions for severely demented subjects. A single patient case study (35), reported positive outcomes in a case study involving an 82 year old lady with severe dementia in

an Italian rehabilitation hospital, using body-weight supported treadmill training as a novel approach to rehabilitation.

Morghen and colleagues (42) were the only authors who sought to compare the outcomes of rehabilitation in terms of the severity of dementia and suggested that people with dementia could make functional improvements.

## **Discussion**

The aims of this scoping review were to determine the current literature regarding physiotherapy for people with dementia who sustain a hip fracture, in order to identify gaps in the evidence. In accordance with the aims of scoping reviews the inclusion and exclusion criteria were deliberately very broad (18). A total of twenty six articles met the inclusion criteria for this review.

This review has demonstrated the lack of research aimed specifically at people with dementia who have a hip fracture, with the majority of studies including subgroups of people with dementia or performing post-hoc analyses of people with dementia. This is supported by a general lack of dementia related research historically in the UK. Research by the Alzheimer's Society found that there were only 125 ongoing clinical trials in the dementia field in 2013, compared to 5,755 for cancer (59).

Few RCTs were found and of these only one focused specifically on a physiotherapy intervention (29). Similarly, the majority of the observational studies included studies with physiotherapy as part of a rehabilitation process. There is contrasting evidence to determine the value of multidisciplinary versus isolated physiotherapy. In musculoskeletal rehabilitation, one study found no difference between the outcomes between the provision of isolated physiotherapy interventions and a multidisciplinary approach (60), however a similar study comparing multidisciplinary rehabilitation for chronic back pain found benefits of a multi-disciplinary approach compared to isolated physiotherapy (61). It could be considered that patients with chronic, long-term conditions may benefit more from the multidisciplinary approach, although no research has compared this in patients with dementia specifically. Although these studies add context to the overall rehabilitation interventions for this population, the importance of physiotherapy being provided in isolation or as part of a multidisciplinary input are not clear and therefore, limit the inferences that can be drawn from this evidence.

Very few of the studies described the physiotherapy intervention in a manner that would be reproducible. Indeed, although all of the studies state they included physiotherapy as part of the intervention, the majority failed to describe the physiotherapy component at all. These authors simply describe the intervention as “physiotherapy” – assuming that this is a treatment in itself rather than an umbrella term for multiple potential treatment techniques. A further three articles described the

intervention as being “normal physiotherapy” (50), “standard physiotherapy” (36), or physiotherapy that was “left to the discretion of the physiotherapist” (51). This “black box” of physiotherapy has been highlighted by several other authors (62, 63) and the importance of determining the contents of unpicking such interventions has been highlighted.

This suggests that there is insufficient evidence to guide physiotherapists about what intervention to deliver, evidence which is supported by the systematic reviews included in this study. One study suggested that people with mild to moderate dementia may show improvement with rehabilitation, but was unable to isolate the role of physiotherapy (25). The further two systematic reviews concluded that there was little evidence to support the physiotherapy interventions for this population (26, 27). It is clear there is little evidence to support the actual interventions but the lack of information about the experiences of those receiving or providing the intervention highlights the need for more high-quality research for this population.

This review also highlights the lack of qualitative research into physiotherapy interventions for this population. However, the importance of understanding the experiences of those delivering the physiotherapy, as well as those receiving it, is suggested to be a vital part of delivering any complex intervention (64). The lack of involvement of people with dementia in research has been highlighted by several authors (65, 66), who suggest that the person with



dementia is frequently regarded as a subject to be studied rather than being encouraged to contribute rich data to describe their experiences.

The strengths of this study could be considered the broad nature of the searches as well as the robust screening and data extraction techniques using two researchers. However, we note that we were interested only in 'standard' techniques that a physiotherapist may use, which excluded us from searching for more general techniques that a physiotherapist could employ – techniques such as 'tai chi' or 'music therapy'. The definition of such standard techniques is difficult to ascertain, however, we suggest that these are techniques that would not require extra training or education in order to provide to patients.

## **Conclusion**

The lack of evidence to support physiotherapy interventions for this population appears to pose a challenge to physiotherapists. The aim of this scoping review was to identify gaps in the literature which may guide a future systematic review. However, the lack of evidence found means that undertaking a systematic review is not appropriate or necessary.

There is currently insufficient evidence to guide the nature of the physiotherapy intervention. There is also limited evidence to describe the experiences of patients, next of kin, or physiotherapists working with this population. The consideration of the attitudes towards an intervention could be considered a vital component of a complex intervention and it is suggested that they should be an integral part of the implementation of that intervention. This advocates high quality research being needed to determine what physiotherapy techniques may be of benefit for this population and to help guide physiotherapists as how to deliver this.

### **Ethical Approval**

Ethical approval was not required for this study.

### **Competing Interests**

The author(s) declare that they have no competing interests.

### **Acknowledgements**

This research was funded by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South West Peninsula. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

## References

1. Royal College of Physicians. More patients surviving due to continued improvements in hip fracture care 2014 [14/7/15]. Available from: <https://www.rcplondon.ac.uk/press-releases/more-patients-surviving-due-continued-improvements-hip-fracture-care>.
2. McGilton KS, Davis AM, Naglie G, Mahomed N, Flannery J, Jaglal S, et al. Evaluation of patient-centered rehabilitation model targeting older persons with a hip fracture, including those with cognitive impairment. *BMC Geriatrics*. 2013;13:136.
3. Heruti RJ, Lusky A, Barell V, Ohry A, Adunsky A. Cognitive status at admission: does it affect the rehabilitation outcome of elderly patients with hip fracture? *Arch Phys Med Rehabil*. 1999;80(4):432-6.
4. Leibson CL, Tosteson AN, Gabriel SE, Ransom JE, Melton LJ. Mortality, disability, and nursing home use for persons with and without hip fracture: a population-based study. *J Am Geriatr Soc*. 2002;50(10):1644-50.
5. Fransen M, Woodward M, Norton R, Robinson E, Butler M, Campbell AJ. Excess mortality or institutionalization after hip fracture: men are at greater risk than women. *J Am Geriatr Soc*. 2002;50(4):685-90.
6. Melton LJ, Beard CM, Kokmen E, Atkinson EJ, O'Fallon WM. Fracture risk in patients with Alzheimer's disease. *Journal of the American Geriatrics Society*. 1994;42(6):614-9.
7. Natalwala A, Potluri R, Uppal H, Heun R. Reasons for hospital admissions in dementia patients in Birmingham, UK, during 2002-2007. *Dement Geriatr Cogn Disord*. 2008;26(6):499-505.
8. Braithwaite RS, Col NF, Wong JB. Estimating hip fracture morbidity, mortality and costs. *J Am Geriatr Soc*. 2003;51(3):364-70.

9. Tinetti ME, Williams CS. Falls, injuries due to falls, and the risk of admission to a nursing home. *N Engl J Med*. 1997;337(18):1279-84.
10. Mitchell P, Bateman, K. Dementia, falls and fractures. Integrated approaches to improve quality and reduce costs. Novartis, 2012.
11. Health Economics Research Centre. Dementia2010: The economic burden of dementia and associated research funding in the United Kingdom 2010. University of Oxford ftAsT; 2010.
12. Mundi S, Chaudhry H, Bhandari M. Systematic review on the inclusion of patients with cognitive impairment in hip fracture trials: a missed opportunity? *Canadian journal of surgery Journal canadien de chirurgie*. 2014;57(4):E141-5.
13. Hebert-Davies J, Laflamme GY, Rouleau D. Bias towards dementia: Are hip fracture trials excluding too many patients? A systematic review. *Injury*. 2012;43(12):1978-84.
14. Briggs TW. Getting it right first time. Improving the quality of orthopaedic care within the National Health Service in England. 2015.
15. NICE. Hip Fracture: The management of hip fracture in adults. 2011 Modified March 2014. Report No.
16. Pham M, Rajic A, Greig J, Sargeant J, Papadopoulos A, McEwen S, editors. Characteristics of scoping reviews in the literature: A scoping review of scoping reviews. Canadian Public Health Association Conference; 2013.
17. Gough D, Thomas J, Oliver S. Clarifying differences between review designs and methods. *Systematic reviews*. 2012;1(1):28.
18. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International journal of social research methodology*. 2005;8(1):19-32.

19. Mays N, Roberts, E. and Popay, J. Synthesising research evidence. In: N. Fulop PA, A. Clarke and N. Black, editor. *Studying the Organisation and Delivery of Health Services: Research Methods*. London: Routledge; 2001. p. 188.
20. Richards DA. The complex interventions framework. In: Richards. D.A. and Hallberg IR, editor. *Complex Interventions in Health: An overview of research methods*. UK: Routledge; 2015.
21. Sackett DL, Straus, M.D., Richardson, W.S, Rosenberg, W., Haynes, R.B. *Evidence-Based Medicine: How to Practice and Teach EBM* London, UK: Churchill Livingstone; 2000.
22. Chartered Society of Physiotherapy. Scope of Practice: Introduction 2016. Available from: <http://www.csp.org.uk/professional-union/professionalism/scope-of-practice/scope-practice-introduction>.
23. Alvarez-Hernandez E. [Treatment of large vessel vasculitis]. *Reumatologia clinica*. 2011;7 Suppl 3:S28-32.
24. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implementation science* : IS. 2010;5(1):1-9.
25. Allen J, Koziak A, Buddingh S, Liang J, Buckingham J, Beaupre LA. Rehabilitation in patients with dementia following hip fracture: a systematic review. *Physiotherapy Canada*. 2012;64(2):190-201.
26. Muir SW, Yohannes AM. The impact of cognitive impairment on rehabilitation outcomes in elderly patients admitted with a femoral neck fractures: A systematic review. *Journal of Geriatric Physical Therapy*. 2009;32(1):24-32.
27. Smith T, Hameed Yasir A, Henderson C, Cross Jane L, Sahota O, Fox C. Enhanced rehabilitation and care models for adults with dementia following hip fracture surgery (Review). *Cochrane Database of Systematic Reviews* [Internet]. 2015; (6). Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD010569/abstract>.

28. Huusko TM, Karppi P, Avikainen V, Kautiainen H, Sulkava R. Randomized, clinically controlled trial of intensive geriatric rehabilitation in patients with hip fracture: Subgroup analysis of patients with dementia. *British Medical Journal*. 2000;321(7269):1107-11.
29. Moseley AM, Sherrington C, Lord SR, Barracough E, St George RJ, Cameron ID. Mobility training after hip fracture: A randomised controlled trial. *Age and Ageing*. 2009;38(1):74-80.
30. Naglie G, Tansey C, Kirkland JL, Ogilvie-Harris DJ, Detsky AS, Etchells E, et al. Interdisciplinary inpatient care for elderly people with hip fracture: A randomized controlled trial. *Cmaj*. 2002;167(1):25-32.
31. Shyu YI, Tsai WC, Chen MC, Liang J, Cheng HS, Wu CC, et al. Two-year effects of an interdisciplinary intervention on recovery following hip fracture in older Taiwanese with cognitive impairment. *International Journal of Geriatric Psychiatry*. 2012;27(5):529-38.
32. Stenvall M, Berggren M, Lundstrom M, Gustafson Y, Olofsson B. A multidisciplinary intervention program improved the outcome after hip fracture for people with dementia-Subgroup analyses of a randomized controlled trial. *Archives of Gerontology and Geriatrics*. 2012;54(3):e284-e9.
33. Uy C, Kurrle SE, Cameron ID. Inpatient multidisciplinary rehabilitation after hip fracture for residents of nursing homes: A randomised trial. *Australasian Journal on Ageing*. 2008;27(1):43-4.
34. Rolland Y, Pillard F, Lauwers-Cances V, Busquere F, Vellas B, Lafont C. Rehabilitation outcome of elderly patients with hip fracture and cognitive impairment. *Disability and Rehabilitation*. 2004;26(7):425-31.
35. Bellelli G, Guerini F, Trabucchi M. Body weight-supported treadmill in the physical rehabilitation of severely demented subjects after hip fracture: A case report [6]. *Journal of the American Geriatrics Society*. 2006;54(4):717-8.

36. Bellelli G, Frisoni GB, Pagani M, Magnifico F, Trabucchi M. Does cognitive performance affect physical therapy regimen after hip fracture surgery. *Aging Clinical and Experimental Research*. 2007;19(2):119-24.
37. Giusti A, Barone A, Pioli G. Rehabilitation after hip fracture in patients with dementia. *Journal of the American Geriatrics Society*. 2007;55(8):1309-10.
38. Goldstein FC, Strasser DC, Woodard JL, Roberts VJ. Functional outcome of cognitively impaired hip fracture patients on a geriatric rehabilitation unit. *Journal of the American Geriatrics Society*. 1997;45(1):35-42.
39. HersHKovitz A BY, Brill S. Mobility assessment of hip fracture patients during a post-acute rehabilitation program. *Archives of Gerontology and Geriatrics*. 2012;55(1):35-41.
40. Heruti RJ, Lusky A, Barell V, Ohry A, Adunsky A. Cognitive status at admission: Does it affect the rehabilitation outcome of elderly patients with hip fracture? *Archives of Physical Medicine and Rehabilitation*. 1999;80(4):432-6.
41. Horgan NF, Cunningham CJ. Impact of cognitive impairment on hip fracture outcome in older people. *INT J THER REHABIL*. 2003;10(5):228.
42. Morghen S, Gentile S, Ricci E, Guerini F, Bellelli G, Trabucchi M. Rehabilitation of older adults with hip fracture: Cognitive function and walking abilities. *Journal of the American Geriatrics Society*. 2011;59(8):1497-502.
43. Uriz F, Malafarina V. The impact of cognitive impairment on short-term rehabilitation outcomes in elderly patients with hip fracture. *European Geriatric Medicine*. 2014;5:S103.
44. Al-Ani AN, Flodin L, Soderqvist A, Ackermann P, Samnegard E, Dalen N, et al. Does Rehabilitation Matter in Patients With Femoral Neck Fracture and Cognitive Impairment? A Prospective Study of 246 Patients. *Archives of Physical Medicine and Rehabilitation*. 2010;91(1):51-7.

45. Barone A, Giusti A, Pizzonia M, Razzano M, Oliveri M, Palummeri E, et al. Factors Associated With an Immediate Weight-Bearing and Early Ambulation Program for Older Adults After Hip Fracture Repair. *Archives of Physical Medicine and Rehabilitation*. 2009;90(9):1495-8.
46. Rydholm Hedman AM, Heikkila K, Grafstrom M, Stromberg L. Hip fractures and cognitive state: patient outcomes and proxies' perceptions of the rehabilitation period. *Int J Older People Nurs*. 2008;3(3):178-86.
47. McGilton K, Wells J, Davis A, Rochon E, Calabrese S, Teare G, et al. Rehabilitating patients with dementia who have had a hip fracture: Part II: Cognitive symptoms that influence care. *Topics in Geriatric Rehabilitation*. 2007;23(2):174-82.
48. Smith Toby O, Hameed Yasir A, Henderson C, Cross Jane L, Sahota O, Fox C. Effectiveness of post-operative management strategies for adults with dementia following hip fracture surgery. *Cochrane Database of Systematic Reviews* [Internet]. 2013; (6). Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD010569/abstract>.
49. Hedman AMR, Grafstrom M. Conditions for rehabilitation of older patients with dementia and hip fracture - The perspective of their next of kin. *Scandinavian Journal of Caring Sciences*. 2001;15(2):151-8.
50. Hedman AMR, Stromberg L, Grafstrom M, Heikkila K. Hip fracture patients' cognitive state affects family members' experiences - a diary study of the hip fracture recovery. *Scandinavian Journal of Caring Sciences*. 2011;25(3):451-8.
51. Giusti A, Barone A, Pioli G. Rehabilitation after hip fracture in patients with dementia [7]. *Journal of the American Geriatrics Society*. 2007;55(8):1309-10.
52. Stenvall M, Berggren M, Lundström M, Gustafson Y, Olofsson B. A multidisciplinary intervention program improved the outcome after hip fracture for people with dementia--subgroup analyses of a randomized controlled trial. *Arch Gerontol Geriatr*. 2012;54(3):e284-9.



53. Uriz-Otano F, Uriz-Otano JI, Malafarina V. Factors associated with short-term functional recovery in elderly people with a hip fracture. Influence of cognitive impairment. *Journal of the American Medical Directors Association*. 2015;16(3):215-20.
54. Bellelli G, Morghen S, Torpilliesi T. Dementia, delirium, and depression in patients with hip fracture: 1+1 doesn't always make 2. *Journal of the American Geriatrics Society*. 2009;57(1):179-80.
55. Robles Raya MJ. Walking aids utilization and cognitive function after neck fracture rehabilitation program. *European Geriatric Medicine*. 2011;2:S178.
56. Huusko TM, Karppi P, Avikainen V, Kautiainen H, Sulkava R. Randomised, clinically controlled trial of intensive geriatric rehabilitation in patients with hip fracture: subgroup analysis of patients with dementia. *Bmj*. 2000;321(7269):1107-11.
57. HersHKovitz A, Beloosesky Y, Brill S. Mobility assessment of hip fracture patients during a post-acute rehabilitation program. *Archives of Gerontology and Geriatrics*. 2012;55(1):35-41.
58. Lenze EJ, Munin MC, Dew MA, Rogers JC, Seligman K, Mulsant BH, et al. Adverse effects of depression and cognitive impairment on rehabilitation participation and recovery from hip fracture. *International Journal of Geriatric Psychiatry*. 2004;19(5):472-8.
59. Alzheimer's Society. *Dementia 2014: Opportunity for change 2014*.
60. Kääpä EH, Frantsi K, Sarna S, Malmivaara A. Multidisciplinary group rehabilitation versus individual physiotherapy for chronic nonspecific low back pain: a randomized trial. *Spine*. 2006;31(4):371-6.
61. Lang E, Liebig K, Kastner S, Neundörfer B, Heuschmann P. Multidisciplinary rehabilitation versus usual care for chronic low back pain in the community: effects on quality of life. *The Spine Journal*. 2003;3(4):270-6.

62. Beer C, Giles E. Hip fracture: Challenges in prevention and management. *Australian family physician*. 2005;34(8):673.
63. Ballinger C, Ashburn A, Low J, Roderick P. Unpacking the black box of therapy—a pilot study to describe occupational therapy and physiotherapy interventions for people with stroke. *Clinical rehabilitation*. 1999;13(4):301-9.
64. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ (Clinical research ed)*. 2008;337:a1655.
65. Lyman KA. Bringing the social back in: A critique of the biomedicalization of dementia. *The Gerontologist*. 1989;29(5):597-605.
66. Cotrell V, Schulz R. The perspective of the patient with Alzheimer's disease: a neglected dimension of dementia research. *The Gerontologist*. 1993;33(2):205-11.

**Table 1 – Description of included randomised controlled trials**

Author(s)	Country	Sample	Location(s) of intervention	Intervention	Control	Follow up	Outcome Measures
Huusko, Karppi (28)	Finland	238 (141 with dementia)	Rehab unit v's orthopaedic ward	Geriatric rehab unit rehabilitation - mobilise on day 1	Normal hospital care	3 & 12 months	Length of stay, mortality, place of residence
Moseley, Sherrington (29)	Australia	160 (54 $\geq$ 3 on short portable mental score questionnaire)	Rehab unit then community	Partial body weight supported treadmill, stepping, tapping foot, sit to stand, on/off block	Seated or lying exercises (not described)	4 & 16 weeks	Knee extensor strength, walking speed, functional abilities, balance abilities, pain, fear of falling, quality of life, length of stay, residential status and community service utilisation
Naglie, Tansey (30)	Canada	279 (74 with dementia)	Acute hospital	Multi-disciplinary team input. 2x daily physiotherapy weekdays	Usual care	3 & 6 months	Mortality and change from baseline mobility and transfers
Shyu, Tsai (31)	Taiwan	160 (51 with dementia)	In patient and then community	Multi-disciplinary team approach including physiotherapy	Usual care	2 years	Hip flexion ratio, recovery of walking ability, activities of daily living, falls, mortality, Emergency Department visits, re-admission and institutionalisation
Stenvall, Berggren (32)	Sweden	64 (all with dementia)	Specialist geriatric unit	Multi-disciplinary team approach, early mobility with physiotherapist	Usual care	12 months	Walking ability, function
Uy, Kurrle (33)	Australia	10 (all with dementia)	Nursing homes	Accelerated rehabilitation program	Early return to nursing home	4 months	Barthel, gait velocity

