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# In Patients over Sixty Years Old with a Primary Hip Fracture, Is Home Based Therapy Effective for Restoring Functional Abilities?

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# In patients over sixty years old with a primary hip fracture, is home based therapy effective for restoring functional abilities?

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

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**Abstract**

**OBJECTIVE:** The objective of this selective EBM review is to determine whether or not home- based therapy is effective for restoring functional abilities in patients over sixty with a primary hip fracture.
STUDY DESIGN: This review consists of two RCTs and one randomized clinical trial published in the English language between the years 2014 and 2015.
DATA SOURCES: Articles were published in peer reviewed journals and compared home-based therapy as an intervention following a primary hip fracture to individuals solely documentation of post-surgical care using Cochrane and PubMed databases.
OUTCOMES MEASURED: The specific outcomes measured varied between articles but all focused on patient functional improvements. Edgren *et al.* focused on ADLs and IADLs sum scores, Latham *et al.* used SPPB and AM-PAC to measure balance, gait, speed, mobility, and function, while Salposki *et al.* used patient perceived ability to climb stairs, SPPB, and BBT.
RESULTS: All three studies had positive outcomes following the intervention with varying degrees of statistical significance. Latham *et al.* had significant results regarding gait, speed, and balance using the SPPB (p<O.OOl) and BBT (p=O.Ol) along with functional activity using AM- PAC (p=0.01) while balance with AM-PAC was insignificant (p=0.060). Salposki *et al* found statistically significant improvement in confidence ambulating stairs (p=0.001) but no statistical significance with the SPPB or BBT. Although Edgren *et al* did not find data with statistical significance, there was improvement in IADLs of food preparation and medication handling (p=0.061).
CONCLUSIONS: The results of the RCTs and randomized clinical trial suggest there may be a benefit in recovery with the intervention of home-based therapy following a primary hip fracture in those over 60. Although every study did not have statistical significance, all studies did show improvement in the intervention groups when compared to the control. Further research is needed to determine the length or types of home-based therapy that should be implemented. The studies could be improved by determining the most effective forms of therapy and by measuring functional abilities and confidence levels prior to hip fracture, following the hip fracture, and following the interventions.
Key Words: "home-based therapy"; "hip fracture"

INTRODUCTION:

A hip fracture is classified as a break in the upper one-fourth of the femur. Fractures to this region are more common in elderly adults as a result of decreasing bone density with an increasing age. In addition to having weaker bones, the elderly also has a greater fall risk, both factors making them more susceptible to hip fractures. These two factors greatly influence the fact that greater than 90% of all hip fractures occur in individuals over the age of 65.[1]

With the growing life span, it is becoming more and more common for clinicians to encounter patients who have experienced hip fractures. Approximately 300,000 individuals within the United States experience a hip fracture each year and the incidence is anticipated to reach 500,000 by the year 2040.[1] Additionally, with the increase in medical expenses, it is crucial to eliminate extra spending.

Although fractures may seem relatively common and easily treatable in the general population, one's morbidity and mortality rate increases following a hip fracture. Hip fractures may result in cognitive/neurologic, cardiac/vascular, pulmonary, gastrointestinal, genitourinary, and hematologic complications in conjunction to the expected musculoskeletal complications following a fracture. A patient's mortality rate is between 14-36% within the first year following a hip fracture.[2]

This comprehensive review article evaluates two randomized control trials (RCTs) and one randomized clinical trial that evaluate the efficacy of home-based physical therapy in comparison to the sole distribution of standard care instructions provided to patients following surgery. An improvement to recovery can be particularly meaningful for clinicians. Not only can faster, more efficient and effective recovery improve patient care and quality of life, but it can also decrease healthcare costs.

Medical costs due to falls are increasing each year. In 2015, through Medicare alone, more than $31 billion dollars were spent. The average hospital cost alone for fall injuries is more than $30,000.[3] The number of annual health care visits following a total hip replacement is not well studied at this time in the U.S. and likely ranges greatly due to the vast majority of recovery routes that are available. One aspect of care that remains consistent is admission to nursing homes or assisted living facilities due to the high level of care one needs following a hip fracture.

Although the exact cause of hip fractures can vary drastically, osteoporosis is a factor that greatly contributes to the prevalence in the elderly. Osteoporosis is defined by a DEXA scan with a T-score standard deviation greater than -2.5. Other factors that may increase one's risk of a hip fracture include muscle degeneration/weakness, poor eye sight, and medication side effects. Treatment following a fracture typically includes surgery within 1-2 days of a hip fracture with the administration of non-NSAID analgesics. After surgery, patients require extensive strengthening and rehabilitation. As the patient recovers, it is also important to treat the underlying causes of the hip fracture. In order to reverse osteoporosis or halt worsening, patients should supplement their diets with calcium and vitamin D and increase weight bearing exercises. Furthermore, recovery and rehab are critical to the patient's post-op quality of life and mortality rate. All patients are recommended to participate in rehabilitation and physical therapy. The patient's compliance can be a limiting factor to recovery and may be affected by personal dedication, accountability, and access to care. Home-based therapy has been initiated in various circumstances in order to overcome many of the potential barriers to recovery. The methods incorporated into this portion of care are variable and can be tailored according to the patient in order to optimize improvement throughout activities of daily living (ADLs).

OBJECTIVE:

The objective of this systematic review is to determine whether or not home-based therapy is effective in restoring functional abilities following a primary hip fracture in patients over sixty years of age. In regards to this objective, the hypothesis is that home based therapy is effective at improving functional abilities for elderly patients following primary hip fractures.

METHODS:

This review encompasses articles that involve individuals over the age of sixty who have experienced hip fractures of the femoral neck or pre-trochanteric region. Each of the articles focus on the intervention of home-based rehabilitation to assist with recovery following a hip fracture. The control group is represented by those who were provided standard documentation for recovery following the surgical repair of a hip fracture.

Edgren *et al.* focused on the patient's recovery in regards to activities of daily living and their confidence in completing such tasks after participation in a multi-component home-based therapy program. Latham *et al.* addressed the effects of a home-based exercise program to assist with functional abilities by using the Short Physical Performance Battery (SPPB) and mobility/activity by using the Activity Measure for Post-Acute Care (AM-PAC). Salposki *et al* studied the effects of a multi-component program and how it effects function and performance/balance of the lower-extremity by using the SPPB, perceived ability to negotiate stairs, and musculoskeletal pain at the low back, hip, and knee. While different articles explored various elements of home-based therapy and its achievements, this review will encompass the role home-based therapy has in restoring functional ability following a hip fracture.

Two studies were randomized control trials while the third was a randomized clinical trial. All articles were published in a peer review journal in the English language and were found on

PubMed by using the keywords “home-based therapy” and “hip fracture”. All studies focused on results that were measured using patient oriented outcomes such as functional ability, balance, and perceived ability to climb stairs. The articles were selected based on inclusion and exclusion criteria. Inclusion criteria consisted of randomized controlled trials or randomized clinical trial. Exclusion criteria omitted patients less than sixty years old. Statistical data was recorded using p-values.

Table 1: Overview of Demographics and Characteristics

| Study | Type | # of Pts | Age (yrs) | Inclusion Criteria | Exclusion Criteria | W/D | Intervention |
|---|---|---|---|---|---|---|---|
| Edgren, 2015 (1) | RCT | 81 | >60 | >60 yo, ambulatory and community-dwelling, received operation on femoral neck or per-trochanteric fx, within 70 days fx | Memory problems (MMI<18), alcoholism, CVD, neoplasm, or severe depression (Beck’s >29), paraplegic | 3 (1 from interventio n group) | Aim: restore mobility with evaluation and modification of environmental hazards, safe walking guidance, pain mngmt, home exercise, Phys act. Counseling, standard care |
| Latham, 2014 (2) | R Clinical T | 232 | >60 | >60 yo, primary dx of hip fx, d/c from rehab within 20 months of baseline, english-speaking, independently move from sitting to standing, a functional limitation | MMS <20; depression (>10 on geriatric DS), terminal illness, significant cardia/pulm, b/l hip fx, hip fx d/t malignancy, >24 months since hip fx, progressive neuro ds | 53 | home exercises 3x/wk for 6 mo after instruction with 3 in home PT sessions (1 hr), telephone calls q month, DVD programs. Content: repetition of fxnal tasks with therabands and standing exercises, cog/behave strategies for positive attitudes and beliefs, and exercise logging. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Salposki, 2014 (3) | RCT | 81 | >60 | >60 yo, hip fx patients | MMSE <18, alcoholism, sever cardio/pulm ds, beck dep >29 | 6 | Stand. Care + Promotion mobility (ProMo): restore mobility/ fxn, 5-6 home visits w/ PT; nonpharm pain mgmt. (3 visits); strength, stretch, balance, fxn exercises w/ resistance inc (completed 2-3 times/wk); motivational talks |

OUTCOMES MEASURED:

The research articles focused on multiple components of patient recovery but they each included studies of participants >60 years old with a history of a primary hip fracture. This review focuses on the functional improvements made throughout the studies.

The study done by Edgren *et al*. focused on activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Edgren *et al.* looked at serial sum scores recorded at chronologic periods (baseline, 3 mo, 6 mo, 12 mo). Such scores were based on a self-reported questionnaire with ADL scores ranging from 0-30 and IADL from 0-40 with higher scores indicating greater difficulty. Participants were then placed into categories of (1) no difficulty, (2) some difficulty, or (3) major difficulty as seen in Table 3.

Lathem *et al* measured function in terms of balance, gait, and speed using the Short Physical Performance Battery (SPPB) while basic mobility and daily activity were measured using the Activity Measure for Post-Acute Care (AM-PAC).

Salposki *et al.* assessed functional limitation of performance and balance (at 3-mo, 6-mo, and 12 mo). Salposki *et al.* also considered the patient's perceived ability to ambulate stairs on a scale of 1-5 (1= climb without difficulty – 5= unable to climb stairs with assistance; at 6 and 12 months) to assess their level of disability.

RESULTS:

The three studies in this review article considered how home-based recovery programs impacted the patient's functional abilities following a hip fracture. There were no safety concerns or any harm reported in any of the studies as a result of the intervention.

The RCT done by Edgren *et al* explored the outcomes of the home-based rehabilitation program and the participants' ADL/IADLs as shown in Table 2. Participants were randomly divided into intervention (n=40) and control groups (n= 41). The mean scores were recorded as sum scores. The mean sum score for the intervention group at baseline was 4.7 for ADL (0-30) and 9.4 for IADL (0-40) while the mean sum scores for the control group were 3.9 ADL and 7.8 IADL. The intervention and control groups each had an average improvement of 1.1 between the baseline and 12 month readings. The p-value between the two groups were p=0.436 for ADLs and p= 0.920 for the IADLs (p-value <0.05). There was no statistically significant difference between the intervention and control group when considering combined ADL/IADLs.

Table 2: Edgren *et al* ADL & IADL sum score, absolute changes, and p-value. All recorded scores are mean sum scores.

| | Intervention (n=40) | | | Control (n=41) | | | |
|---|---|---|---|---|---|---|---|
| | Baseline | 12-month | Improvements (SE) | Baseline | 12-month | Improvements (SE) | p-value |
| ADL | 4.7 | 3.6 | 1.1 | 3.9 | 3.0 | 1.1 | 0.436 |
| IADL | 9.4 | 6.8 | 2.6 | 7.8 | 6.5 | 1.1 | 0.920 |

When isolating specific IADLs of meal preparation and medication management, the intervention group had greater improvement than the control group (p=0.061) but the results were not statistically significant as seen in Table 3.

Table 3: Edgren *et al*. focused on difficulty with individual IADLs: meal preparation & medication handling.

| | Intervention (n=40) | | | Control (n=41) | | | |
|---|---|---|---|---|---|---|---|
| **Preparing meals** | Initial Level of Difficulty (%) | | | Level of difficulty at 12 months (%) | | | p-value |
| | None | Some | Major | None | Some | major | |
| Baseline | 45 | 25 | 30 | 55 | 30 | 15 | 0.061 |
| 12-months | 65 | 20 | 15 | 65 | 20 | 15 | |
| (12- month – baseline) | 25 | -5 | -15 | 10 | -10 | 0 | |
| **Handling medications** | | | | | | | |
| Baseline | 65 | 12 | 23 | 75 | 10 | 15 | 0.061 |
| 12-month | 75 | 5 | 20 | 60 | 8 | 32 | |
| (12-month – baseline) | 10 | -7 | -3 | -15 | -2 | 17 | |

The randomized clinical trial by Lantham *et al*. was the only study in this review that observed effects of home-based therapy following traditional therapy. Lanthem *et al* focused on change in balance, gait, and speed (SPPB), activity (AM-PAC), and mobility (AM-PAC).

Table 4: Latham *et al*. participant attrition and retention.

| Participants per group | Enrollment | 6-mo follow up | 9-mo follow up |
|---|---|---|---|
| Intervention | 120 | 100 | 94 |
| Control | 112 | 95 | 85 |

As seen in Table 4, participants were randomized into intervention (n=120) and control groups (n=112), 37 of which were lost to follow up at the 6-month period (intervention= 20, control=-17). At the 9-mo follow-up, another 26 participants were lost from the intervention group and 27 from the control group. At 6-months, the between group difference was 0.9 ($p<0.001$) for SPPB, 3.4 ($p=0.01$) for AM-PAC daily activity, and 1.0 ($p=0.06$) for AM-PAC mobility (Table 5). There was no significant change within or across groups at the 6 and 9

month readings. At 6 months, balance significantly improved in the intervention group compared to the control group with a score of 2.3 (p=0.001).

Table 5: Lantham *et al.* primary outcomes at 6 and 9 months, change from baseline, and difference between intervention and control groups with p-value.

| | | 6 month | 9 month | Total change from baseline | Between group difference | P value (p <0.05) |
|---|---|---|---|---|---|---|
| Balance, gait, and speed (SPPB) | Intervention | 7.2 | 7.6 | 1.3 | 0.9 | <0.001 |
| | control | 6.2 | 6.3 | 1.0 | | |
| Activity (AM-PAC) | Intervention | 61.3 | 63.0 | 4.2 | 3.4 | 0.01 |
| | Control | 58.6 | 59.0 | 2.8 | | |
| Mobility (AM-PAC) | Intervention | 58.1 | 59.5 | 2.6 | 1.0 | 0.06 |
| | Control | 56.6 | 56.7 | 1.7 | | |
| Balance (BBT) | Intervention | 44.4 | 45.6 | 2.7 | 2.3 | 0.001 |
| | Control | 41.1 | 40.4 | 0.1 | | |

The RCT done by Salposki *et al.* explored patient's perceived ability to climb stairs (1-5 scale at 6-mo and 12-mo) in addition to functional performance and balance using SPPB and BBS. Measurements were done at baseline, 3-mo, 6-mo, and 12-mo. On average, baseline measurements were 9 weeks following surgery. The intervention group included 40 participants (2 - dropped out) and the control group had 41 (3 - dropped out prior to the 6-mo evaluation). In regards to negotiating stairs, the intervention group had statistically significant less difficulty than the control group at 6 and 12-months (p<0.001). There were no statistically significant findings regarding the BBS or SPPB between groups. When comparing the pre-fracture values of perceived difficulty climbing stairs to the 12-mo values, the intervention group reported less perceived difficulty at the 12-mo time than prior to the injury (Table 6).

Table 6: Percent of individuals with perceived difficulty ambulating 5 stairs. Participants responded according to a scale of 1-5 (1= unable to manage even with help, 5= no difficulties)

| | Scale (0-1) | % of participants | | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre-fracture | Baseline | 3-mo | 6-mo | 12-mo | (12- mo – pre-fracture) |
| Intervention (n=40) | (1) Unable with help | 0 | 7.5 | 0 | 0 | 0 | 0 |
| | (2) manage only w/help | 5 | 10 | 8.3 | 2.7 | 13.9 | 8.9 |
| | (3) great difficulty | 10 | 7.5 | 8.3 | 5.4 | 0 | -10 |
| | (4) some difficulty | 28 | 25 | 19.5 | 16.2 | 11.1 | -16.9 |
| | (5) no difficulty | 57 | 50 | 63.9 | 75.7 | 75 | -18 |
| Control (n=41) | (1) unable with help | 0 | 0 | 0 | 0 | 0 | 0 |
| | (2) manage only w/ help | 0 | 4.9 | 5.2 | 2.7 | 7.7 | 2.8 |
| | (3) great difficulty | 7.3 | 7.3 | 2.5 | 2.7 | 7.7 | 0.4 |
| | (4) some difficulty | 24.4 | 29.3 | 20.5 | 32.4 | 35.9 | 11.5 |
| | (5) no difficulty | 68.3 | 58.5 | 71.8 | 62.2 | 48.7 | -19.6 |

DISCUSSION:

This systematic review used two randomized control trials and one randomized clinical trial to explore the effects of home-based therapy in the functional recovery of hip fractures in patients over 60 years old.

One study showed statistically significant improvement at 6-months in regards to balance, gait, and speed (SPPB) and activity improvement. In this study, Lantham *et al.* added home-based therapy to the rehabilitation process for participants that have already completed the standard physical therapy provided—increasing the total rehab time. Additionally, 16% and 21% of participants were lost to follow up at 6 and 9 months respectively in the study.

Another article studied how the home-based therapy model impacted one's perceived ability to climb stairs.[6] The intervention group showed such great improvement that participants had greater confidence ambulating the stairs at the 12-month recovery period than they had prior to

experiencing the hip fracture.[6] This study, however, is limited in its small sample size and its exclusion of individuals who had a hip fracture, but resided in living facilities and its small sample size. Due to such limitations, this study did not provide a full representation of individuals with hip fractures.[6]

The last study looked at ADLs and IADLs. When comparing the overall average of ADLs and IADLs between the intervention and control groups, there was no difference between groups. However, when isolating the specific tasks of food preparation and medication handling, although not statistically significant, there was improvement within the intervention group that was lacking within the control group.[4] This article was limited in that a large majority of the improvements found were within the first 3 months following recovery, which may be attributed to natural healing process following a surgical intervention.

Other barriers to each of these studies is the variability in function of participants prior to the hip fracture, personal motivation for improvement, and monetary means to facilitate improvement. Over the past ten years, post-acute care costs for hip fractures have climbed 4% per year and insurance companies continue to restrict sessions and options available for recovery.[5] Home-based therapy programs are thought to be a means to overcome such barriers but would lack the personal feedback and consistency that outpatient physical therapists can provide.

CONCLUSION:

The purpose of this comprehensive review is to determine whether or not home-based therapy is effective to restore functional abilities in individuals over sixty who have experienced a hip fracture. All of the articles reviewed support the evidence of home-based therapy to some degree, however some articles did not have significant statistical data

($p<0.05$) indicating that the impact of home-based therapy observed in their study could have been from chance alone. For this reason, the effects of home-based therapy suggest that it may be beneficial, but cannot conclusively support hypothesis that home-based therapy would have a positive effect following a hip fracture in patients greater than 60 years old. For example, one of the studies showed statistically significant data to support improvements with balance, gait, and activity while another study supported improvements without any statistical significance.[4,5] However, when concerning the clinical significance and functional improvements of living support, the benefits of home-based therapy status post hip fracture are present.

A way to improve the methods used across all studies would be patient adherence. Although patients should be self-motivated to regain their functional abilities, if the studies were to offer some other motivation or accountability to perform the weekly exercises, the true impact of home-based therapy may become more evident. Furthermore, some indication to the amount of exercise or effort the control groups were taking to assist their recovery would have been helpful to see, especially for the study that supplemented home-based therapy following standard physical therapy, especially if these patients chose to continue their exercises at home.[5]

Due to the increasing occurrence of hip fractures as a result of the aging population, further studies should be done to establish better options to improve recovery and reduce costs. In future studies, another component regarding hip fractures that should be address is the level of fear and confidence participants' experience. Many individuals who have suffered prior injuries such as a hip fracture would benefit from encouragement and confidence to assist with their balance, mobility, and functional abilities.

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