MANAGEMENT OF HIP FRACTURES IN THE ELDERLY

EVIDENCE- BASED CLINICAL PRACTICE GUIDELINE

Adopted by the American Academy of Orthopaedic Surgeons Board of Directors
September 5, 2014

This Guideline has been endorsed by the following organizations:

Disclaimer

This Clinical Practice Guideline was developed by an AAOS physician volunteer Work Group based on a systematic review of the current scientific and clinical information and accepted approaches to treatment and/or diagnosis. This Clinical Practice Guideline is not intended to be a fixed protocol, as some patients may require more or less treatment or different means of diagnosis. Clinical patients may not necessarily be the same as those found in a clinical trial. Patient care and treatment should always be based on a clinician's independent medical judgment, given the individual patient's clinical circumstances.

Disclosure Requirement
In accordance with AAOS policy, all individuals whose names appear as authors or contributors to Clinical Practice Guideline filed a disclosure statement as part of the submission process. All panel members provided full disclosure of potential conflicts of interest prior to voting on the recommendations contained within this Clinical Practice Guidelines.

Funding Source
This Clinical Practice Guideline was funded exclusively by the American Academy of Orthopaedic Surgeons who received no funding from outside commercial sources to support the development of this document.

FDA Clearance
Some drugs or medical devices referenced or described in this Clinical Practice Guideline may not have been cleared by the Food and Drug Administration (FDA) or may have been cleared for a specific use only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or device he or she wishes to use in clinical practice.

Published 2014 by the American Academy of Orthopaedic Surgeons
6300 North River Road
Rosemont, IL 60018
First Edition

I. SUMMARY OF RECOMMENDATIONS

The following is a summary of the recommendations of the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly. All readers of this summary are strongly urged to consult the full guideline and evidence report for this information. We are confident that those who read the full guideline and evidence report will see that the recommendations were developed using systematic evidence-based processes designed to combat bias, enhance transparency, and promote reproducibility.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician, and other healthcare practitioners.

Strength of Recommendation Descriptions

Strength	Overall Strength of Evidence	Description of Evidence Strength	Strength Visual
Strong	Strong	Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.	
Moderate	Moderate	Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.	
Limited	Low Strength Evidence or Conflicting Evidence	Evidence from one or more "Low" strength studies with consistent findings **or** evidence from a single moderate strength study for recommending for or against the intervention or diagnostic test **or** the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.	
Consensus	No Evidence	There is no supporting evidence. In the absence of reliable evidence, the work group is making a recommendation based on their clinical opinion. Consensus recommendations can only be created when not establishing a recommendation could have catastrophic consequences.	

ADVANCED IMAGING

Moderate evidence supports MRI as the advanced imaging of choice for diagnosis of presumed hip fracture not apparent on initial radiographs.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

PREOPERATIVE REGIONAL ANALGESIA

Strong evidence supports regional analgesia to improve preoperative pain control in patients with hip fracture.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

PREOPERATIVE TRACTION

Moderate evidence does not support routine use of preoperative traction for patients with a hip fracture.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

SURGICAL TIMING

Moderate evidence supports that hip fracture surgery within 48 hours of admission is associated with better outcomes.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

ASPIRIN AND CLOPIDOGREL

Limited evidence supports not delaying hip fracture surgery for patients on aspirin and/or clopidogrel.

Strength of Recommendation: Limited 

Description: Evidence from two or more "Low" strength studies with consistent findings **or** evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

ANESTHESIA

Strong evidence supports similar outcomes for general or spinal anesthesia for patients undergoing hip fracture surgery.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

STABLE FEMORAL NECK FRACTURES

Moderate evidence supports operative fixation for patients with stable (non-displaced) femoral neck fractures.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

DISPLACED FEMORAL NECK FRACTURES

Strong evidence supports arthroplasty for patients with unstable (displaced) femoral neck fractures.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

UNIPOLAR VERSUS BIPOLAR

Moderate evidence supports that the outcomes of unipolar and bipolar hemiarthroplasty for unstable (displaced) femoral neck fractures are similar.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

HEMI VS. TOTAL HIP ARTHROPLASTY

Moderate evidence supports a benefit to total hip arthroplasty in properly selected patients with unstable (displaced) femoral neck fractures.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

CEMENTED FEMORAL STEMS

Moderate evidence supports the preferential use of cemented femoral stems in patients undergoing arthroplasty for femoral neck fractures.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

SURGICAL APPROACH

Moderate evidence supports higher dislocation rates with a posterior approach in the treatment of displaced femoral neck fractures with hip arthroplasty.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

STABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports the use of either a sliding hip screw or a cephalomedullary device in patients with stable intertrochanteric fractures.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

SUBTROCHANTERIC OR REVERSE OBLIQUITY FRACTURES

Strong evidence supports using a cephalomedullary device for the treatment of patients with subtrochanteric or reverse obliquity fractures.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

UNSTABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports using a cephalomedullary device for the treatment of patients with unstable intertrochanteric fractures.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

VTE PROPHYLAXIS

Moderate evidence supports use of venous thromboembolism prophylaxis (VTE) in hip fracture patients.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

TRANSFUSION THRESHOLD

Strong evidence supports a blood transfusion threshold of no higher than 8g/dl in asymptomatic postoperative hip fracture patients.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

OCCUPATIONAL AND PHYSICAL THERAPY

Moderate evidence supports that supervised occupational and physical therapy across the continuum of care, including home, improves functional outcomes and fall prevention.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

INTENSIVE PHYSICAL THERAPY

Strong evidence supports intensive physical therapy post-discharge to improve functional outcomes in hip fracture patients.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

NUTRITION

Moderate evidence supports that postoperative nutritional supplementation reduces mortality and improves nutritional status in hip fracture patients.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

INTERDISCIPLINARY CARE PROGRAM

Strong evidence supports use of an interdisciplinary care program in those patients with mild to moderate dementia who have sustained a hip fracture to improve functional outcomes.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

POSTOPERATIVE MULTIMODAL ANALGESIA

Strong evidence supports multimodal pain management after hip fracture surgery.

Strength of Recommendation: Strong 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

CALCIUM AND VITAMIN D

Moderate evidence supports use of supplemental vitamin D and calcium in patients following hip fracture surgery.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

SCREENING

Limited evidence supports preoperative assessment of serum levels of albumin and creatinine for risk assessment of hip fracture patients.

Strength of Recommendation: Limited 

Description: Evidence from two or more "Low" strength studies with consistent findings **or** evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

OSTEOPOROSIS EVALUATION AND TREATMENT

Moderate evidence supports that patients be evaluated and treated for osteoporosis after sustaining a hip fracture.

Strength of Recommendation: Moderate 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

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II. **INTRODUCTION**

OVERVIEW

This clinical practice guideline is based on a systematic review of published studies with regard to the management of hip fractures in patients over the age of 65. In addition to providing practice recommendations, this guideline also highlights limitations in the literature and areas that require future research.

This guideline is intended to be used by all qualified and appropriately trained physicians and surgeons involved in the management of hip fractures in the elderly. It is also intended to serve as an information resource for decision makers and developers of practice guidelines and recommendations.

GOALS AND RATIONALE

The purpose of this clinical practice guideline is to help improve treatment based on the current best evidence. Current evidence-based medicine (EBM) standards demand that physicians use the best available evidence in their clinical decision making. To assist them, this clinical practice guideline consists of a systematic review of the available literature regarding the management of hip fractures in the elderly. The systematic review detailed herein was conducted between April 2011 and September 2013 and demonstrates where there is good evidence, where evidence is lacking, and what topics future research must target in order to improve the management of elderly patients (defined as age 65 or older) with hip fractures. AAOS staff and the physician work group systematically reviewed the available literature and subsequently wrote the following recommendations based on a rigorous, standardized process.

Musculoskeletal care is provided in many different settings by many different providers. We created this guideline as an educational tool to guide qualified physicians through a series of treatment decisions in an effort to improve the quality and efficiency of care. This guideline should not be construed as including all proper methods of care or excluding methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific procedure or treatment must be made in light of all circumstances presented by the patient and the needs and resources particular to the locality or institution.

INTENDED USERS

This guideline is intended to be used by orthopaedic surgeons and physicians managing elderly patients with hip fractures. Typically, orthopaedic surgeons will have completed medical training, a qualified residency in orthopaedic surgery, and some may have completed additional sub-specialty training. Adult primary care physicians, geriatricians, hospital based adult medicine specialists, physical therapists, occupational therapists, nurse practitioners, physician assistants, emergency physicians, and other healthcare professionals who routinely see this type of patient in various practice settings may also benefit from this guideline.

Hip fracture management is based on the assumption that decisions are predicated on the patient and / or the patient’s qualified heath care advocate having physician communication

with discussion of available treatments and procedures applicable to the individual patient. Once the patient and or their advocate have been informed of available therapies and have discussed these options with his/her physician, an informed decision can be made. Clinician input based on experience with conservative management and the clinician's surgical experience and skills increases the probability of identifying patients who will benefit from specific treatment options.

This guideline is not intended for use a a benefits determination document.

PATIENT POPULATION

This document addresses the management of low energy hip fractures in elderly patients defined as those 65 years of age and older. It is not intended to address management of patients with fractures as a result of high energy trauma or those with fractures related to pathologic bone lesions.

BURDEN OF DISEASE

The economic burden of managing elderly hip fractures was estimated at $17-20 billion in 2010.[M1, M2]

A typical patient with a hip fracture spends US $40000 in the first year following hip fracture for direct medical costs and almost $5000 in subsequent years.

Costs to be considered include:

1. Direct Medical Cost
2. Long-term Medical Cost
3. Home Modification Costs
4. Nursing Home Costs

ETIOLOGY

Hip fractures in the elderly are the result of low energy trauma and often are associated with osteoporosis/low bone mass and other associated medical conditions that may increase the prevalence of falls.

INCIDENCE AND PREVALENCE

There was an estimated 340,000 hip fracture patients per year in United States in 1996 with most fractures occurring in women older than age 65 years, and an annual worldwide incidence of approximately 1.7 million.[M1, M7]

Between 1986 and 2005, the annual mean number of hip fractures was 957.3 per 100 000 (95% confidence interval [CI], 921.7-992.9) for women and 414.4 per 100 000 (95% CI, 401.6-427.3) for men.[M1]

With rising life expectancy, the number of elderly individuals and those with chronic health conditions is increasing and it is estimated that the prevalence of hip fractures will continue to

increase. The number of people older than age 65 years is expected to increase from 37.1 million to 77.2 million by the year 2040, and the occurence of hip fractures is expected increase concomitantly, with an estimated 6.3 million hip fractures predicted worldwide by 2050.[M7]

RISK FACTORS

Risk factors for sustaining a hip fracture in the elderly include, but are not limited to, low bone mass, impaired physical function or balance, diabetes, impaired vision, and inadequate home safety or supervision.

EMOTIONAL AND PHYSICAL IMPACT

Elderly patients with hip fractures are at risk for:

1. Increased rate of mortality [M8]
2. Inability to return to prior living circumstances [M8]
3. Need for increased level of care and supervision [M3, M4]
4. Decreased quality of life [M3, M4]
5. Decreased level of mobility and ambulation [M8]
6. Secondary osteoporotic fractures including a "second or contralateral side" hip fracture [M5, M6]

POTENTIAL BENEFITS, HARMS, AND CONTRAINDICATIONS

Most treatments are associated with some known risks, especially invasive and operative treatments. Contraindications vary widely based on the treatment administered. A particular concern when managing hip fractures in the elderly is the potential for the overall fracture treatment to result in increased patient mortality or decreased level of mobility and independence (compared to status prior to hip fracture). Additional factors may affect the physician's choice of treatment including, but not limited to: associated injuries the patient may present with, as well as the individual's co-morbidities, and/or specific patient characteristics including low bone mass and osteoarthritis. Clinician input based on experience increases the probability of identifying patients who will benefit from specific treatment options. The individual patient and/or their decision surrogate dynamic will also influence treatment decisions, therefore, discussion of available treatments and procedures applicable to the individual patient rely on mutual communication between the patient and/or decision surrogate and physician, weighing the potential risks and benefits for that patient. Once the patient and/or their decision surrogate have been informed of available therapies and have discussed these options with the patient's physician, an informed decision can be made.

FUTURE RESEARCH

Consideration for future research is provided for each recommendation within this document. Review of the published literature does indicate that the men and women are different with regard to rate of hip fracture incidence, morbidity after hip fracture and medical co-morbidity profiles. Further, due to the paucity of sex segregated data reporting in published

research for this disease topic, the workgroup strongly suggests that future research studies publish both overall results and sex segregated results. The availability of sex segregated results will allow stratification of meta-analyzed data by sex, affording guideline developers the ability to make specific recommendations for men and women, which may lead to improved patient care.

III. METHODS

The methods used to perform this systematic review were employed to minimize bias and enhance transparency in the selection, appraisal, and analysis of the available evidence. These processes are vital to the development of reliable, transparent, and accurate clinical recommendations for treating hip fractures in the elderly.

This clinical practice guideline and the systematic review upon which it is based evaluate the effectiveness of treatments for hip fractures in the elderly. This section describes the methods used to prepare this guideline and systematic review, including search strategies used to identify literature, criteria for selecting eligible articles, determining the strength of the evidence, data extraction, methods of statistical analysis, and the review and approval of the guideline. The AAOS approach incorporates practicing physicians (clinical experts) and methodologists who are free of potential conflicts of interest as recommended by guideline development experts.[M10]

The AAOS understands that only high-quality guidelines are credible, and we go to great lengths to ensure the integrity of our evidence analyses. The AAOS addresses bias beginning with the selection of work group members. Applicants with financial conflicts of interest (COI) related to the guideline topic cannot participate if the conflict occurred within one year of the start date of the guideline's development or if an immediate family member has, or has had, a relevant financial conflict. Additionally, all work group members sign an attestation form agreeing to remain free of relevant financial conflicts for two years following the publication of the guideline.

This guideline and systematic review were prepared by the AAOS Management of Hip Fractures in the Elderly guideline physician work group (clinical experts) with the assistance of the AAOS Evidence-Based Medicine (EBM) Unit in the Department of Research and Scientific Affairs (methodologists) at the AAOS. To develop this guideline, the work group held an introductory meeting on June 11-12, 2011 to establish the scope of the guideline and the systematic reviews. The physician experts defined the scope of the guideline by creating preliminary recommendations (Questions) that directed the literature search. When necessary, these clinical experts also provided content help, search terms and additional clarification for the AAOS Medical Librarian. The Medical Librarian created and executed the search(s). The supporting group of methodologists (AAOS EBM Unit) reviewed all abstracts, recalled pertinent full-text articles for review and evaluated the quality of studies meeting the inclusion criteria. They also abstracted, analyzed, interpreted, and/or summarized the relevant evidence for each recommendation and prepared the initial draft for the final meeting. Upon completion of the systematic reviews, the physician work group participated in a three-day recommendation meeting on October 25-26, 2013. At this meeting, the physician experts and methodologists then evaluated and integrated all material to develop the final recommendations. The final recommendations and rationales were edited, written and voted on at the final meeting. The draft guideline recommendations and rationales received final review by the methodologists to ensure that these recommendations and rationales were consistent with the data. The draft was then completed and submitted for peer review on April 1, 2014.

The resulting draft guidelines were then peer-reviewed, edited in response to that review and subsequently sent for public commentary, where after additional edits were made. Thereafter, the

draft guideline was sequentially approved by the AAOS Committee on Evidence-Based Quality and Value, AAOS Council on Research and Quality, and the AAOS Board of Directors (see Appendix II for a description of the AAOS bodies involved in the approval process). All AAOS guidelines are reviewed and updated or retired every five years in accordance with the criteria of the National Guideline Clearinghouse.

Thus the process of AAOS guideline development incorporates the benefits from clinical physician expertise as well as the statistical knowledge and interpretation of non-conflicted methodologists. The process also includes an extensive review process offering the opportunity for over 200 clinical physician experts to provide input into the draft prior to publication. This process provides a sound basis for minimizing bias, enhancing transparency and ensuring the highest level of accuracy for interpretation of the evidence.

FORMULATING PRELIMINARY RECOMMENDATIONS

The work group began work on this guideline by constructing a set of preliminary recommendations. These recommendations specify [what] should be done in [whom], [when], [where], and [how often or how long]. They function as questions for the systematic review, not as final recommendations or conclusions. Preliminary recommendations are almost always modified on the basis of the results of the systematic review. Once established, these *a priori* preliminary recommendations cannot be modified until the final work group meeting.

STUDY SELECTION CRITERIA

We developed *a priori* article inclusion criteria for our review. These criteria are our "rules of evidence" and articles that did not meet them are, for the purposes of this guideline, not evidence.

To be included in our systematic reviews (and hence, in this guideline) an article had to meet the following criteria:

- Study must be of elderly (mean age of 65) patients with hip fractures
- Article must be a full article report of a clinical study
- Retrospective non-comparative case series, medical records review, meeting abstracts, historical articles, editorials, letters, and commentaries are excluded
- Case series studies that give patients the treatment of interest AND another treatment are excluded
- Case series studies that have non-consecutive enrollment of patients are excluded
- Controlled trials in which patients were not stochastically assigned to groups AND in which there was either a difference in patient characteristics or outcomes at baseline AND where the authors did not statistically adjust for these differences when analyzing the results are excluded
- All studies evaluated as Level V will be excluded
- Composite measures or outcomes are excluded even if they are patient-oriented
- Study must appear in a peer-reviewed publication
- Study should have 10 or more patients per group
- Study must be of humans
- Study must be published in English

- Study must be published in or after 1966
- Study results must be quantitatively presented
- All study follow up durations are included
- For any given follow-up time point in any included study, there must be ≥ 50% patient follow-up (if the follow-up is >50% but <80%, the study quality will be downgraded by one Level)
- For any included study that uses "paper-and-pencil" outcome measures (e.g., SF-36), only those outcome measures that have been validated will be included
- Study must not be an in vitro study
- Study must not be a biomechanical study
- Study must not have been performed on cadavers

We will only evaluate surrogate outcomes when no patient oriented outcomes are available**.**

We did not include systematic reviews or meta-analyses compiled by others or guidelines developed by other organizations. These documents are developed using different inclusion criteria than those specified by the AAOS work group. Therefore they may include studies that do not meet our inclusion criteria. We recalled these documents, if the abstract suggested they might provide an answer to one of our recommendations, and searched their bibliographies for additional studies to supplement our systematic review.

BEST EVIDENCE SYNTHESIS

We included only the best available evidence for any given outcome addressing a recommendation. Accordingly, we first included the highest quality evidence for any given outcome if it was available. In the absence of two or more occurrences of an outcome at this quality, we considered outcomes of the next lowest quality until at least two or more occurrences of an outcome had been acquired. For example, if there were two 'moderate' quality occurrences of an outcome that addressed a recommendation, we did not include 'low' quality occurrences of this outcome. A summary of the evidence that met the inclusion criteria, but was not best available evidence was created and can be viewed by recommendation in Appendix XII.

MINIMALLY CLINICALLY IMPORTANT IMPROVEMENT

Wherever possible, we consider the effects of treatments in terms of the minimally clinically important difference (MCII) in addition to whether their effects are statistically significant. The MCI is the smallest clinical change that is important to patients, and recognizes the fact that there are some treatment-induced statistically significant improvements that are too small to matter to patients. However, there were no occurrences of validated MCID outcomes in the studies included in this clinical practice guideline.

When MCID values from the specific guideline patient population are not available, we use the following measures listed in order of priority:

1) MCID/MID
2) PASS or Impact
3) Another validated measure
4) Statistical Significance

LITERATURE SEARCHES

We begin the systematic review with a comprehensive search of the literature. Articles we consider were published prior to April 2013 in four electronic databases; PubMed, EMBASE, CINAHL, and The Cochrane Central Register of Controlled Trials. The medical librarian conducts the search using key terms determined from the work group's preliminary recommendations.

We supplement the electronic search with a manual search of the bibliographies of all retrieved publications, recent systematic reviews, and other review articles for potentially relevant citations. Recalled articles are evaluated for possible inclusion based on the study selection criteria and are summarized for the work group who assist with reconciling possible errors and omissions.

The study attrition diagram in Appendix IV provides a detailed description of the numbers of identified abstracts and recalled and selected studies that were evaluated in the systematic review of this guideline. The search strategies used to identify the abstracts are contained in Appendix V.

METHODS FOR EVALUATING EVIDENCE

STUDIES OF INTERVENTION/PREVENTION

QUALITY

As noted earlier, we judge quality based on *a priori* research questions and use an automated numerical scoring process to arrive at final ratings. Extensive measures are taken to determine quality ratings so that they are free of bias.

We evaluate the quality of evidence separately for each outcome reported in every study using research design domains suggested by GRADE work group members and others.[M2, M3] The GRADE evidence appraisal system is used in the Cochrane Collaboration[M4] and has been developed for studies evaluating matched control groups. We incorporate a coding scheme adaptable to all research designs that involves incremental increases or decreases based on the following criteria:

- The study was prospective (with prospective studies, it is possible to have an a priori hypothesis to test; this is not possible with retrospective studies.)
- The statistical power of the study
- The assignment of patients to groups was unbiased
- There was sufficient blinding to mitigate against a placebo effect
- The patient groups were comparable at the beginning of the study
- The treatment was delivered in such a way that any observed effects could reasonably be attributed to that treatment
- Whether the instruments used to measure outcomes were valid
- Whether there was evidence of investigator bias

Each of the above quality domains is rated for possible flaws based on up to four indicator questions that define them. See Appendix VI for a discussion of the AAOS appraisal system. Domains are considered "flawed" if one indicator is coded "No" or at least two defining questions are "Unclear." The Statistical Power domain is considered flawed if sample size is too small to detect at least a small effect size of 0.2.

If there are flawed domains then the evidence quality is downgraded according to the reductions shown in Table 1. As an example, the evidence reported in a randomized controlled trial (RCT) for any given outcome is rated as "High" quality if zero or one domain is flawed. If two or three domains are flawed, the rating is reduced to "Moderate." If four or five domains are flawed, the quality of evidence is downgraded to "Low." The quality of evidence is reduced to "Very Low" if six or more domains are flawed. As indicated above, very low quality evidence is not included in this AAOS guideline.

Table 1. Relationship between Quality and Domain Scores for Interventions

Number of Domains With No More Than One "Unclear" Answer	Strength of Evidence
0	High
1-2	Moderate
3-4	Low
>5	Very Low

Some flaws are so serious that we automatically term the evidence as being of "Very Low" quality if a study exhibits them. These serious design flaws are:

- Non-consecutive enrollment of patients in a case series
- Case series that gave patients the treatment of interest AND another treatment
- Measuring the outcome of interest one way in some patients and measuring it in another way in other patients
- Low Statistical Power

Conversely, the quality of research articles may be upgraded if the research is of high applicability or if providing the intervention decreases the potential for catastrophic harm, such as loss of life or limb. The criteria, based on the G.R.A.D.E. methodology, which can be used to upgrade the quality of a study, are as follows:

- The study has a large (>2) or very large (>5) magnitude of treatment effect: used for non-retrospective observational studies;
- All plausible confounding factors would reduce a demonstrated effect or suggest a spurious effect when results show no effect;
- Consideration of the dose-response effect.

Quality is one of two dimensions that determine the strength of the final recommendations.

APPLICABILITY

The applicability (also called "generalizability" or "external validity") of an outcome is one of the factors used to determine the strength of a recommendation. We categorize outcomes according to whether their applicability is "High", "Moderate", or "Low." As with quality, we separately evaluate the applicability for each outcome a study reports.

The applicability of a study is evaluated using the PRECIS instrument.[M5] The instrument was originally designed to evaluate the applicability of randomized controlled trials, but it can also be used for studies of other design. For example, the existence of an implicit control group in a case series (see above) make it useful for evaluating outcomes from these latter studies.

This instrument is comprised of the 10 questions that are briefly described in Table 2. All 10 questions are asked of all studies, regardless of design. The questions are divided into four domains. These domains and their corresponding questions are given in Table 2.

Table 2. Brief Description of the PRECIS Questions and Domains

Question	Domain
All Types of Patients Enrolled	Participants
Flexible Instructions to Practitioners	Interventions and Expertise
Full Range of Expt'l Practitioners	Interventions and Expertise
Usual Practice Control	Interventions and Expertise
Full Range of Control Practitioners	Interventions and Expertise
No Formal Follow-up	Interventions and Expertise
Usual and Meaningful Outcome	Interventions and Expertise
Compliance Not Measured	Compliance and Adherence
No Measure of Practitioner Adherence	Compliance and Adherence
All Patients in Analysis	Analysis

Each study is assumed to have "High" applicability at the start, and applicability is downgraded for flawed domains as summarized in Table 3.

Table 3. Relationship between Applicability and Domain Scores for Studies of Treatments

Number of Flawed Domains	Applicability
0	High
1, 2, 3	Moderate
4	Low

A study's applicability is "High" if there is only one "Unclear" answer in one domain and the answers to all of the questions for all other domains is "Yes." A study's applicability is low if there is one "Unclear" answer in one domain and the answers to all of the questions for all other domains is "No." A study's applicability is "Moderate" under all other conditions.

STUDIES OF SCREENING AND DIAGNOSTIC TESTS

QUALITY

As with our appraisal of the quality of studies of intervention, our appraisal of studies of screening and diagnostic tests is a domain-based approach conducted using *a priori* questions and scored by a computer program. The questions we used are those of the QUADAS instrument[M6] and the six domains we employed are listed below:

1. Participants (whether the spectrum of disease among the participants enrolled in the study is the same as the spectrum of disease seen in actual clinical practice)

2. Reference Test (whether the reference test , often a "gold standard," and the way it was employed in the study ensures correct and unbiased categorization of patients as having or not having disease)
3. Index Test (whether interpretation of the results of the test under study, often called the "index test", was unbiased)
4. Study Design (whether the design of the study allowed for unbiased interpretation of test results)
5. Information (whether the same clinical data were available when test results were interpreted as would be available when the test is used in practice)
6. Reporting (whether the patients, tests, and study protocol were described well enough to permit its replication)

We characterized a study that has no flaws in any of its domains as being of "High" quality, a study that has one flawed domain as being of "Moderate" quality, a study with two flawed domains as being of "Low" quality, and a study with three or more flawed domains as being of "Very Low" quality (Table).We characterized a domain as "flawed" if one or more questions addressing any given domain are answered "No" for a given screening/diagnostic/test, or if there are two or more "Unclear" answers to the questions addressing that domain.

We considered some design flaws as so serious that their presence automatically guarantees that a study is characterized as being of "Very Low" quality regardless of its domain scores. These flaws are:

- The presence of spectrum bias (occurs when a study does not enroll the full spectrum of patients who are seen in clinical practice. For example, a diagnostic case control study enrolls only those known to be sick and those known to be well, a patient population quite different from that seen in practice. Because diagnostic case control studies enroll only the easy to diagnose patients, these kinds of studies typically overestimate the abilities of a diagnostic test.)
- Failure to give all patients the reference standard regardless of the index test results
- Non-independence of the reference test and the index text

Table 4. Relationship Between Domain Scores and Quality of Screening/Diagnostic Tests

Number of Flawed Domains	Quality
0	High
1	Moderate
2	Low
≥3	Very Low

APPLICABILITY

We judged the applicability of evidence pertinent to screening and diagnostic tests using a modified version of the PRECIS instrument, implying that the questions are determined *a priori*. As before, scoring was accomplished by a computer. The applicability domains we employed for screening and diagnostic tests were:

1. Patients (i.e., whether the patients in the study are like those seen in actual clinical practice)
2. Index Test (i.e., whether the test under study could be used in actual clinical practice and whether it was administered in a way that reflects its use in actual practice)
3. Directness (i.e., whether the study demonstrated that patient health is affected by use of the diagnostic test under study)
4. Analysis (i.e., whether the data analysis reported in the study was based on a large enough percentage of enrolled patients to ensure that the analysis was not conducted on "unique" or "unusual" patients)

We characterized a domain as "flawed" if one or more questions addressing any given domain are answered "No" for a given screening/diagnostic/test, or if there are two or more "Unclear" answers to the questions addressing that domain. We characterized the applicability of a screening/diagnostic test as "High" if none of its domains are flawed, "Low" if all of its domains are flawed, and "Moderate" in all other cases (Table 5).

Table 5. Relationship Between Domain Scores and Applicability for Studies of Screening/Diagnostic Tests

Number of Flawed Domains	Applicability
0	High
1,2, 3	Moderate
4	Low

STUDIES OF PROGNOSTICS

QUALITY

Our appraisal of studies of prognostics is a domain-based approach conducted using *a priori* questions, and scored by a computer program for the questions we used and the domains to which they apply). The five domains we employed are:

1. Prospective (A variable is specified as a potential prognostic variable *a priori*. This is not possible with retrospective studies.)
2. Power (Whether the study had sufficient statistical power to detect a prognostic variable as statistically significant)
3. Analysis (Whether the statistical analyses used to determine that a variable was rigorous to provide sound results)
4. Model (Whether the final statistical model used to evaluate a prognostic variable accounted for enough variance to be statistically significant)
5. Whether there was evidence of investigator bias

We separately determined a quality score for each prognostic reported by a study. We characterized the evidence relevant to that prognostic variable as being of "High" quality if there are no flaws in any of the relevant domains, as being of "Moderate" quality if one of the relevant domains is flawed, as "Low" quality if there are two flawed domains, and as "Very Low" quality if three or more relevant domains are flawed (Table 5). We characterized a domain as "flawed" if one or more questions addressing any given domain are answered "No" for a given prognostic variable, or if there are two or more "Unclear" answers to the questions addressing that domain.

Table 6. Relationship Between Quality and Domain Scores for Studies of Prognostics

Number of Flawed Domains	Quality
0	High
1	Moderate
2	Low
≥3	Very Low

APPLICABILITY

We separately evaluated the applicability of each prognostic variable reported in a study, and did so using a domain-based approach for the relevant questions and the domains they address) that involves predetermined questions and computer scoring. The domains we used for the applicability of prognostics are:

1. Patients (i.e. whether the patients in the study and in the analysis were like those seen in actual clinical practice)
2. Analysis (i.e., whether the analysis was conducted in a way that was likely to describe variation among patients that might be unique to the dataset the authors used)
3. Outcome (i.e., whether the prognostic was a predictor of a clinically meaningful outcome)

We characterized the evidence relevant to that prognostic as being of "High" applicability if there are no flaws in any of the relevant domains, as being of "Low" applicability if all three domains are flawed, and as of "Moderate" applicability in all other cases (Table 6). We characterized a domain as "flawed" if one or more questions addressing any given domain are answered "No" for a given prognostic variable, or if there are two or more "Unclear" answers to the questions addressing that domain.

Table 7. Relationship Between Domain Scores and Applicability for Studies of Prognostics

Number of Flawed Domains	Applicability
0	High
1,2	Moderate
3	Low

FINAL STRENGTH OF EVIDENCE

To determine the final strength of evidence for an outcome, the strength is initially taken to equal quality. An outcome's strength of evidence is increased by one category if its applicability is "High", and an outcome's strength of evidence is decreased by one category if its applicability is "Low." If an outcome's applicability is "Moderate", no adjustment is made to the strength of evidence derived from the quality evaluation.

DEFINING THE STRENGTH OF THE RECOMMENDATIONS

Judging the strength of evidence is only a stepping stone towards arriving at the strength of a guideline recommendation. The strength of recommendation also takes into account the quality,

quantity, and the trade-off between the benefits and harms of a treatment, the magnitude of a treatment's effect, and whether there is data on critical outcomes.

Strength of recommendation expresses the degree of confidence one can have in a recommendation. As such, the strength expresses how possible it is that a recommendation will be overturned by future evidence. It is very difficult for future evidence to overturn a recommendation that is based on many high quality randomized controlled trials that show a large effect. It is much more likely that future evidence will overturn recommendations derived from a few small case series. Consequently, recommendations based on the former kind of evidence are given a high strength of recommendation and recommendations based on the latter kind of evidence are given a low strength.

To develop the strength of a recommendation, AAOS staff first assigned a preliminary strength for each recommendation that took only the final strength of evidence (including quality and applicability) and the quantity of evidence (see Table 8).

Table 8. Strength of Recommendation Descriptions

Strength	Overall Strength of Evidence	Description of Evidence Strength	Strength Visual
Strong	Strong	Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.	
Moderate	Moderate	Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.	
Limited	Low Strength Evidence or Conflicting Evidence	Evidence from two or more "Low" strength studies with consistent findings **or** evidence from a single study for recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.	
Consensus*	No Evidence	There is no supporting evidence. In the absence of reliable evidence, the work group is making a recommendation based on their clinical opinion. Consensus recommendations can only be created when not establishing a recommendation could have catastrophic consequences.	

WORDING OF THE FINAL RECOMMENDATIONS

To prevent bias in the way recommendations are worded, the AAOS uses specific predetermined language stems that are governed by the evidence strengths. Each recommendation was written using language that accounts for the final strength of the recommendation. This language, and the corresponding strength, is shown in Table 9.

Table 9. AAOS Guideline Language Stems

Guideline Language	Strength of Recommendation
Strong evidence supports that the practitioner should/should not do X, because…	Strong
Moderate evidence supports that the practitioner could/could not do X, because…	Moderate
Limited evidence supports that the practitioner might/might not do X, because…	Limited
In the absence of reliable evidence, it is the ***opinion*** of this work group that…*	Consensus*

**Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII.*

APPLYING THE RECOMMENDATIONS TO CLINICAL PRACTICE

To increase the practicality and applicability of the guideline recommendations in this document, the information listed in Table 10 provides assistance in interpreting the correlation between the strength of a recommendation and patient counseling time, use of decision aids, and the impact of future research

Table 10. Clinical Applicability: Interpreting the Strength of a Recommendation

Strength of Recommendation	Patient Counseling (Time)	Decision Aids	Impact of Future Research
Strong	Least	Least Important, unless the evidence supports no difference between two alternative interventions	Not likely to change
Moderate	Less	Less Important	Less likely to change
Limited	More	Important	Change possible/anticipated
Consensus	Most	Most Important	Impact unknown

VOTING ON THE RECOMMENDATIONS

The recommendations and their strength were voted on by the work group members during the final meeting. If disagreement between the work group occurred, there was further discussion to see whether the disagreement(s) could be resolved. Up to three rounds of voting were held to attempt to resolve disagreements. If disagreements were not resolved following three voting rounds, no recommendation was adopted. Lack of agreement is a reason that the strength for some recommendations can be labeled "Limited."

STATISTICAL METHODS

ANALYSIS OF DIAGNOSTIC DATA

Likelihood ratios, sensitivity, specificity and 95% confidence intervals were calculated to determine the accuracy of diagnostic modalities based on two by two diagnostic contingency tables extracted from the included studies. When summary values of sensitivity, specificity, or other diagnostic performance measures were reported, estimates of the diagnostic contingency table were used to calculate likelihood ratios.

Likelihood ratios (LR) indicate the magnitude of the change in probability of disease due to a given test result. For example, a positive likelihood ratio of 10 indicates that a positive test result is 10 times more common in patients with disease than in patients without disease. Likelihood ratios are interpreted according to previously published values, as seen in Table below.

Table 11. Interpreting Likelihood Ratios

Positive Likelihood Ratio	Negative Likelihood Ratio	Interpretation
>10	<0.1	Large and conclusive change in probability
5-10	0.1-0.2	Moderate change in probability
2-5	0.2-0.5	Small (but sometimes important change in probability)
1-2	0.5-1	Small (and rarely important) change in probability

ANALYSIS OF INTERVENTION/PREVENTION DATA

When possible, we recalculate the results reported in individual studies and compile them to answer the recommendations. The results of all statistical analysis conducted by the AAOS Clinical Practice Guidelines Unit are conducted using STATA 12. STATA was used to determine the magnitude, direction, and/or 95% confidence intervals of the treatment effect. For data reported as means (and associated measures of dispersion) the mean difference between groups and the 95% confidence interval was calculated and a two-tailed t-test of independent groups was used to determine statistical significance. When published studies report measures of dispersion other than the standard deviation the value was estimated to facilitate calculation of the treatment effect. In studies that report standard errors or confidence intervals the standard deviation was back-calculated. In some circumstances statistical testing was conducted by the authors and measures of dispersion were not reported. In the absence of measures of dispersion, the results of the statistical analyses conducted by the authors (i.e. the p-value) are considered as evidence. For proportions, we report the proportion of patients that experienced an outcome along with the percentage of patients that experienced an outcome. The variance of the arcsine difference was used to determine statistical significance.[M7] P-values < 0.05 were considered statistically significant.

We performed meta-analyses using the random effects method of DerSimonian and Laird.[M8] A minimum of four studies was required for an outcome to be considered by meta-analysis. Heterogeneity was assessed with the I-squared statistic. Meta-analyses with I-squared values less than 50% were considered as evidence. Those with I-squared larger than 50% were not considered as evidence for this guideline. All meta-analyses were performed using STATA 12

and the "metan" command. The arcsine difference was used in meta-analysis of proportions. In order to overcome the difficulty of interpreting the magnitude of the arcsine difference, a summary odds ratio is calculated based on random effects meta-analysis of proportions and the number needed to treat (or harm) is calculated. The standardized mean difference was used for meta-analysis of means and magnitude was interpreted using Cohen's definitions of small, medium, and large effect.

PEER REVIEW

Following the final meeting, the guideline draft undergoes peer review for additional input from external content experts. Written comments are provided on the structured review form (see Appendix VII). All peer reviewers are required to disclose their conflicts of interest.
To guide who participates, the work group identifies specialty societies at the introductory meeting. O*rganizations*, not *individuals*, are specified.

The specialty societies are solicited for nominations of individual peer reviewers approximately six weeks before the final meeting. The peer review period is announced as it approaches and others interested are able to volunteer to review the draft. The chair of the AAOS committee on Evidence Based Quality and Value reviews the draft of the guideline prior to dissemination.

Some specialty societies (both orthopaedic and non-orthopaedic) ask their evidence-based practice (EBP) committee to provide review of the guideline. The organization is responsible for coordinating the distribution of our materials and consolidating their comments onto one form. The chair of the external EBP committees provides disclosure of their conflicts of interest (COI) and manages the potential conflicts of their members.

Again, the AAOS asks for comments to be assembled into a single response form by the specialty society and for the individual submitting the review to provide disclosure of potentially conflicting interests. The peer review stage gives external stakeholders an opportunity to provide evidence-based direction for modifications that they believe have been overlooked. Since the draft is subject to revisions until its approval by the AAOS Board of Directors as the final step in the guideline development process, confidentiality of all working drafts is essential.

The manager of the evidence-based medicine unit drafts the initial responses to comments that address methodology. These responses are then reviewed by the work group chair and vice-chair, who respond to questions concerning clinical practice and techniques. The director of the Department of Research and Scientific Affairs provides input as well. All comments received and the initial drafts of the responses are also reviewed by all members of the work group. All changes to a recommendation as a result of peer review are based on the evidence and undergoes majority vote by the work group members via teleconference. Final revisions are summarized in a detailed report that is made part of the guideline document throughout the remainder of the review and approval processes.

The AAOS believes in the importance of demonstrating responsiveness to input received during the peer review process and welcomes the critiques of external specialty societies. Following final approval of the guideline, all individual responses are posted on our website http://www.aaos.org/guidelines with a point-by-point reply to each non-editorial comment.

Reviewers who wish to remain anonymous notify the AAOS to have their names de-identified; their comments, our responses, and their COI disclosures are still posted.

Review of the Management of Hip fractures in the elderly guideline was requested of 31 organizations and 23 external content experts were nominated to represent them. Ten individuals returned comments on the structured review form (see Appendix IX).

PUBLIC COMMENTARY

After modifying the draft in response to peer review, the guideline was subjected to a thirty day period of "Public Commentary." Commentators consist of members of the AAOS Board of Directors (BOD), members of the Council on Research and Quality (CORQ), members of the Board of Councilors (BOC), and members of the Board of Specialty Societies (BOS). The guideline is automatically forwarded to the AAOS BOD and CORQ so that they may review it and provide comment prior to being asked to approve the document. Members of the BOC and BOS are solicited for interest. If they request to see the document, it is forwarded to them for comment. Based on these bodies, over 200 commentators have the opportunity to provide input into this guideline. Three members returned public comments.

THE AAOS GUIDELINE APPROVAL PROCESS

This final guideline draft must be approved by the AAOS Committee on Evidence Based Quality and Value Committee, the AAOS Council on Research and Quality, and the AAOS Board of Directors. These decision-making bodies are described in Appendix II and are not designated to modify the contents. Their charge is to approve or reject its publication by majority vote.

REVISION PLANS

This guideline represents a cross-sectional view of current treatment and may become outdated as new evidence becomes available. This guideline will be revised in accordance with new evidence, changing practice, rapidly emerging treatment options, and new technology. This guideline will be updated or withdrawn in five years in accordance with the standards of the National Guideline Clearinghouse.

GUIDELINE DISSEMINATION PLANS

The primary purpose of the present document is to provide interested readers with full documentation about not only our recommendations, but also about how we arrived at those recommendations. This document is also posted on the AAOS website at http://www.aaos.org/research/guidelines/guide.asp.

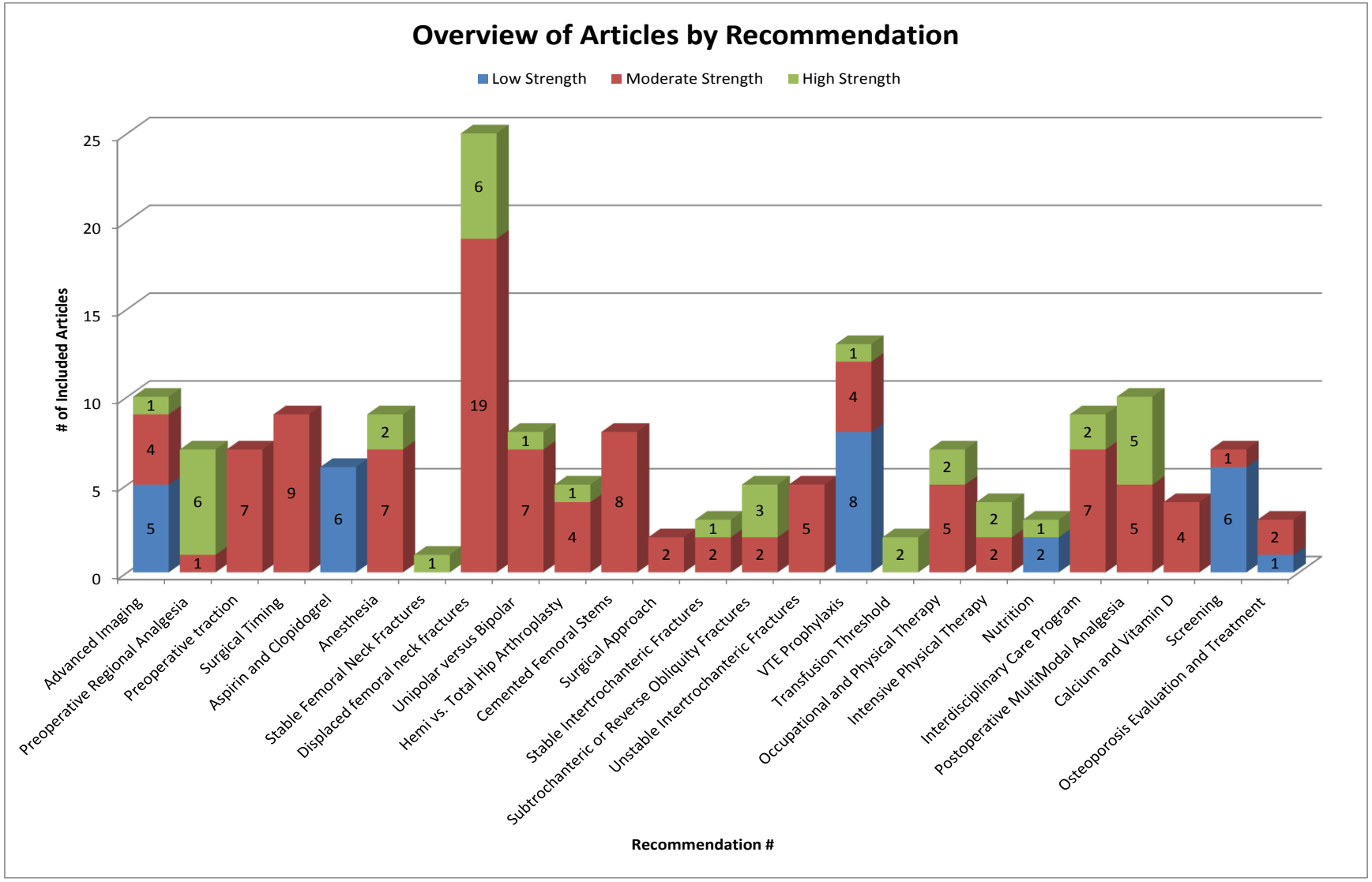
Shorter versions of the guideline are available in other venues. Publication of most guidelines is announced by an Academy press release, articles authored by the work group and published in the Journal of the American Academy of Orthopaedic Surgeons, and articles published in AAOS *Now*. Most guidelines are also distributed at the AAOS Annual Meeting in various venues such as on Academy Row and at Committee Scientific Exhibits.

Selected guidelines are disseminated by webinar, an Online Module for the Orthopaedic Knowledge Online website, Radio Media Tours, Media Briefings, and by distributing them at relevant Continuing Medical Education (CME) courses and at the AAOS Resource Center.

Other dissemination efforts outside of the AAOS will include submitting the guideline to the National Guideline Clearinghouse and distributing the guideline at other medical specialty societies' meetings.

IV.RECOMMENDATIONS

OVERVIEW OF ARTICLES BY RECOMMENDATION



ADVANCED IMAGING

Moderate evidence supports MRI as the advanced imaging of choice for diagnosis of presumed hip fracture not apparent on initial radiographs.

Strength of Recommendation: Moderate 

RATIONALE

Five low strength studies evaluated the use of MRI to assess for hip fractures in patients with a clinical history consistent with fracture but negative plain films. The included studies demonstrated the ability of MRI to identify fractures, especially in older patients (Chana et al [1]). The studies also noted that MRI was able to demonstrate causes of hip pain other than fracture (Harrmati et al[2], Kirby et al[3], Lim et al [4], and Pandey et al [5]). Only one low strength study (Lee et al [6]) was available that evaluated the sensitivity of bone scan in detecting occult hip fractures. Rizzo et al. [7] noted equivalent accuracy when comparing MRI to bone scan in this setting; however, MRI was found to provide a diagnosis earlier (Rizzo et al. [7]) than bone scan, with better spatial resolution. In this study, MRI was obtained within 24 hours of admission and bone scan within 72 hours. For situations in which MRI is not immediately available, bone scan can be considered (Rizzo et al). [7] In addressing issues of cost and patient discomfort,, three studies showed that a "limited" MRI of the hip could identify occult hip fractures (Lim et al [4], Iwata et al [8], Quinn et al [9]); these limited scans were obtained with lower cost and shorter duration that standard MRIs.

Limited, small studies have examined the use of CT scan in the diagnosis of occult hip fractures. Due to the quality of existing literature, as well as potential harm with radiation exposure related to use of CT in this setting, this modality was not recommended for evaluation of occult hip fracture.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no specific harms associated with this recommendation.

FUTURE RESEARCH

Additional research is needed to clarify the role, if any, as well as accuracy and timing, of bone scan in identifying occult hip fractures. Studies are also needed to clarify the role, if any, of CT in this situation, and the relative accuracy and safety of bone scan vs CT vs MRI for the diagnosis of occult hip fractures. There needs to be further clarification of the technique and relative accuracy of "limited" MRIs in the diagnosis of occult hip fractures.

RESULTS

QUALITY AND APPLICABILITY

Table 12. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Chana et al 2006	MRI (Confirmation of Radiograph)	●	○	○	○	○	●	●	Low	●	○	●	●	Moderate	Low
Haramati et al 1994	Fracture confirmed by MRI after negative radiograph	●	○	○	○	○	●	●	Low	●	○	●	●	Moderate	Low
Lim et al 2002	MRI confirmation after unequivocal radiograph	●	○	○	○	○	●	○	Low	●	○	●	●	Moderate	Low
Pandey et al 1998	MRI diagnosed fracture	●	○	○	○	○	●	●	Low	●	○	●	●	Moderate	Low
Quinn et al 1993	MRI diagnosis	●	○	○	○	○	●	○	Low	●	○	●	●	Moderate	Low

Table 13. Quality Table of Diagnostic Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Reporting (Penalty)	Index Test	Reference Text	Participants	Information	Study Design	*Quality*	Participants	Index Test	Directness of Results	Analysis	*Applicability*	*Strength of Evidence*
Iwata et al 2012	MRI	○	●	●	●	●	○	Moderate	●	○	○	●	Moderate	Moderate
Kirby et al 2010	MRI (Radiographs as Reference)	○	●	●	●	●	●	High	●	○	●	●	Moderate	High
Lee et al 2010	Bone scan	○	●	○	●	●	●	Moderate	●	○	○	●	Moderate	Moderate
Lee et al 2010	MRI	○	●	○	●	●	●	Moderate	●	○	○	●	Moderate	Moderate
Rizzo et al 1993	Fracture confirmed by MRI and bone scan after negative radiograph (MRI as Index)	○	○	○	●	●	●	Low	●	●	●	●	High	Moderate

FINDINGS

Table 14. MRI Results

Author	Injury	Diagnostic Test	Reference Test	N	Number of MRI Detected Fractures/ N (%)	Kappa Reliability Statistic Between Diagnostic and Reference Standard	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Sensitivity	Specificity	TP	FP	FN	TN
Chana et al. 2006	Hip fracture	MRI after negative radiographs with suspicion of fracture	-	35	29/35 (83%)	-	-	-	-	-	-	-	-	-
Haramati et al. 1994	Proximal fracture	MRI after Negative radiograph with suspected hip fracture	-	15	10/15 (66.6%)	-	-	-	-	-	-	-	-	-
Kirby and Spritzer 2010	Llium	Radiography	MRI	-	-	-	3.8	.51	57%	85%	-	-	-	-
Lee et al 2010	Hip fracture	MRI and Bone Scan after radiograph with Non displaced or minimally displaced isolated GT fractures	-	25	-	22/25 agreement Kappa=.97	-	-	-	-	-	-	-	-
Lim et al 2002	Femoral neck fracture	MRI after negative radiograph and clinical suspicion of fracture	-	57	8/57 (14%)	-	-	-	-	-	-	-	-	-

Table 14. MRI Results

Author	Injury	Diagnostic Test	Reference Test	N	Number of MRI Detected Fractures/ N (%)	Kappa Reliability Statistic Between Diagnostic and Reference Standard	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Sensitivity	Specificity	TP	FP	FN	TN
Lim et al 2002	Intertrochanteric fracture	MRI after negative radiograph and clinical suspicion of fracture	-	57	5/57 (9%)	-	-	-	-	-	-	-	-	-
Lim et al 2002	Other pathology	MRI after negative radiograph and clinical suspicion of fracture	-	57	19/57 (33%)	-	-	-	-	-	-	-	-	-
Lim et al 2002	Hip fracture	MRI after negative radiograph and clinical suspicion of fracture	-	57	25/57 (44%)	-	-	-	-	-	-	-	-	-
Quinn et al 1993	Indeterminate findings on radiograph	MRI after negative radiograph	-	20	20/20 (100%)	-	-	-	-	-	-	-	-	-
Pandey et al 1998	Hip fracture	MRI after negative radiograph and clinical suspicion of fracture	-	33	23/33	-	-	-	-	-	-	-	-	-
Iwata et al 2012	Hip fracture	MRI (T1 weighted images) after negative radiographs with suspicion of fracture	Unclear	26	-	-	-	-	100%	-	-	-	-	-

Table 14. MRI Results

Author	Injury	Diagnostic Test	Reference Test	N	Number of MRI Detected Fractures/ N (%)	Kappa Reliability Statistic Between Diagnostic and Reference Standard	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Sensitivity	Specificity	TP	FP	FN	TN
Iwata et al 2012	Hip fracture	MRI (T2 weighted images) after negative radiographs with suspicion of fracture	Unclear	25	-	-	-	-	84%	-	-	-	-	-
Rizzo et al 1993	Hip	MRI	Bone Scan	62	-	-	26(3.8, 177.69)	0%	100%	96.15	36	1	0	25

PREOPERATIVE REGIONAL ANALGESIA

Strong evidence supports regional analgesia to improve preoperative pain control in patients with hip fracture.

Strength of Recommendation: Strong ★★★★

RATIONALE

Six high strength studies (Fletcher et al [10], Foss et al [11], Haddad et al [12], Monzon et al [13], Mouzopoulos et al [14], and Yun et al [15]) and one moderate strength study (Matot, 2003 [16]) showed beneficial outcomes. Six studies inclusive of 593 patients used a prospective randomized clinical trial design to assess the effect of regional analgesia in reducing preoperative pain after hip fracture upon presentation to the emergency department (Fletcher et al [10], Foss et al [11], Haddad et al [12], Monzon et al [13], Mouzopoulos et al, and Yun et al [15]). These studies all used a technique of administration of a local anesthetic that results in temporary loss of nerve function in the fascia iliaca or femoral compartment of the injured hip. In each study the patients who received this agent reported significant reduction in reported preoperative pain on a visual analog scale. One of these studies reported improved reported pain at time of administering spinal anesthesia.

The administration of regional analgesia in these six studies was performed by a different group of providers in each study including: emergency physicians, anesthesiologists, and orthopaedic surgeons (Fletcher et al [10], Foss et al [11], Haddad et al [12], Monzon et al [13], Mouzopoulos et al [14], and Yun et al [15]). All the providers who were administering the analgesia were trained in performance of the specific technique before the study began. One study found the technique for this type of regional analgesia administration can be successfully taught to medical providers who were inexperienced in these skills (Fletcher et al [10]).

In all of these trials pain recorded with a visual analog score is a reported outcome (Fletcher et al [10], Foss et al [11], Haddad et al [12], Matot, et al [16], Monzon et al [13], Mouzopoulos et al [14], and Yun et al [15]). Reported outcomes in five of the trials were limited to the preoperative episode of care for the studies patients (Fletcher et al [10], Foss et al [11], Haddad et al [12], Monzon et al [13], and Yun et al[15]).

Two trials reported effects beyond this initial preoperative period. One trial reported a reduction in the incidence of postoperative delirium in addition to a reduction in preoperative pain levels in the population who received regional analgesia. Incidence of delirium with the regional analgesia group was 11% (11/102) and 24% (25/105) in the control group [relative risk 0.45, 95% CI 0.23-0.87] (Mouzopoulos et al [14]). The seventh study reported the use of epidural anesthesia administered preoperatively in hip fracture patients with known cardiac disease or who were at high risk for cardiac disease was associated with reduction of preoperative myocardial ischemia events; Adverse preoperative cardiac events occurred in 7 of 34 patients in the control group and 0 of 34 patients in the treatment group [p = 0.01] (Matot et al [16]).

No complications were reported in these studies using a technique of administration of a numbing agent that results in temporary loss of nerve function in the femoral compartment of the injured hip. However, the consideration of standard risks and benefits of these techniques should be considered when implementing this recommendation.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Risks are equal to those of any regional anesthesia technique.

FUTURE RESEARCH

The studies available to date report improved pain scores preoperatively. Future research should focus on the impact of early regional analgesic technique on patient outcome. Several important outcomes need to be studied: assessment of total opioid usage pre- and post-op, incidence of delirium during hospital stay, and length of stay; There may be others.

RESULTS

QUALITY AND APPLICABILITY

Table 15. Quality Table of Treatment Studies for Preoperative Regional Analgesia

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Monzon et al 2010	VAS Pain Scale	●	●	●	○	●	●	●	High	○	○	●	○	Moderate	High
Mouzopoulos et al 2009	Severity of Delirium (DRSR-98)	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mouzopoulos et al 2009	Duration of Delirium (days)	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High
Yun et al 2009	VAS Pain Scale	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Yun et al 2009	Time to Anesthesia Induction (min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Yun et al 2009	Time to Perform Spinal Blockade (min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain on 15 deg leg lift (60 min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	Block Success (15° Leg Movement)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High

Table 15. Quality Table of Treatment Studies for Preoperative Regional Analgesia

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Foss et al 2007	Pain on 15° Leg Movement	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	Maximum pain relief on movement elicited pain	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain on 15 deg leg lift (180 min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain at Rest (30 Min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	5 pt Verbal Ranking Scale Overall pain relief (after 30 min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain on repositioning pt in bed	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	5pt Verbal Ranking Scale Discomfort	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain on 15 deg leg lift (30 Min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Maximum pain	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High

Table 15. Quality Table of Treatment Studies for Preoperative Regional Analgesia

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
	relief at rest														
Foss et al 2007	Block Success (Max Pain Relief on vas)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain at Rest (60 Min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	10 pt Verbal Ranking Scale Pain at Rest (180 Min)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	Received Supplementary Opioids	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Foss et al 2007	Sedation	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Haddad et al 1995	VAS Pain Scale	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Mortality	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Skin Breakdown	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High

Table 15. Quality Table of Treatment Studies for Preoperative Regional Analgesia

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Haddad et al 1995	Respiratory Infection	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Proven DVT	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Wound Infection	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Cardiovascular Complication	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Haddad et al 1995	Urinary tract infection	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Fletcher et al 2003	Pain numeric rating scale (0-3)	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Fletcher et al 2003	Mortality	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Matot et al 2003	Cardiac events	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Matot et al 2003	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

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Table 16. Regional Analgesia Versus Control: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2007	Block Success (Max Pain Relief)	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	Risk ratio	16.00	0.01	N/A	Favors FICB
Foss et al 2007	Received Supplementary Opioids	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	Risk ratio	1.00	1.00	N/A	NS
Foss et al 2007	Pain on 15° Leg Movement	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 1.00	NS
Foss et al 2007	10 pt VRS Pain on repositioning pt in bed	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.18	NS
Foss et al 2007	5 pt VRS Overall pain relief (after 30 min)	30 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.09	NS
Foss et al 2007	10 pt VRS Maximum pain relief at rest	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p< 0.01	Favors FICB
Foss et al 2007	Maximum pain relief on movement elicited pain	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.02	Favors FICB
Foss et al 2007	4 pt VRS Overall Pain Relief at Rest (30 min after block placement)	30 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	NR	NR
Foss et al 2007	10 pt VRS Pain on 15 deg leg lift (30 Min)	30 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.32	NS
Foss et al 2007	10 pt VRS Pain on 15 deg leg lift (60 min)	60 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.06	NS

Table 16. Regional Analgesia Versus Control: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2007	10 pt VRS Pain on 15 deg leg lift (180 min)	180 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.04	Favors FICB
Foss et al 2007	10 pt VRS Pain at Rest (30 Min)	30 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.06	NS
Foss et al 2007	10 pt VRS Pain at Rest (60 Min)	60 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.01	Favors FICB
Foss et al 2007	10 pt VRS Pain at Rest (180 Min)	180 min	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.03	Favors FICB
Haddad et al 1995	Analgesic Score Preblock	Immediate	Femoral Nerve Block	Systemic Analgesia	45	Mean difference	0.30	-	NR	NS
Haddad et al 1995	Analgesic Score 15 minutes	15 minutes	Femoral Nerve Block	Systemic Analgesia	45	Mean difference	-1.60	-	p< 0.05	Favors Systemic Analgesia
Haddad et al 1995	Analgesic Score 2 Hours	2 Hours	Femoral Nerve Block	Systemic Analgesia	45	Mean difference	-2.20	-	p< 0.01	Favors Systemic Analgesia
Haddad et al 1995	Analgesic Score 8 Hours	8 Hours	Femoral Nerve Block	Systemic Analgesia	45	Mean difference	-0.80	-	NR	NS
Haddad et al 1995	Oral Analgesia Request	Within 24 Hours	Femoral Nerve Block	Systemic Analgesia	45	Risk ratio	0.88	0.83	N/A	NS
Haddad et al 1995	Voltarol Analgesia Request	Within 24 Hours	Femoral Nerve Block	Systemic Analgesia	45	Risk ratio	0.68	0.34	N/A	NS
Haddad et al 1995	IM Opiate	Within 24 Hours	Femoral Nerve Block	Systemic Analgesia	45	Risk ratio	0.30	0.00	N/A	Favors Systemic Analgesia
Monzon et al 2010	10 cm VAS pain	Baseline	Fascia Iliaca Block with Bupivacaine	Fascia Iliaca Block with IV NSAID	154	Mean difference	-0.90	0.59	N/A	NS
Monzon et al 2010	10 cm VAS pain	15 minutes	Fascia Iliaca Block with Bupivacaine	Fascia Iliaca Block with IV NSAID	154	Mean difference	3.34	0.00	N/A	Favors Bupivacaine
Monzon et al 2010	10 cm VAS pain	2 Hours	Fascia Iliaca Block with Bupivacaine	Fascia Iliaca Block with IV NSAID	154	Mean difference	-0.52	0.74	N/A	NS

Table 16. Regional Analgesia Versus Control: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Monzon et al 2010	10 cm VAS pain	8 Hours	Fascia Iliaca Block with Bupivacaine	Fascia Iliaca Block with IV NSAID	154	Mean difference	-2.37	0.08	N/A	NS
Fletcher et al 2003	Pain numeric rating scale	24 hours	3-in-1 Femoral Nerve Block	Intravenous Morphine	50	Mean difference	-0.77	-	<.05	Favors block
Yun et al 2009	Visual Analogue Pain Scale (VAS) 10cm	Preop	Fascia Iliaca Compartment Block (FIC)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	0.00	1.00	N/A	NS
Yun et al 2009	Visual Analogue Pain Scale (VAS) 10cm	Positioning for spinal anesthesia	Fascia Iliaca Compartment Block (FICB)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	-1.90	0.00	N/A	Favors FICB
Yun et al 2009	Visual Analogue Pain Scale (VAS) 10cm	6 hours	Fascia Iliaca Compartment Block (FICB)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	-0.70	0.34	N/A	NS
Yun et al 2009	Visual Analogue Pain Scale (VAS) 10cm	24 hours	Fascia Iliaca Compartment Block (FICB)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	-0.50	0.10	N/A	NS

Table 17. Fascia Iliaca Compartment Blockade (FICB) Versus Systemic Morphine

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2007	Block Success (15° Leg Movement)	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.04	Favors FICB

Table 18. Regional Analgesia Versus Control: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Haddad et al 1995	Mortality	Immediate	Femoral Nerve Block	Systemic Analgesia	45	Risk ratio	0.25	0.20	N/A	NS

Table 18. Regional Analgesia Versus Control: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Matot et al 2003	Pre-op death	Preop	Epidural Group	Control	68	% risk difference	-11.8	0.00	N/A	Favors Epidural

Table 19. Regional Analgesia Versus Control: Other Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2007	Sedation	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	Risk ratio	0.17	0.09	N/A	NS
Foss et al 2007	5pt VRS Discomfort	Immediate	Fascia Iliaca Compartment Blockade (FICB)	Systemic Morphine	48	N/A	-	-	p= 0.37	NS
Yun et al 2009	Time to Perform Spinal Blockade (min)	Varied	Fascia Iliaca Compartment Block (FICB)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	-3.90	0.01	N/A	Favors FICB
Yun et al 2009	Time to Anesthesia Induction (min)	Varied	Fascia Iliaca Compartment Block (FICB)	IV Analgesia with Alfentanil (IVA)	40	Mean difference	15.60	0.00	N/A	Favors FICB
Mouzopoulos et al 2009	Severity of Delirium (DRSR-98)	Perioperative period	FICB Prophylaxis Group	Placebo Group	219	Mean difference	-4.27	0.00	N/A	Favors FICB Group
Mouzopoulos et al 2009	Duration of Delirium (days)	Varied	FICB Prophylaxis Group	Placebo Group	219	Mean difference	-5.75	0.00	N/A	Favors FICB Group
Matot et al 2003	Cardiac Events	Preop	Epidural Group	Control	68	% risk difference	-20.59	0.01	N/A	Favors Epidural
Matot et al 2003	Cardiac Events	Postop	Epidural Group	Control	68	Risk ratio	0.50	0.40	N/A	NS

PREOPERATIVE TRACTION

Moderate evidence does not support routine use of preoperative traction for patients with a hip fracture.

Strength of Recommendation: Moderate 

RATIONALE

Seven moderate strength studies (Anderson et al [17], Finsen et al [18], Needoff et al [19], Resch et al [20], Rosen et al [21], Saygi et al [22], Yip et al [23]) compared skin traction to no traction. There was no difference noted between the two groups with regard to decreased pain or decreased doses of analgesia administered. A meta-analysis of the data showed that preoperative traction offered no benefit to hip fracture patients.

One high strength study (Resch et al [24]) showed no difference in pain alleviation and number of analgesics administered when comparing skeletal traction to skin traction in hip fracture patients. However, half of the patients in the skeletal traction group found the application of skeletal traction to be painful.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms of implementing this recommendation.

FUTURE RESEARCH

Future research regarding preoperative modalities to minimize patient pain should be continued to be investigated.

RESULTS

QUALITY AND APPLICABILITY

Table 20. Quality Table of Treatment Studies for Preoperative Traction

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Anderson et al 1993	VAS Pain	●	○	○	○	●	●	●	Moderate	●	●	●	○	Moderate	Moderate
Anderson et al 1993	Analgesic doses	●	○	○	○	●	●	●	Moderate	●	●	●	○	Moderate	Moderate
Finsen et al 1992	Complications: Intraoperative bleeding (in ml)	●	○	●	○	●	○	○	Moderate	○	○	●	●	Moderate	Moderate
Finsen et al 1992	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Needoff et al 1993	Pain: 0-100 pain score (100 maximum)	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Needoff et al 1993	Pain: analgesia consumption	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Resch et al 1998	VAS Pain	●	○	●	●	●	●	●	High	●	○	●	●	Moderate	High
Resch et al 1998	Pain: doses of analgesics	●	○	●	●	●	○	●	High	●	○	●	●	Moderate	High

Table 20. Quality Table of Treatment Studies for Preoperative Traction

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Resch et al 2005	VAS Pain	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Resch et al 1998	Pain: doses of analgesics	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Rosen et al 2001	Pain: VAS score average reduction from baseline	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Rosen et al 2001	Pain: patients reporting the intervention as a painful experience	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Rosen et al 2001	Pain: patients requesting pain medication at a rate of 2.44+ doses/24hrs	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Rosen et al 2001	Pain: patients requesting no pain medication before surgery	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Saygi et al 2010	VAS Pain	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 20. Quality Table of Treatment Studies for Preoperative Traction

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Yip et al 2002	Pain: visual analogue scale	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Yip et al 2002	Blood loss ml	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate

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Table 21. Traction Versus No Traction: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Anderson et al 1993	VAS Pain	Admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	1 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	2 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	3 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	4 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	5 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	6 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	VAS Pain	7 Day after admission	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS

Table 21. Traction Versus No Traction: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Anderson et al 1993	Pain: Analgesia doses	Day 1	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	Pain: Analgesia doses	Day 2	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Anderson et al 1993	Pain: Analgesia doses	Day 3	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	N/A	-	-	>.05	NS
Needoff et al 1993	Pain: 0-100 pain score (100 maximum)	1 Day	Skin traction with 2.5 kg	No preoperative traction	60	Mean difference	0.40	-	>.05	NS
Needoff et al 1993	Pain: 0-100 pain score (100 maximum)	2 Days	Skin traction with 2.5 kg	No preoperative traction	60	Mean difference	14.80	-	>.05	NS
Needoff et al 1993	Pain: analgesia consumption	1st 24 hrs	Skin traction with 2.5 kg	No preoperative traction	60	Mean difference	4.60	-	<.05	Favors no traction
Needoff et al 1993	Pain: analgesia consumption	2nd 24 hrs	Skin traction with 2.5 kg	No preoperative traction	60	Mean difference	1.20	-	>.05	NS
Resch et al 1998	VAS Pain	30 minutes after traction application	Skeletal traction with K-wire through proximal tibia, 30deg flexion and weight of 5-10% patient's body weight (approx 3-5kg)	No preoperative traction	68	Mean difference	-0.10	0.79	N/A	NS

Table 21. Traction Versus No Traction: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Resch et al 1998	Pain: doses of analgesics	While in orthopedic ward	Skeletal traction with K-wire through proximal tibia, 30deg flexion and weight of 5-10% patient's body weight (approx 3-5kg)	No preoperative traction	183	Mean difference	-0.80	0.01	N/A	Favors traction
Resch et al 1998	Pain: doses of analgesics	While in emergency department	Skeletal traction with K-wire through proximal tibia, 30deg flexion and weight of 5-10% patient's body weight (approx 3-5kg)	No preoperative traction	183	Mean difference	0.00	1.00	N/A	NS
Resch et al 2005	VAS Pain	After immobil.	Skin Traction	Lasse pillow	70	Mean difference	0.10	0.88	N/A	NS
Resch et al 2005	VAS Pain	After immobil.	Skin Traction	Regular pillow	102	Mean difference	0.50	0.26	N/A	NS
Resch et al 1998	Pain: doses of analgesics	While in orthopedic ward	Skin Traction	Regular pillow	102	Mean difference	-0.20	0.69	N/A	NS
Resch et al 1998	Pain: doses of analgesics	While in emergency department	Skin Traction	Regular pillow	102	Mean difference	0.20	0.10	N/A	NS
Resch et al 1998	Pain: doses of analgesics	While in orthopedic ward	Skin Traction	Lasse pillow	59	Mean difference	-0.80	0.08	N/A	NS
Resch et al 1998	Pain: doses of analgesics	While in emergency department	Skin Traction	Lasse pillow	59	Mean difference	0.20	0.28	N/A	NS
Rosen et al 2001	Pain: VAS score	15 minutes after intervention	Skin traction with foam rubber boot and 5lbs weight	Pillow	100	Mean difference	-0.20	0.60	N/A	NS
Rosen et al 2001	Pain: VAS score average reduction from baseline	Morning after intervention	Skin traction with foam rubber boot and 5lbs weight	Pillow	100	Mean difference	-1.06	-	.04	Favors pillow

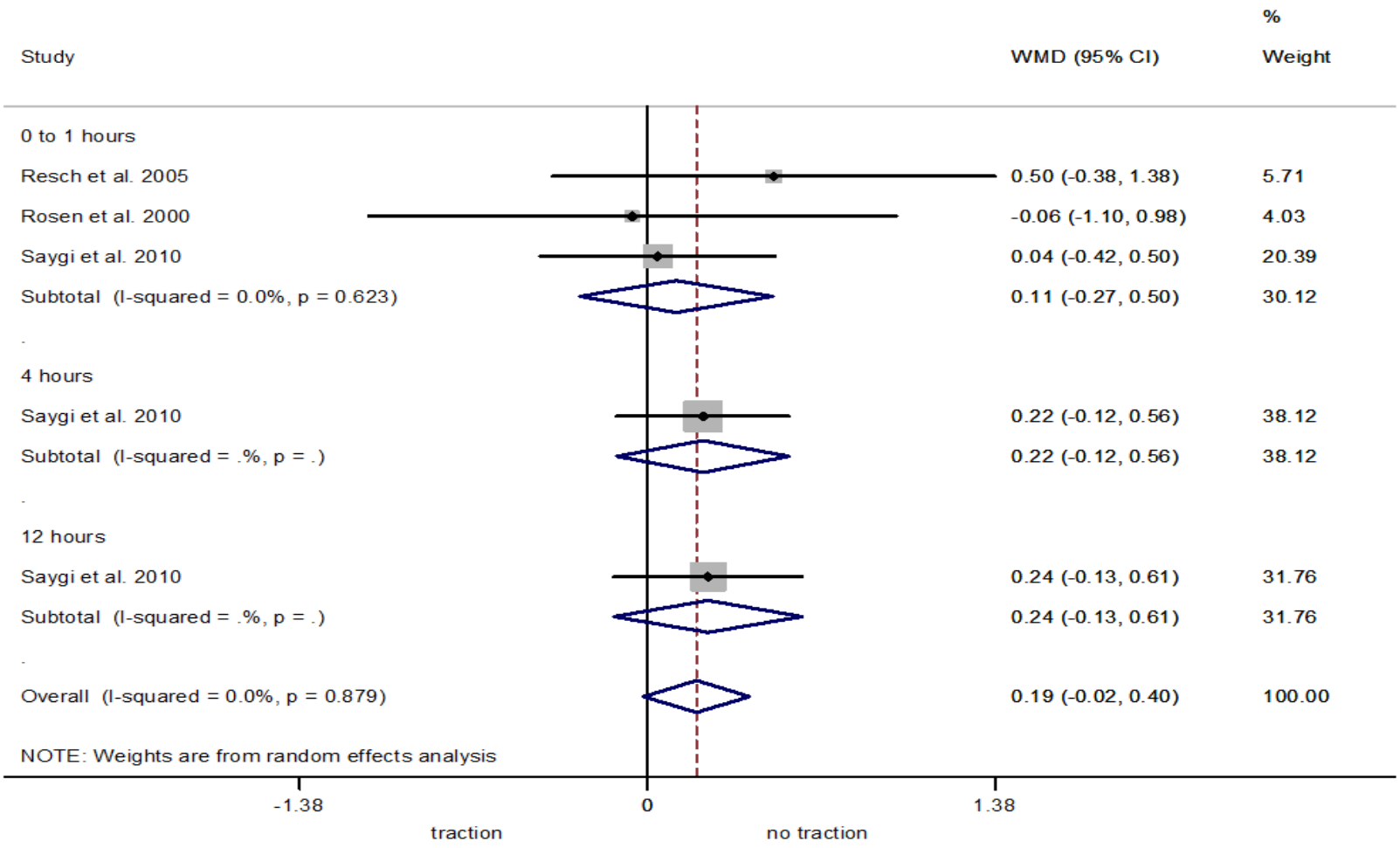
Table 21. Traction Versus No Traction: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Rosen et al 2001	Pain: patients reporting the intervention as a painful experience	Unclear	Skin traction with foam rubber boot and 5lbs weight	Pillow	100	Risk ratio	1.59	0.05	N/A	NS
Rosen et al 2001	Pain: patients requesting pain medication at a rate of 2.44+ doses/24hrs	Group1: 1.31 days Group2: 1.20 days	Skin traction with foam rubber boot and 5lbs weight	Pillow	100	Risk ratio	1.78	0.01	N/A	Favors pillow
Rosen et al 2001	Pain: patients requesting no pain medication before surgery	Group1: 1.31 days Group2: 1.20 days	Skin traction with foam rubber boot and 5lbs weight	Pillow	100	Risk ratio	0.45	0.12	N/A	NS
Saygi et al 2010	VAS Pain	1 hour	Skin Traction	Pillow	72	Mean difference	0.04	0.87	N/A	NS
Saygi et al 2010	VAS Pain	4 hours	Skin Traction	Pillow	72	Mean difference	0.22	0.21	N/A	NS
Saygi et al 2010	VAS Pain	12 hours	Skin Traction	Pillow	72	Mean difference	0.24	0.21	N/A	NS
Yip et al 2002	Pain: visual analogue scale	Day 1	Preoperative Foam boot traction with 2 kg weight	Pillow	311	N/A	-	-	>.05	NS
Yip et al 2002	Pain: visual analogue scale	Day 2	Preoperative Foam boot traction with 2 kg weight	Pillow	311	N/A	-	-	>.05	NS

Table 22. Traction Versus No Traction: Other Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Anderson et al 1993	Hospital Stay: in days	Varying	Preoperative Hamilton-Russell skin traction with 2.3kg weight	No traction	252	Mean difference	1.20	0.24	N/A	NS
Finsen et al 1992	Complications: Intraoperative bleeding (in ml)	In surgery	Cervical fracture with preoperative skeletal traction and 10% of patient's body weight	Pillow	31	Mean difference	50.00	-	<.01	Favors pillow
Finsen et al 1992	Complications: Intraoperative bleeding (in ml)	In surgery	Cervical fracture with preoperative skin traction with 3kg weight	Pillow	30	Mean difference	0.00	-	>.05	NS
Finsen et al 1992	Complications: Intraoperative bleeding (in ml)	In surgery	Trochanteric fracture with preoperative skeletal traction with 10% patient's body weight	Pillow	20	Mean difference	150.00	-	<.01	Favors pillow
Yip et al 2002	Blood loss ml	In surgery	Preoperative Foam boot traction with 2 kg weight	Pillow	311	Mean difference	29.00	0.19	N/A	NS
Finsen et al 1992	Mortality	Preoperative	Skin or skeletal traction	Pillow	73	% risk difference	-7.69	0.08	N/A	NS

Figure 1. Meta-Analysis Traction Versus No Traction: VAS Pain



SURGICAL TIMING

Moderate evidence supports that hip fracture surgery within 48 hours of admission is associated with better outcomes.

Strength of Recommendation: Moderate 

RATIONALE

Nine moderate strength studies evaluated patient outcomes in relation to timing of hip fracture surgery (Elliot et al [25], Fox et al [26], McGuire et al [27], Moran et al [28], Novack et al [29], Orosz et al [30], Parker et al [31], Radcliff et al [32], Siegmeth et al [33]). In many of these studies the presence of increased comorbidities represented a confounding effect, and therefore delays for medical reasons were often excluded.

The majority of studies favored improved outcomes in regards to mortality, pain, complications, or length of stay (Elliot et al [25], McGuire et al [27], Novack et al [29], Orosz et al [30], Parker et al [31], and Siegmeth et al [33]). Although several studies showed a benefit of surgery within 48 hours, one study showed no harm with a delay up to four days for patients fit for surgery who were not delayed for medical reasons (Moran et al [28]). Patients delayed due to medical reasons had the highest mortality and it is this subset of patients that could potentially benefit the most from earlier surgery.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation.

FUTURE RESEARCH

Future research improving controls for bias relating to increased medical severity of patients delayed for surgery is needed to better identify critical timing related issues regarding patient specific populations.

RESULTS

QUALITY AND APPLICABILITY

Table 23. Quality Table of Treatment Studies for Surgical Timing

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Elliott et al 2003	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Fox et al 1994	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Fox et al 1994	Length of Hospital Stay (days)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
McGuire et al 2004	Mortality	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Moran et al 2005	Mortality	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Novack et al 2007	Mortality	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Novack et al 2007	Readmission	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Orosz et al 2004	Mean pain score (1-5)	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate
Orosz et al 2004	Number of days of severe pain	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate

Table 23. Quality Table of Treatment Studies for Surgical Timing

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Orosz et al 2004	Mean Length of Stay (days)	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate
Orosz et al 2004	FIM locomotion	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate
Orosz et al 2004	FIM self-care	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate
Orosz et al 2004	FIM transfers	●	○	●	○	●	○	●	Moderate	○	○	●	●	Moderate	Moderate
Parker et al 1992	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Parker et al 1992	Mean total hospital stay (days)	●	○	●	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Radcliff et al 2008	Mortality	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Radcliff et al 2008	Readmission	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Radcliff et al 2008	Complications	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Siegmeth et al 2005	Return to Original Residence	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

Table 23. Quality Table of Treatment Studies for Surgical Timing

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Siegmeth et al 2005	Change in Residence	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Siegmeth et al 2005	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Siegmeth et al 2005	Mean Hospital Stay In Days	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

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Table 24. Surgical Time: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Elliott et al 2003	Mortality	1 year	<1 day	1-<3 days	1389	Risk ratio	0.40	0.00	N/A	Favors<1 day
Elliott et al 2003	Mortality	1 year	<1 day	3-<5 days	1389	Risk ratio	0.45	0.00	N/A	Favors<1 day
Elliott et al 2003	Mortality	1 year	<1 day	5-<10 days	1389	Risk ratio	0.28	0.00	N/A	Favors<1 day
Elliott et al 2003	Mortality	1 year	<1 day	> 10 days	1389	Risk ratio	0.13	0.00	N/A	Favors<1 day
Elliott et al 2003	Mortality	1 year	1<3 days	3-<5 days	1389	Risk ratio	1.11	0.42	N/A	NS
Elliott et al 2003	Mortality	1 year	1-< 3 days	5- <10 days	1389	Risk ratio	0.69	0.00	N/A	Favors 1-< 3 days
Elliott et al 2003	Mortality	1 year	1-<3 days	> 10 days	1389	Risk ratio	0.33	0.00	N/A	Favors 1-< 3 days
Elliott et al 2003	Mortality	1 year	3-<5 days	5-<10 days	1389	Risk ratio	0.62	0.00	N/A	Favors 3-< 5 days
Elliott et al 2003	Mortality	1 year	3-<5 days	>10 days	1389	Risk ratio	0.30	0.00	N/A	Favors 3-< 5 days
Elliott et al 2003	Mortality	1 year	5-<10 days	> 10 days	1389	Risk ratio	0.47	0.00	N/A	Favors 5-< 10 days
Fox et al 1994	Mortality	In hospital	Within 24 hours	Greater than 24 hours	142	N/A	-	-	p=0.04	Within 24 hours
McGuire et al 2004	Adjusted Mortality	30 days	< 1 day	Delay >1 day	18209	N/A	-	-	p=0.981	NS
McGuire et al 2004	Adjusted Mortality	30 days	< 1 day	Delay >2 days	18209	N/A	-	-	p=0.02	< 1 day
McGuire et al 2004	Adjusted Mortality	30 days	< 1 day	Delay >3 days	18209	N/A	-	-	p=0.048	NS
Moran et al 2005	Mortality	30 days	Early (< 24 hours)	Delayed (>24 hours)	2148	Risk ratio	1.19	0.24	N/A	NS
Novack et al 2007	Mortality	In hospital	< 2 days	2-4 days	3211	Risk ratio	1.02	0.93	N/A	NS
Novack et al 2007	Mortality	1 month	< 2 days	2-4 days	3211	Risk ratio	0.91	0.62	N/A	NS

Table 24. Surgical Time: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Novack et al 2007	Mortality	1 year	< 2 days	2-4 days	3211	Risk ratio	0.84	0.03	N/A	Favors < 2 days
Novack et al 2007	Mortality	In hospital	< 2 days	>4 days	3069	Risk ratio	0.62	0.03	N/A	Favors < 2 days
Novack et al 2007	Mortality	1 month	< 2 days	>4 days	3069	Risk ratio	0.66	0.02	N/A	Favors < 2 days
Novack et al 2007	Mortality	1 year	< 2 days	>4 days	3069	Risk ratio	0.67	0.00	N/A	Favors < 2 days
Novack et al 2007	Mortality	In hospital	2-4 days	>4 days	1350	Risk ratio	2.05	0.00	N/A	Favors >4 days
Novack et al 2007	Mortality	1 month	2-4 days	>4 days	1350	Risk ratio	2.17	0.00	N/A	Favors >4 days
Novack et al 2007	Mortality	1 year	2-4 days	>4 days	1350	Risk ratio	2.20	0.00	N/A	Favors >4 days
Parker et al 1992	Mortality	30 days	Early Group (<48 hours)	Late Group (>48 hours)	468	Risk ratio	.68	.395	N/A	NS
Parker et al 1992	Mortality	1 year	Early Group (<48 hours)	Late Group (>48 hours)	468	Risk ratio	.58	.014	N/A	<48 hours
Radcliff et al 2008	Mortality	30 days	Surgery less than 4 days	Surgery on or after 4 days	5683	Odds ratio 95%CI	.78(.62,.98)	-	<.05	Favors surgery before day 4
Smektala et al 2007	Mortality	In hospital	<24 Hours	>24 hours	2325	Odds Ratio	0.95	N/A	>.05	NS
Smektala et al 2007	Mortality	1 year	<24 Hours	>24 hours	2325	Odds Ratio	0.92	N/A	>.05	NS
Siegmeth et al 2005	Mortality	1 year	Early Group (<48 hours)	Delayed Group (>48 hours)	3628	N/A	-	-	p<0.001	Favors <48 hours

Table 25. Surgical Time: Functional Status

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Orosz et al 2004	FIM locomotion	6 months	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	0.14	-	p= 0.559	NS
Orosz et al 2004	FIM self-care	6 months	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	-1.04	-	p=0.081	NS
Orosz et al 2004	FIM transfers	6 months	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	-0.50	-	p= 0.132	NS

Table 26. Surgical Time: Length of Hospital Stay

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Fox et al 1994	Length of Hospital Stay (days)	Varied	Day 0,1	Day 2	142	Mean difference	-7.50	-	p<0.01	Day 0,1
Orosz et al 2004	Mean Length of Stay (days)	Varied	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	-1.46	-	p= 0.000	Favors <24 Hours
Parker et al 1992	Mean total hospital stay (days)	Varied	Early Group (<48 hours)	Late Group (>48 hours)	468	Mean difference	-9.00	-	p= 0.06	NS
Siegmeth et al 2005	Mean Hospital Stay In Days	Varied	Early Group (<48 hours)	Delayed Group (>48 hours)	3628	Mean difference	-14.90	-	p<0.0001	Early Group (<48 hours)

Table 27. Surgical Time: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Orosz et al 2004	Mean pain score (1-5)	Hospital day 1-5	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	-0.30	-	p= 0.016	Early (< 24 hours)
Orosz et al 2004	Number of days of severe pain	Hospital day 1-5	Early (< 24 hours)	Late (>24 hours)	1178	Mean difference	-0.29	-	p= 0.013	Early (< 24 hours)

Table 28. Surgical Time: Residence

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Siegmeth et al 2005	Return to Original Residence	1 year	Early Group (<48 hours)	Delayed Group (>48 hours)	3628	N/A	-	-	p<0.0001	Early Group (<48 hours)
Siegmeth et al 2005	Change in Residence	1 year	Early Group (<48 hours)	Delayed Group (>48 hours)	3628	N/A	-	-	p<0.0007	Early Group (<48 hours)

Table 29. Surgical Time Complications and Hospital Readmission

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Novack et al 2007	Readmission	1 month	< 2 days	2-4 days	3211	Risk ratio	0.80	0.05	N/A	NS
Novack et al 2007	Readmission	1 month	< 2 days	>4 days	3069	Risk ratio	0.74	0.01	N/A	Favors < 2 days
Novack et al 2007	Readmission	1 month	2-4 days	>4 days	1350	Risk ratio	2.43	0.00	N/A	Favors >4 days
Radcliff et al 2008	Readmission	30 days	Surgery before day 4	Surgery on or after day 4	5683	Odds ratio 95%CI	.70(.54,.91)	-	<.05	Favors surgery after day 4
Radcliff et al 2008	Complications	30 days	Same day	Next Day	5683	Odds ratio	1.02	-	<.05	NS
Smektala et al 2007	DVT	1 year	<24 Hours	>24 hours	2325	Odds Ratio	0.89	N/A	>.05	NS

Table 29. Surgical Time Complications and Hospital Readmission

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Smektala et al 2007	Pneumonia	1 year	<24 Hours	>24 hours	2325	Odds Ratio	0.68	N/A	>.05	NS
Smektala et al 2007	Urinary tract infection	1 year	<24 Hours	>24 hours	2325	Odds Ratio	0.84	N/A	>.05	NS
Smektala et al 2007	Decubitus ulcers	1 year	<24 Hours	>24 hours	2325	Odds Ratio	0.33	N/A	<.05	Favors <24 hours

ASPIRIN AND CLOPIDOGREL

Limited evidence supports not delaying hip fracture surgery for patients on aspirin and/or clopidogrel.

Strength of Recommendation: Limited ★★☆☆

RATIONALE

Six low-strength studies (Chechik et al[34]; Maheshwari et al [35]; Manning et al [36]; Thaler et al [37]; Hossain et al [38]) showed either no difference in outcome or favored not delaying hip fracture surgery in patients on antiplatelet (clopidogrel and/or aspirin) therapy. Previously, some surgeons have delayed surgery for hip fracture patients on Aspirin and / or clopidogrel. This systematic review suggests at worse that there is no advantage to this practice or that in fact the advantage is for patients where surgery is not delayed. The benefit of implementing this recommendation is preventing an unnecessary (unhelpful) delay in performing hip fracture surgery.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

As with all surgical procedures, there are potential risks and complications, including, but not limited to, the possibility of bleeding. There is no data suggesting patient outcome harms will occur with implementation of this recommendation.

FUTURE RESEARCH

Future research with regard to risks and benefits of delayed surgery should include patient oriented outcome measures such as death, return to prior living situation and treatment complications such as transfusions, wound infections and return to operating room. Some of these factors may be addressed with treatment registries. It is also appropriate to address the risks and benefits of delayed surgery for patients on antiplatelet medication specific to this patient population and to quantify risks of those who are on these medicines (e.g. bleeding, transfusions, etc). Appropriately targeted randomized trials would be helpful.

RESULTS

QUALITY AND APPLICABILITY

Table 30. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Chechik et al 2012	Mortality	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: ACS	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: CVA	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: Sepsis	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: Pneumonia	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: Pulmonary Oedema	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: PE	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: Decubitus ulcer	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Complication: GI bleeding	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low

Table 30. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Chechik et al 2012	Complication: wound bleeding	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Require blood transfusion	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Chechik et al 2012	Hospitalization time (hours)	○	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Hossain et al 2013	Transfusion given	○	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Hossain et al 2013	Hematoma	○	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Hossain et al 2013	Wound infection	○	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Hossain et al 2013	Reoperation	○	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Honkonen et al 1971	Complications	○	○	○	○	●	●	○	Low	●	●	●	●	High	Low
Honkonen et al 1971	Severe Hypotension	○	○	○	○	●	●	○	Low	●	●	●	●	High	Low
Honkonen et al 1971	Moderate Hypotension	○	○	○	○	●	●	○	Low	●	●	●	●	High	Low

Table 30. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Honkonen et al 1971	Slight Hypotension	○	○	○	○	●	●	○	Low	●	●	●	●	High	Low
Honkonen et al 1971	Disturbances of Heart Rhythm	○	○	○	○	●	●	○	Low	●	●	●	●	High	Low
Honkonen et al 1971	Mortality	○	○	○	○	●	●	○	Low	●	●	●	●	High	Moderate
Maheshwari et al 2011	Mortality (delay to surgery is treated as a continuous predictor of mortality in a survival analysis)	●	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Manning et al 2003	Require blood transfusion	●	○	○	○	○	●	○	Low	○	○	●	○	Moderate	Low
Thaler et al 2010	Major Bleeding	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Major Bleeding	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Red blood cell units transfused in 24 hours	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Red blood cell units transfused in 24 hours	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low

Table 30. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Thaler et al 2010	Total red blood cell units transfused	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Total red blood cell units transfused	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Blood drainage (ml)	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Blood drainage (ml)	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Mortality	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Mortality	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Major Bleeding	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low
Thaler et al 2010	Major Bleeding	●	○	●	○	○	○	○	Low	○	○	●	●	Moderate	Low

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Table 31. Aspirin or Clopidogrel Early Versus Delayed Treatment

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study reported p value	Favors
Chechik et al 2012	Mortality, in hospital	Varied	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	-6.67	0.12	N/A	NS
Chechik et al 2012	Mortality, within 1st year	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	0.67	0.38	N/A	NS
Chechik et al 2012	Complication: ACS	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	3.00	0.33	N/A	NS
Chechik et al 2012	Complication: CVA	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	1.00	1.00	N/A	NS
Chechik et al 2012	Complication: Sepsis	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	0.67	0.64	N/A	NS
Chechik et al 2012	Complication: Pneumonia	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	2.00	0.40	N/A	NS
Chechik et al 2012	Complication: Pulmonary Oedema	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	-10.0	0.05	N/A	NS
Chechik et al 2012	Complication: PE	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	-3.33	0.27	N/A	NS
Chechik et al 2012	Complication: Decubitus ulcer	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	-3.33	0.27	N/A	NS
Chechik et al 2012	Complication: GI bleeding	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	-10.0	0.05	N/A	NS
Chechik et al 2012	Complication: wound bleeding	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	% risk difference	3.33	0.27	N/A	NS
Chechik et al 2012	Require blood transfusion	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Risk ratio	0.67	0.38	N/A	NS
Chechik et al 2012	Hospitalization time (hours)	12	Clopidogrel, early treatment	Clopidogrel, delayed treatment	60	Mean difference	-159	0.00	N/A	Favors Clopidogrel, early treatment

Table 31. Aspirin or Clopidogrel Early Versus Delayed Treatment

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study reported p value	Favors
Maheshwari et al 2011	Mortality (delay to surgery is treated as a continuous predictor of mortality in a survival analysis)	1 year	Longer delays	Shorter delays	30	Hazard Ratio	1.357	<.05	N/A	Longer delays associated with higher mortality
Manning et al 2003	Require blood transfusion	24 hours	Aspirin	No aspirin	89	Risk ratio	2.14	0.04	N/A	Favors no aspirin
Thaler et al 2010	Major Bleeding	Unclear	Aspirin no delay	No platelet inhibitors, no delay	440	Risk ratio	0.86	0.81	N/A	NS
Thaler et al 2010	Major Bleeding	Unclear	Clopidogrel, no delay	No platelet inhibitors, no delay	364	% Risk difference	2.9	.378	N/A	NS
Thaler et al 2010	Red blood cell units transfused in 24 hours	24 hours	Aspirin no delay	No platelet inhibitors, no delay	440	Mean difference	.2	.24	N/A	NS
Thaler et al 2010	Red blood cell units transfused in 24 hours	24 hours	Clopidogrel, no delay	No platelet inhibitors, no delay	364	Mean difference	-.3	.36	N/A	NS
Thaler et al 2010	Total red blood cell units transfused	Unclear	Aspirin no delay	No platelet inhibitors, no delay	440	Mean difference	-.1	.83	N/A	NS
Thaler et al 2010	Total red blood cell units transfused	Unclear	Clopidogrel, no delay	No platelet inhibitors, no delay	364	Mean difference	-.8	.96	N/A	NS
Thaler et al 2010	Blood drainage (ml)	Unclear	Aspirin no delay	No platelet inhibitors, no delay	440	Mean difference	1	.98	N/A	NS
Thaler et al 2010	Blood drainage (ml)	Unclear	Clopidogrel, no delay	No platelet inhibitors, no delay	364	Mean difference	14	.88	N/A	NS
Thaler et al 2010	Mortality	Unclear	Aspirin no delay	No platelet inhibitors, no delay	440	Risk ratio	0.86	0.81	N/A	NS
Thaler et al 2010	Mortality	In hospital	Clopidogrelno delay	No platelet inhibitors, no delay	364	% Risk difference	2.9	.378	N/A	NS
Thaler et al 2010	Major Bleeding	Unclear	Aspirin no delay	No platelet inhibitors, no delay	440	Risk ratio	0.86	0.81	N/A	NS

Table 31. Aspirin or Clopidogrel Early Versus Delayed Treatment

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study reported p value	Favors
Thaler et al 2010	Major Bleeding	Unclear	Clopidogrelno delay	No platelet inhibitors, no delay	364	% Risk difference	2.9	.378	N/A	NS
Hossain et al 2013	Transfusion given	Unclear	Surgically treated while clopidogrel therapy was continued	Surgically treated patients with no exposure to clopidogrel	102	Mean difference	-3.2	.28	N/A	NS
Hossain et al 2013	Hematoma	Unclear	Surgically treated while clopidogrel therapy was continued	Surgically treated patients with no exposure to clopidogrel	102	Risk ratio	3.96	N/A	.16	NS
Hossain et al 2013	Wound infection	Unclear	Surgically treated while clopidogrel therapy was continued	Surgically treated patients with no exposure to clopidogrel	102	Risk ratio	0.52	0.54	N/A	NS
Hossain et al 2013	Reoperation	Unclear	Surgically treated while clopidogrel therapy was continued	Surgically treated patients with no exposure to clopidogrel	102	Risk ratio	0.52	0.54	N/A	NS

ANESTHESIA

Strong evidence supports similar outcomes for general or spinal anesthesia for patients undergoing hip fracture surgery.

Strength of Recommendation: Strong ★★★★

RATIONALE

Two high strength (Casati et al[39], Davis et al[40]) and seven moderate strength (De Visme et al [41], Honkonen et al[42], Koval et al[43], Koval et al[44], McKenzie et al[45], Sutcliffe et al[46], and Valentin et al[47]) studies compared spinal anesthesia to general anesthesia in patients undergoing hip fracture surgery.

Meta-analysis showed no difference in mortality. McKenzie et al [45] demonstrated a decreased mortality rate at two weeks post operatively in the spinal anesthesia group; however, this difference did not persist at two months. Valentin et al[47], Sutcliffe et al [46], Davis et al [40] and Koval et al [43] did not demonstrate a difference in mortality between the two groups. De Visme et al [41] and Casati et al [39] found no differences in postoperative confusion.

Casati et al [39], McKenzie et al [45], and Valentin et al[47], demonstrated decreased blood loss in those patients receiving spinal anesthesia.. Finally, Koval et al[43], Valentin et al[47], Sutcliffe et al[46], McKenzie et al[45], and Casati et al[39] all did not demonstrate a difference in hospital length of stay.

The work group recognizes that anesthetic techniques described in several of these articles which were published decades ago may have changed when compared with modern methods. In addition, there was significant heterogeneity in the patient populations studied, including multiple studies in which patients were not randomized.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Both general anesthesia and spinal anesthesia carry risks and benefits, which should be assessed on an individual basis. Because both forms of anesthesia appear to have similar mortality profiles, providers can consider specific circumstances that would favor one form or the other for their particular patient.

FUTURE RESEARCH

Future research involving appropriately randomized patients may yet delineate which anesthesia technique is more appropriate in this patient population.

RESULTS

QUALITY AND APPLICABILITY

Table 32. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Casati et al 2003	Hypotension requiring crystalloid infusion	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Heart Rate	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Bradycardia requiring atropine	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Intraoperative blood loss (mL)	●	○	●	○	●	○	○	Low	●	○	●	○	Moderate	Low
Casati et al 2003	Median time (min) for Fulfilment of post anesthesia care unit discharge criteria	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Hospital Stay (days)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Mini Mental States Examination scores (0-30)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Mental Confusion	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 32. Quality Table of Treatment Studies for Aspirin and Clopidogrel

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Casati et al 2003	Phenylephrine	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Casati et al 2003	Quality of pain control	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Davis et al 1981	Blood Loss (mL)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Low
Davis et al 1981	Mortality	●	○	●	○	●	●	○	Moderate	●	●	●	●	High	High
Davis et al 1981	Delay time: Injury to Surgery (hr)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Davis et al 1981	Duration of Anesthesia (min)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
de Visme et al 2000	Heart Rate	●	○	●	○	●	○	○	Low	●	○	●	●	Moderate	Low
de Visme et al 2000	MAP decrease (mm Hg)	●	○	●	○	●	○	○	Low	●	○	●	●	Moderate	Low
de Visme et al 2000	Postoperative Cognitive dysfunction	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
de Visme et al 2000	Postoperative Confusion	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 32. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
de Visme et al 2000	VAS Score	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
de Visme et al 2000	Ephedrine (mg)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Koval et al 1998	Recover ambulatory ability	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Koval et al 1998	Functional Recovery Score Before Fracture	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Koval et al 1998	Functional Recovery Score	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Koval et al 1998	Ambulation ability	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Koval et al 1998	Hospital Stay (days)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Koval et al 1998	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
McKenzie et al 1984	Mean (SEM) Blood Loss (mL)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
McKenzie et al 1984	Mean (SEM) Length of Stay in Acute Hospital (days)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

Table 32. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
McKenzie et al 1984	Mean (SEM) Duration of All Types of Hospitalization (days)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
McKenzie et al 1984	Mean (SEM) Duration of Surgery (min)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
McKenzie et al 1984	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Sutcliffe et al 1994	Incidence of deep vein thrombosis	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Sutcliffe et al 1994	Incidence of pulmonary embolism	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Sutcliffe et al 1994	Hospital Stay (days)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Sutcliffe et al 1994	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Valentin et al 1986	Blood Loss	●	○	●	○	●	○	○	Low	●	○	●	●	Moderate	Low
Valentin et al 1986	Ambulation (chair) in days	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Valentin et al 1986	Ambulation (walking) in days	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 32. Quality Table of Treatment Studies for Aspirin and Clopidogrel

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Valentin et al 1986	Discharge (days)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Valentin et al 1986	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

FINDINGS

Table 33. Spinal Versus General Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Casati et al 2003	Hypotension requiring crystalloid infusion	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	Risk ratio	0.58	0.08	N/A	NS
Casati et al 2003	Heart Rate	15-60 minutes after induction	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	p= 0.01	HR significantly lower in Sevoflurane
Casati et al 2003	Bradycardia requiring atropine	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	% risk difference	20.00	0.05	N/A	NS
Casati et al 2003	Intraoperative blood loss (mL)	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	p=0.015	Favors Spinal Anesthesia
McKenzie et al 1984	Mean (SEM) Blood Loss (mL)	Immediate	Subarachnoid Blockade	General Anesthesia	148	Mean difference	16.00	0.76	N/A	NS
Valentin et al 1986	Blood Loss		Spinal Anesthesia	General Anesthesia	578	N/A	-	-	p<0.001	Favors Spinal
Davis et al 1981	Blood Loss (mL)	Immediate	Subarachnoid Block	General Anesthesia	132	Mean difference	-201.00	0.00	N/A	Favors Subarachnoid Block
Sutcliffe et al 1994	Incidence of deep vein thrombosis	Immediate	Spinal Anesthesia	General Anesthesia	1333	Risk ratio	2.17	0.03	N/A	Favors GA
Sutcliffe et al 1994	Incidence of pulmonary embolism	Immediate	Spinal Anesthesia	General Anesthesia	1333	Risk ratio	1.31	0.49	N/A	NS
Koval et al 1998	Recover ambulatory ability	6 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	P>.05	NS
Koval et al 1998	Functional Recovery Score Before Fracture	Immediate	Spinal Anesthesia	General Anesthesia	531	Mean difference	-3.30	-	P>.05	NS
Koval et al 1998	Functional Recovery Score	6 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	P>.05	NS

Table 33. Spinal Versus General Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Koval et al 1998	Functional Recovery Score	3 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	P>.05	NS
Koval et al 1998	Functional Recovery Score	12 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	NR	NS
Koval et al 1998	Ambulation ability	Immediate	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	NR	NS
Koval et al 1998	Ambulation ability	3 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	NR	NS
Koval et al 1998	Ambulation ability	12 months	Spinal Anesthesia	General Anesthesia	531	N/A	-	-	NR	NS
Valentin et al 1986	Ambulation (chair) in days	Immediate	Spinal Anesthesia	General Anesthesia	578	N/A	-	-	NR	NS
Valentin et al 1986	Ambulation (walking) in days	Immediate	Spinal Anesthesia	General Anesthesia	578	N/A	-	-	NR	NS
Koval et al 1998	Hospital Stay (days)	Immediate	Spinal Anesthesia	General Anesthesia	631	Mean difference	0.10	-	P>.05	NS
Casati et al 2003	Median time (min) for Fulfilment of post anesthesia care unit discharge criteria	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	p=0.0005	Time significantly shorter in spinal group
Casati et al 2003	Hospital Stay (days)	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	NS
McKenzie et al 1984	Mean (SEM) Length of Stay in Acute Hospital (days)	Immediate	Subarachnoid Blockade	General Anesthesia	148	Mean difference	-4.10	0.69	N/A	NS
McKenzie et al 1984	Mean (SEM) Duration of All Types of Hospitalization (days)	Immediate	Subarachnoid Blockade	General Anesthesia	148	Mean difference	3.00	0.87	N/A	NS
Valentin et al 1986	Discharge (days)	Immediate	Spinal Anesthesia	General Anesthesia	578	N/A	-	-	NR	NS

Table 33. Spinal Versus General Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sutcliffe et al 1994	Hospital Stay (days)	Immediate	Spinal Anesthesia	General Anesthesia	1333	Mean difference	1.90	-	NR	NS
McKenzie et al 1984	Mean (SEM) Duration of Surgery (min)	Immediate	Subarachnoid Blockade	General Anesthesia	148	Mean difference	5.00	0.23	N/A	NS
Casati et al 2003	Mini Mental States Examination scores (0-30)	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	NS
Casati et al 2003	Mini Mental States Examination scores (0-30)	1 day	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	NS
Casati et al 2003	Mini Mental States Examination scores (0-30)	7 days	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	NS
Casati et al 2003	Mental Confusion	1 day	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	Risk ratio	0.89	0.71	N/A	NS
Casati et al 2003	Mental Confusion	7 days	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	Risk ratio	0.33	0.32	N/A	NS
Koval et al 1998	Mortality	Within 1 year	Spinal Anesthesia	General Anesthesia	631	Risk ratio	0.93	0.68	N/A	NS
McKenzie et al 1984	Mortality	56 days	Subarachnoid Blockade	General Anesthesia	148	Risk ratio	1.03	0.94	N/A	NS
McKenzie et al 1984	Mortality	14 days	Subarachnoid Blockade	General Anesthesia	148	Risk ratio	0.26	0.03	N/A	Subarachnoid Blockade
Valentin et al 1986	Mortality	30 days	Spinal Anesthesia	General Anesthesia	578	Risk ratio	1.29	0.40	N/A	NS
Valentin et al 1986	Mortality	2 Years	Spinal Anesthesia	General Anesthesia	578	N/A	-	-	p<0.05	NS
Davis et al 1981	Mortality	4 weeks	Subarachnoid Block	General Anesthesia	132	Risk ratio	0.35	0.11	N/A	NS

Table 33. Spinal Versus General Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sutcliffe et al 1994	Mortality	30 days	Spinal Anesthesia	General Anesthesia	1333	Risk ratio	1.06	0.75	N/A	NS
Sutcliffe et al 1994	Mortality	1 year	Spinal Anesthesia	General Anesthesia	800	% risk difference	-	-	N/A	NS
Davis et al 1981	Delay time: Injury to Surgery (hr)	Immediate	Subarachnoid Block	General Anesthesia	132	Mean difference	-1.00	0.74	N/A	NS
Davis et al 1981	Duration of Anesthesia (min)	Immediate	Subarachnoid Block	General Anesthesia	132	Mean difference	0.00	1.00	N/A	NS
Casati et al 2003	Phenylephrine	Immediate	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	Risk ratio	0.75	0.67	N/A	NS
Casati et al 2003	Quality of pain control	1 hour post surgery	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	Pain control better in spinal
Casati et al 2003	Quality of pain control	3 hours	Unilateral Spinal Anesthesia with Hyperb	Single-agent Anesthesia with Sevoflurane	30	N/A	-	-	NR	NS
Honkonen et al 1971	Complications	During	Spinal Anesthesia	General Anesthesia	150	Risk ratio	1.52	0	N/A	Favors GA
Honkonen et al 1971	Complications	During	Combined Spinal/ General	General Anesthesia	150	Risk ratio	1.54	0.01	N/A	Favors GA
Honkonen et al 1971	Complications	Immediate	Spinal Anesthesia	General Anesthesia	150	Risk ratio	2.41	0.12	N/A	NS
Honkonen et al 1971	Complications	Immediate	Combined Spinal/ General	General Anesthesia	150	Risk ratio	2.46	0.25	N/A	NS
Honkonen et al 1971	Severe Hypotension	During	Spinal Anesthesia	General Anesthesia	150	Risk ratio	5.16	0.15	N/A	NS
Honkonen et al 1971	Severe Hypotension	During	Combined Spinal/ General	General Anesthesia	150	% risk difference	-1.16	0.56	N/A	NS
Honkonen et al 1971	Moderate Hypotension	During	Spinal Anesthesia	General Anesthesia	150	Risk ratio	2.03	0.05	N/A	NS

Table 33. Spinal Versus General Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Honkonen et al 1971	Moderate Hypotension	During	Combined Spinal/ General	General Anesthesia	150	Risk ratio	1.12	0.88	N/A	NS
Honkonen et al 1971	Slight Hypotension	During	Spinal Anesthesia	General Anesthesia	150	Risk ratio	1.4	0.13	N/A	NS
Honkonen et al 1971	Slight Hypotension	During	Combined Spinal/ General	General Anesthesia	150	Risk ratio	1.82	0.03	N/A	Favors General
Honkonen et al 1971	Disturbances of Heart Rhythm	During	Spinal Anesthesia	General Anesthesia	150	Risk ratio	1.03	0.95	N/A	NS
Honkonen et al 1971	Disturbances of Heart Rhythm	During	Combined Spinal/ General	General Anesthesia	150	Risk ratio	1.23	0.77	N/A	NS
Honkonen et al 1971	Mortality	Postop	Spinal Anesthesia	General Anesthesia	150	Risk ratio	2.87	0.14	N/A	NS
Honkonen et al 1971	Mortality	Postop	Combined Spinal/ General	General Anesthesia	150	Risk ratio	4.1	0.1	N/A	NS

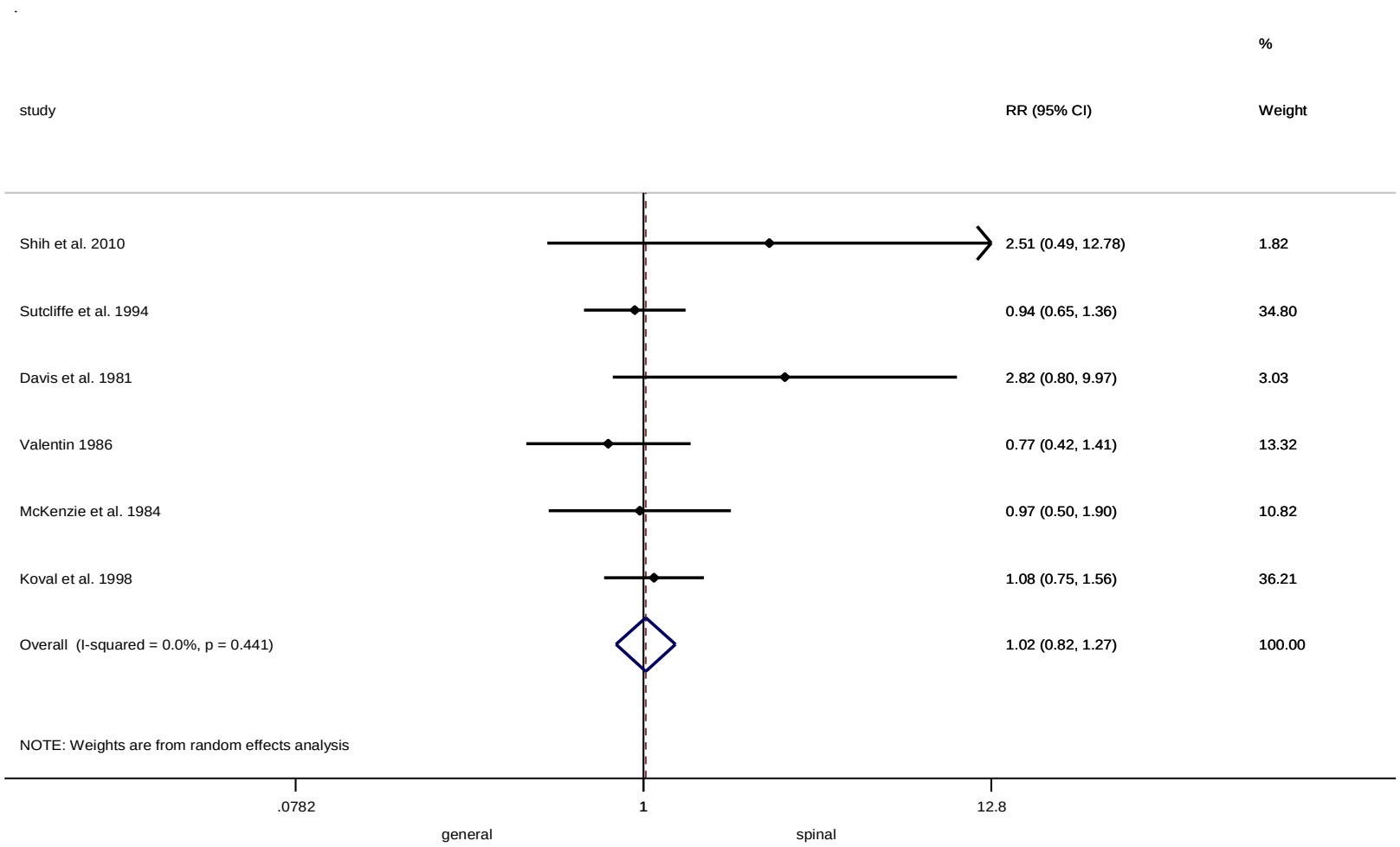
Table 34. Local Versus Spinal Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
de Visme et al 2000	Heart Rate	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Mean difference	-31.00	0.00	N/A	Combined Peripheral Nerve Block
de Visme et al 2000	MAP decrease (mm Hg)	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Mean difference	-16.00	0.04	N/A	Combined Peripheral Nerve Block
de Visme et al 2000	Postoperative Cognitive dysfunction	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Risk ratio	1.12	0.81	N/A	NS
de Visme et al 2000	Postoperative Confusion	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Mean difference	-1.00	0.78	N/A	NS

Table 34. Local Versus Spinal Anesthesia

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
de Visme et al 2000	VAS Score	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Mean difference	-5.00	0.46	N/A	NS
de Visme et al 2000	Ephedrine (mg)	Immediate	Combined Peripheral Nerve Block	Spinal Anesthesia	29	Mean difference	-10.00	0.02	N/A	Favors Spinal Anesthesia

Figure 2. Spinal Versus General Anesthesia: Meta-Analysis of Mortality



STABLE FEMORAL NECK FRACTURES

Moderate evidence supports operative fixation for patients with stable (non-displaced) femoral neck fractures.

Strength of Recommendation: Moderate 

RATIONALE

One high strength article compared operative to nonoperative treatment for non-displaced femoral neck fractures (Cserhati et al[48]). The major risk factor for non-operative treatment is displacement. It is unclear if this will lead to a more involved treatment such as arthroplasty with higher risks and if the risk- benefit curve favors this approach. There is unique difficulty in determining a truly non-displaced fracture and what patient will benefit from non-operative treatment. Operative treatment typically provides reproducible results with low risk, earlier mobilization and fewer complications.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Higher morbidity, mortality, and longer hospital stays have been shown to be associated with non-operative treatment. The benefit of avoiding surgery and anesthesia was contrasted with a failure rate of approximately 20% in the non-operative treatment group that required surgery.

FUTURE RESEARCH

Given high failure rates with non-operative treatment, clinical equipoise is lacking, making a study on non-operative treatment of hip fractures unethical. While there are clearly hip fracture patients with end of life issues who may be appropriate for non-operative treatment, surgical fixation may decrease pain, facilitate hygiene and nursing, and improve mobilization for end of life comfort.

Special consideration for end of life issues, risks and limited benefits of surgery and the balancing of surgical goals with patient and family wishes.

RESULTS

QUALITY AND APPLICABILITY

Table 35. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability* Study
Cserhati et al 1996	Time to Mobilization	●	○	●	○	○	●	●	Moderate	●	○	●	○	Moderate
Cserhati et al 1996	Hospital Stay	●	○	●	○	●	●	●	Moderate	●	○	●	○	Moderate
Cserhati et al 1996	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	○	Moderate

FINDINGS

Table 36. Internal Fixation Versus No Surgery

Outcome	Statistic (95%CI)	p-value	Results
Hospital stay beyond 2 weeks	Relative risk= 2.08 (1.42-3.04)	P=.045	Non-surgical patients were at higher risk of continued hospitalization beyond 2 weeks.
Mobilized in first week	Relative risk= .26 (.132-.513)	P<.001	Non-surgical patients were less likely to be mobilized within the first week
Death in hospital	Relative risk= 5.46 (1.23-24.21)	P=.026	Non-surgical patients were at higher risk of death in the hospital
Death within 4 months	Relative risk= 4.36 (1.52-12.55)	P=.006	Non-surgical patients were at higher risk of death within 4 months
Death within a year	Relative risk= 2.65(1.15-6.08)	P=.022	Non-surgical patients were at higher risk of death within 1 year
Overall death	Relative risk= 1.66 (1.041-2.66)	P=.023	Non-surgical patients were at higher risk of death in the hospital

DISPLACED FEMORAL NECK FRACTURES

Strong evidence supports arthroplasty for patients with unstable (displaced) femoral neck fractures.

Strength of Recommendation: Strong ★★★★

RATIONALE

Six high strength (Davison et al [49], Keating et al [50], Johansson et al [51], Bray et al [52], Frihagen et al [53], and Sikorski et al [54]) and 19 moderate-strength studies (Ravikumar et al [55], Rogmark et al [56], Tidermark et al [57], Chammout et al [58], Bacharach-Lindstrom et al [59], Calder et al [60], El-Abed et al [61], Johansson et al [62], Johansson et al [63], Jonsson et al [64], Mouzopoulos et al [65], Neander et al [66], Parker et al [67], Parker et al [68], Parker et al [69], Roden et al [70], Skinner et al [71], Van Dortmont et al [72], Waaler Bjornelv et al [73]) directly compared arthroplasty (hemi- and/or total hip arthroplasty) to internal fixation for the treatment of unstable/displaced (Garden III and IV) femoral neck fractures in elderly patients. These studies consistently reported better outcomes (reoperation rate, pain scores, functional status, and/or complication rate) for patients in whom internal fixation was avoided as the treatment of choice. A decreased rate of reoperation among patients treated with arthroplasty was the most consistent finding across the studies. A meta-analysis on patients treated with hemiarthroplasty demonstrated no statistically significant difference in mortality (Figure 4).

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

The benefit of implementing this recommendation will be the avoidance of reoperations in this frail patient population. This has implications on cost savings to society.

FUTURE RESEARCH

Future studies should help to identify patient populations who may benefit from less invasive treatment.

RESULTS

QUALITY AND APPLICABILITY

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Parker et al 2010	Survival Time	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Frihagen et al 2007	Mortality	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Frihagen et al 2007	Harris Hip Score	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Frihagen et al 2007	Eq-5d Index Score	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Frihagen et al 2007	Eq-5d Visual Analogue Scale	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Frihagen et al 2007	More than one reoperation	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Mouzopoulos et al 2008	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Mouzopoulos et al 2008	Harris Hip score (hemi vs if)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Mouzopoulos et al 2008	Hospital Stay (tha vs if)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Johansson et al 2006	Diseased	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Keating et al 2005	Hip Rating Questionnaire: Global	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Overall	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	EQ-5D: Utility Score	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Pain	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
El-Abed et al 2005	Revision (convert to THA)	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Tidermark et al 2003	Mortality	●	○	●	●	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tidermark et al 2003	Quality of Life (?EQ-5D)	●	○	●	●	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Roden et al 2003	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Roden et al 2003	Pain (Consumption of Analgesics)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Rogmark et al 2002	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Rogmark et al 2002	Failure	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Rogmark et al 2002	Duration of Surgery (min)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Parker et. al. 2002	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Parker et. al. 2002	Pain (w/ little-no pain)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Parker et. al. 2002	Pain (Charnley Pain Scale)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Rogmark et al 2002	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Rogmark et al 2002	Return Home	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Ravikumar et al 2000	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Ravikumar et al 2000	Pain (Sikorski and Barrington Grade 3 or 4)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Johansson et al 2000	Mortality	●	●	●	●	●	●	○	High	●	○	●	●	Moderate	High
Bachrach-Lindstrom et al 2000	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Bachrach-Lindstrom et al 2000	Pain (Harris Hip)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Neander et. al. 1997	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Parker et al 1992	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Jonsson et al 1996	No Pain at Rest	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Jonsson et al 1996	No Pain when Walking	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Jonsson et al 1996	No use of Analgetics	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Davison et al 2001	Mortality	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

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◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Davison et al 2001	Survival Time months	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Davison et al 2001	Quality of Life (Harris hip Score)	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Davison et al 2001	Revision	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Chammout et al 2012	Pain in Operated Hip	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Chammout et al 2012	Major Reoperation	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Waaler Bjornelv et al 2012	Health-Related Quality of Life	●	○	●	○	●	●	○	Moderate	○	○	●	●	High	High
Waaler Bjornelv et al 2012	Quality Adjusted Life Year	●	○	●	○	●	●	○	Moderate	○	○	●	●	High	High
Bray et al 1988	Mortality	●	○	●	○	●	●	○	Moderate	●	●	●	●	High	High
Bray et al 1988	Anesthesia Time (min)	●	○	●	○	●	○	○	Moderate	●	○	●	●	Moderate	Moderate

Table 37. Quality Table of Treatment Studies for Displaced Femoral Neck Fractures

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Bray et al 1988	Surgery Time (min)	●	○	●	○	●	○	○	Moderate	●	○	●	●	Moderate	Moderate
Bray et al 1988	Pain Grade	●	○	●	○	●	●	○	Moderate	●	●	●	●	High	High
Sikorski et al 1981	Mortality	●	●	●	●	●	●	○	High	○	○	●	○	Moderate	High
Skinner et al 1989	Complications	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Skinner et al 1989	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Dortmont et al 2000	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Dortmont et al 2000	Wound complications	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Chammout et al 2012	Time to walk 30 m	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate

FINDINGS

Table 38. Arthroplasty Versus Internal Fixation: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Skinner et al 1989	Mortality	2	Hemi arthroplasty	Internal fixation	278	N/A	-	-	>.05	NS
Skinner et al 1989	Mortality	12	Hemi arthroplasty	Internal fixation	278	N/A	-	-	>.05	NS
Davison et al 2001	Mortality	6	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.70	0.28	N/A	NS
Davison et al 2001	Mortality	12	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.28	0.51	N/A	NS
Davison et al 2001	Mortality	18	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.27	0.47	N/A	NS
Davison et al 2001	Mortality	24	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.54	0.16	N/A	NS
Davison et al 2001	Mortality	30	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.16	0.55	N/A	NS
Davison et al 2001	Mortality	36	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	1.32	0.25	N/A	NS
Davison et al 2001	Survival Time months	36	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	-14.40	-	Yes, p=0.008	AHS
Parker et. al. 2002	Mortality	12	Hemiarthroplasty	Internal Fixation	455	Risk ratio	0.99	0.93	N/A	NS
Parker et. al. 2002	Mortality	24	Hemiarthroplasty	Internal Fixation	455	Risk ratio	1.19	0.07	N/A	NS

Table 38. Arthroplasty Versus Internal Fixation: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Parker et. al. 2002	Mortality	36	Hemiarthroplasty	Internal Fixation	455	Risk ratio	1.13	0.08	N/A	NS
Parker et. al. 2010	Survival Time	11 years	Hemiarthroplasty	Internal Fixation	455	N/A	-	-	No, p=0.424	No Difference
Roden et al 2003	Mortality	24	Hemiarthroplasty	Internal Fixation	100	Risk ratio	0.64	0.46	N/A	NS
Roden et al 2003	Mortality	60-72	Hemiarthroplasty	Internal Fixation	100	Risk ratio	0.81	0.31	N/A	NS
Neander et. al. 1997	Mortality	6 Wks	THA	Internal Fixation	20	Risk ratio	0.50	0.54	N/A	NS
Johansson et al 2000	Mortality	12	THA	Internal Fixation	99	Risk ratio	0.75	0.40	N/A	NS
Tidermark et al 2003	Mortality	24	THA	Internal Fixation	102	Risk ratio	0.54	0.23	N/A	NS
Ravikumar et al 2000	Mortality	2	arthroplasty	Internal Fixation	271	Risk ratio	0.41	0.04	N/A	Arthroplasty
Ravikumar et al 2000	Mortality	12	arthroplasty	Internal Fixation	271	Risk ratio	0.46	0.00	N/A	Arthroplasty
Rogmark et al 2002	Mortality	During Hospital Stay	Arthroplasty	Internal Fixation	409	Risk ratio	1.70	0.56	N/A	NS
Rogmark et al 2002	Mortality	4	Arthroplasty	Internal Fixation	409	Risk ratio	1.44	0.35	N/A	NS
Rogmark et al 2002	Mortality	12	Arthroplasty	Internal Fixation	409	Risk ratio	1.17	0.53	N/A	NS
Rogmark et al 2002	Mortality	24	Arthroplasty	Internal Fixation	409	Risk ratio	1.01	0.97	N/A	NS
Mouzopoulos et al 2008	Mortality	12	Arthroplasty	Internal Fixation	109	Risk ratio	1.28	0.61	N/A	NS
Bachrach-Lindstrom et al 2000	Mortality	12	Primary Total Hip Arthroplasty	Osteosynthesis	100	Risk ratio	1.22	0.62	N/A	NS
Bray et al 1988	Mortality	Immediate	Hemiarthroplasty	Internal Fixation	34	% risk difference	0.00	1.00	N/A	NS
Bray et al 1988	Mortality	12	Hemiarthroplasty	Internal Fixation	34	% risk difference	-5.26	0.30	N/A	NS
Bray et al 1988	Mortality	22	Hemiarthroplasty	Internal Fixation	34	% risk difference	-5.26	0.30	N/A	NS
Bray et al 1988	Mortality	26	Hemiarthroplasty	Internal Fixation	34	% risk difference	-5.26	0.30	N/A	NS

Table 38. Arthroplasty Versus Internal Fixation: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Bray et al 1988	Total Mortality	26	Hemiarthroplasty	Internal Fixation	34	% risk difference	-15.79	0.07	N/A	NS
Frihagen et al 2007	Mortality	30 days	Hemiarthroplasty	Internal Fixation	222	Risk ratio	1.45	0.43	N/A	NS
Frihagen et al 2007	Mortality	90 days	Hemiarthroplasty	Internal Fixation	222	Risk ratio	1.27	0.43	N/A	NS
Frihagen et al 2007	Mortality	12	Hemiarthroplasty	Internal Fixation	222	Risk ratio	1.23	0.39	N/A	NS
Frihagen et al 2007	Mortality	24	Hemiarthroplasty	Internal Fixation	222	Risk ratio	1.02	0.92	N/A	NS
Sikorski et al 1981	Mortality	3	Posterior Thompson Hemiarthroplasty	Internal Fixation	133	N/A	-	-	<0.05	No difference
Sikorski et al 1981	Mortality	6	Anterior Thompson Arthroplasty	Internal Fixation	152	N/A	-	-	<0.05	Anterior Thompson arthroplasty
Parker et al 1992	Mortality	30 days	Hemiarthroplasty	Internal Fixation	200	Risk ratio	1.54	0.39	N/A	NS
Parker et al 1992	Mortality	6	Hemiarthroplasty	Internal Fixation	200	Risk ratio	1.03	0.90	N/A	NS
Parker et al 1992	Mortality	1 year	Hemiarthroplasty	Internal Fixation	200	Risk ratio	0.90	0.58	N/A	NS
Rogmark et al 2002	Mortality	4	Arthroplasty	Internal Fixation	172	Risk ratio	0.53	0.04	N/A	Favors Arthroplasty
Rogmark et al 2002	Mortality	12	Arthroplasty	Internal Fixation	172	Risk ratio	0.69	0.09	N/A	NS
van Dortmont et. al. 2000	Mortality	12	Hemiarthroplasty	Internal Fixation	60	Hazard ratio	.71	-	>.05	NS

Table 39. Arthroplasty Versus Internal Fixation: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
El-Abed et al, 2005	Functional Status (SF-36)	>36	Uncemented hemiarthroplasty	Closed Reduction and fixation with DHS	122	Mean difference	-24.00	-	Yes, p=0.002	Favors DHS
Davison et al, 2001	Functional Status (return to preinjury state), months	36	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	-6.20	-	No, p=0.09	No Difference
Parker et. al. 2002	Mobility (Reduction in Mobility Score)	12	Hemiarthroplasty	Internal Fixation	323	Mean difference	0.20	-	No, p=0.27	No Difference
Parker et. al. 2002	Mobility (Reduction in Mobility Score)	24	Hemiarthroplasty	Internal Fixation	228	Mean difference	0.20	-	No, p=0.45	No Difference
Parker et. al. 2002	Functional Status (Shortening mm)	12	Hemiarthroplasty	Internal Fixation	323	Mean difference	-3.40	-	Yes, p=0.004	Hemiarthroplasty
Parker et. al. 2002	Functional Status (Loss of Flexion)	12	Hemiarthroplasty	Internal Fixation	323	Mean difference	0.40	-	No, p=0.83*	No Difference
Roden et al 2003	Functional Status (walk as well as before sx)	4	Hemiarthroplasty	Internal Fixation	84	Risk ratio	1.66	0.02	N/A	Arthroplasty
Tidermark et al, 2003	Function-Pain (Charnley score)	4	THA	Internal Fixation	102	Mean difference	1.00	-	Yes, p<0.001	Internal fix
Tidermark et al, 2003	Function-Pain (Charnley score)	12	THA	Internal Fixation	102	Mean difference	0.80	-	Yes, p<0.005	Internal fix
Tidermark et al, 2003	Function-Pain (Charnley score)	24	THA	Internal Fixation	102	Mean difference	0.90	-	No, p=0.062	No Difference
Tidermark et al, 2003	Function-Mvmt (Charnley score)	4	THA	Internal Fixation	102	Mean difference	0.30	-	No	No Difference
Tidermark et al, 2003	Function-Mvmt (Charnley score)	12	THA	Internal Fixation	102	Mean difference	0.40	-	Yes, p<0.005	Internal fix
Tidermark et al, 2003	Function-Mvmt (Charnley score)	24	THA	Internal Fixation	102	Mean difference	0.40	-	No	No Difference

Table 39. Arthroplasty Versus Internal Fixation: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Tidermark et al, 2003	Function-Walking (Charnley Score)	4	THA	Internal Fixation	102	Mean difference	0.80	-	Yes, p<0.05	Internal Fix
Tidermark et al, 2003	Function-Walking (Charnley Score)	12	THA	Internal Fixation	102	Mean difference	0.70	-	Yes, p<0.05	Internal fix
Tidermark et al, 2003	Function-Walking (Charnley Score)	24	THA	Internal Fixation	102	Mean difference	0.70	-	No	No Difference
Ravikumar et al, 2000	Mobility	156	arthroplasty	Internal Fixation	271	Risk ratio	1.06	0.74	N/A	NS
Rogmark et al, 2002	Mobility	24	Arthroplasty	Internal Fixation	409	Risk ratio	0.69	0.01	N/A	Arthroplasty
Mouzopoulos et al, 2008	Functional Status (Barthel Index)	At Discharge	THA	Internal Fixation	75	Mean difference	2.00	0.01	N/A	Arthroplasty
Mouzopoulos et al, 2008	Functional Status (Barthel Index)	12	THA	Internal Fixation	75	Mean difference	7.70	0.01	N/A	Arthroplasty
Mouzopoulos et al, 2008	Functional Status (Harris Hip Score)	At Discharge	THA	Internal Fixation	75	Mean difference	1.30	0.31	N/A	NS
Mouzopoulos et al, 2008	Functional Status (Harris Hip Score)	12	THA	Internal Fixation	75	Mean difference	10.30	0.00	N/A	Arthroplasty
Mouzopoulos et al, 2008	Functional Status (Barthel Index)	At Discharge	Hemiarthroplasty	Internal Fixation	72	Mean difference	1.80	0.08	N/A	NS
Mouzopoulos et al, 2008	Functional Status (Barthel Index)	12	Hemiarthroplasty	Internal Fixation	72	Mean difference	-0.30	0.86	N/A	NS
Mouzopoulos et al, 2008	Functional Status (Harris Hip Score)	At Discharge	Hemiarthroplasty	Internal Fixation	72	Mean difference	0.20	0.88	N/A	NS
Mouzopoulos et al, 2008	Functional Status (Harris Hip Score)	12	Hemiarthroplasty	Internal Fixation	72	Mean difference	6.50	0.00	N/A	Arthroplasty
Bray et al 1988	Mobility Grade	19.2; 19.7	Hemiarthroplasty	Internal Fixation	34	Mean difference	-0.80	-	NR	NS
Frihagen et al 2007	Barthel Index Score of 95 or 100	4	Hemiarthroplasty	Internal Fixation	168	Risk ratio	1.07	0.66	N/A	NS

Table 39. Arthroplasty Versus Internal Fixation: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Frihagen et al 2007	Barthel Index Score of 95 or 100	12	Hemiarthroplasty	Internal Fixation	160	Risk ratio	1.50	0.03	N/A	Favors Hemi
Frihagen et al 2007	Barthel Index Score of 95 or 100	24	Hemiarthroplasty	Internal Fixation	137	Risk ratio	1.52	0.04	N/A	Favors Hemi
Frihagen et al 2007	Barthel Index Score of 95 or 100	4	Hemiarthroplasty	Healed Internal Fixation	116	Risk ratio	1.13	0.59	N/A	NS
Frihagen et al 2007	Barthel Index Score of 95 or 100	12	Hemiarthroplasty	Healed Internal Fixation	110	Risk ratio	1.98	0.02	N/A	Favors Hemi
Frihagen et al 2007	Barthel Index Score of 95 or 100	24	Hemiarthroplasty	Healed Internal Fixation	96	Risk ratio	2.47	0.02	N/A	Favors Hemi
Frihagen et al 2007	Barthel Index Score of 95 or 100	4	Hemiarthroplasty	Reoperated Internal Fixation	117	Risk ratio	1.16	0.51	N/A	NS
Frihagen et al 2007	Barthel Index Score of 95 or 100	12	Hemiarthroplasty	Reoperated Internal Fixation	110	Risk ratio	1.32	0.22	N/A	NS
Frihagen et al 2007	Barthel Index Score of 95 or 100	24	Hemiarthroplasty	Reoperated Internal Fixation	98	Risk ratio	1.44	0.17	N/A	NS
Parker et al 1992	Same use of Walking Aids	1 year	Hemiarthroplasty	Internal Fixation	132	Risk ratio	0.83	0.37	N/A	NS
Jonsson et al 1996	Walking-aids: 1 cane or less outdoors	Discharge	Total Hip Replacement	Hook- Pins	47	% risk difference	0.00	1.00	N/A	NS
Jonsson et al 1996	Walking-aids: 1 cane or less outdoors	1 month	Total Hip Replacement	Hook- Pins	47	Risk ratio	2.09	0.54	N/A	NS
Jonsson et al 1996	Walking-aids: 1 cane or less outdoors	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.16	0.68	N/A	NS
Jonsson et al 1996	Walking-aids: 1 cane or less outdoors	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.88	0.02	N/A	Arthroplasty

Table 39. Arthroplasty Versus Internal Fixation: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jonsson et al 1996	Walking-aids: 1 cane or less outdoors	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	2.24	0.02	N/A	Arthroplasty
Jonsson et al 1996	Able to do own Shopping	Pre-Fracture	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.94	0.66	N/A	NS
Jonsson et al 1996	Able to do own Shopping	Discharge	Total Hip Replacement	Hook- Pins	47	% risk difference	0.00	1.00	N/A	NS
Jonsson et al 1996	Able to do own Shopping	1 month	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.70	0.67	N/A	NS
Jonsson et al 1996	Able to do own Shopping	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.25	0.47	N/A	NS
Jonsson et al 1996	Able to do own Shopping	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.74	0.07	N/A	NS
Jonsson et al 1996	Able to do own Shopping	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.57	0.20	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	Pre-Fracture	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.04	0.67	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	Discharge	Total Hip Replacement	Hook- Pins	47	% risk difference	0.00	1.00	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	1 month	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.04	0.95	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.74	0.19	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.36	0.31	N/A	NS
Jonsson et al 1996	Walking Distance: 1 kilometer or more	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.43	0.32	N/A	NS
Jonsson et al 1996	Home Assistance less than 4 hours weekly	Pre-Fracture	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.95	0.53	N/A	NS

Table 39. Arthroplasty Versus Internal Fixation: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jonsson et al 1996	Home Assistance less than 4 hours weekly	1 month	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.70	0.30	N/A	NS
Jonsson et al 1996	Home Assistance less than 4 hours weekly	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.19	0.43	N/A	NS
Jonsson et al 1996	Home Assistance less than 4 hours weekly	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.91	0.68	N/A	NS
Jonsson et al 1996	Home Assistance less than 4 hours weekly	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.22	0.46	N/A	NS
Chammout et al 2012	Time Required to Walk 30m (seconds)	17 years	Total Hip Replacement	Internal Fixation	100	Mean difference	-13.00	-	0.005	Favors Internal Fixation
Keating et al 2005	Hip Rating Questionnaire: Walking	4	Hemiarthroplasty	Fixation	207	Mean difference	1.90	0.01	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Function	4	Hemiarthroplasty	Fixation	207	Mean difference	1.60	0.01	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Walking	12	Hemiarthroplasty	Fixation	207	Mean difference	1.00	0.24	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Function	12	Hemiarthroplasty	Fixation	207	Mean difference	0.50	0.42	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Walking	24	Hemiarthroplasty	Fixation	207	Mean difference	0.80	0.41	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Function	24	Hemiarthroplasty	Fixation	207	Mean difference	-0.10	0.88	N/A	NS

Table 40. Arthroplasty Versus Internal Fixation: Hospital Stay

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Parker et. al. 2002	Hospital Stay	Varied	Hemiarthroplasty	Internal Fixation	455	Mean difference	-0.30	-	0.91	No Difference
Rogmark et al, 2002	Hospital Stay	Varied	Arthroplasty	Internal Fixation	409	N/A	-	-	<0.001	Internal Fix
Bray et al 1988	Hospital Stay (days)	Varied	Hemiarthroplasty	Internal Fixation	34	Mean difference	1.30	-	NR	NS
Frihagen et al 2007	Hospital Stay (days)	Varied	Hemiarthroplasty	Internal Fixation	220	Mean difference	2.00	-	0.14	NS
Parker et al 1992	Orthopaedic Ward Stay (days)	Varied	Hemiarthroplasty	Internal Fixation	200	Mean difference	3.00	-	>.05	No difference
Parker et al 1992	Total Hospital Stay (days)	Varied	Hemiarthroplasty	Internal Fixation	200	Mean difference	10.00	-	>.05	No difference
Rogmark et al 2002	Hospital Stay (days)	Varied	Arthroplasty	Internal Fixation	172	Mean difference	1.00	-	>.05	No difference

Table 41. Arthroplasty Versus Internal Fixation: Reoperation

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Chammout et al 2012	Major Reoperation	17 years	Total Hip Replacement	Internal Fixation	100	Risk ratio	0.24	0.00	N/A	Favors THR
Davison et al 2001	Revision	6	Cemented Arthroplasty	Reduction and internal fixation using an ‘Ambi’ compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.06	0.00	N/A	Arthroplasty
Davison et al 2001	Revision	12	Cemented Arthroplasty	Reduction and internal fixation using an ‘Ambi’ compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.05	0.00	N/A	Arthroplasty
Davison et al 2001	Revision	18	Cemented Arthroplasty	Reduction and internal fixation using an ‘Ambi’ compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.04	0.00	N/A	Arthroplasty

Table 41. Arthroplasty Versus Internal Fixation: Reoperation

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Davison et al 2001	Revision	24	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.06	0.00	N/A	Arthroplasty
Davison et al 2001	Revision	30	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.06	0.00	N/A	Arthroplasty
Davison et al 2001	Revision	36	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Risk ratio	0.05	0.00	N/A	Arthroplasty
El-Abed et al 2005	Revision (convert to THA)	>36	Uncemented hemiarthroplasty	Closed Reduction and fixation with DHS	122	Risk ratio	0.69	0.32	N/A	NS
Frihagen et al 2007	More than one reoperation	24	Hemiarthroplasty	Internal Fixation	219	Risk ratio	0.15	0.01	N/A	Favors Hemi

Table 42. Arthroplasty Versus Internal Fixation: Quality of Life

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Davison et al 2001	Quality of Life (Harris hip Score)	12	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	1.90	-	P>.05	No difference
Davison et al 2001	Quality of Life (Harris hip Score)	24	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	5.30	-	P>.05	No difference
Davison et al 2001	Quality of Life (Harris hip Score)	36	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	3.60	-	P>.05	No difference
Davison et al 2001	Quality of Life (Harris hip Score)	48	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	3.50	-	P>.05	No difference
Davison et al 2001	Quality of Life (Harris hip Score)	60	Cemented Arthroplasty	Reduction and internal fixation using an 'Ambi' compression hip screw (AHS) and a two-hole plate	280	Mean difference	3.20	-	P>.05	No difference
Tidermark et al 2003	Quality of Life (?EQ-5D)	4	THA	Internal Fixation	102	Mean difference	0.20	0.00	N/A	Arthroplasty
Tidermark et al 2003	Quality of Life (?EQ-5D)	12	THA	Internal Fixation	102	Mean difference	0.10	0.10	N/A	NS
Tidermark et al 2003	Quality of Life (?EQ-5D)	24	THA	Internal Fixation	102	Mean difference	0.10	0.05	N/A	Arthroplasty
Frihagen et al 2007	Eq-5d Index Score	4	Hemiarthroplasty	Internal Fixation	149	Mean difference	0.10	-	0.06	NS
Frihagen et al 2007	Eq-5d Index Score	12	Hemiarthroplasty	Internal Fixation	132	Mean difference	0.10	-	0.07	NS
Frihagen et al 2007	Eq-5d Index Score	24	Hemiarthroplasty	Internal Fixation	104	Mean difference	0.10	-	0.03	Favors Hemi
Frihagen et al 2007	Eq-5d Visual Analogue Scale	4	Hemiarthroplasty	Internal Fixation	129	Mean difference	9.00	-	0.01	Favors Hemi

Table 42. Arthroplasty Versus Internal Fixation: Quality of Life

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Frihagen et al 2007	Eq-5d Visual Analogue Scale	12	Hemiarthroplasty	Internal Fixation	113	Mean difference	6.00	-	0.16	NS
Frihagen et al 2007	Eq-5d Visual Analogue Scale	24	Hemiarthroplasty	Internal Fixation	88	Mean difference	0.00	-	0.84	NS
Frihagen et al 2007	Eq-5d Index Score	4	Hemiarthroplasty	Healed Internal Fixation	99	Mean difference	0.00	-	0.67	NS
Frihagen et al 2007	Eq-5d Index Score	12	Hemiarthroplasty	Healed Internal Fixation	89	Mean difference	0.10	-	0.26	NS
Frihagen et al 2007	Eq-5d Index Score	24	Hemiarthroplasty	Healed Internal Fixation	69	Mean difference	0.20	-	0.03	Favors Hemi
Frihagen et al 2007	Eq-5d Visual Analogue Scale	4	Hemiarthroplasty	Healed Internal Fixation	86	Mean difference	6.00	-	0.22	NS
Frihagen et al 2007	Eq-5d Visual Analogue Scale	12	Hemiarthroplasty	Healed Internal Fixation	76	Mean difference	12.00	-	0.01	Favors Hemi
Frihagen et al 2007	Eq-5d Visual Analogue Scale	24	Hemiarthroplasty	Healed Internal Fixation	57	Mean difference	5.00	-	0.32	NS
Frihagen et al 2007	Eq-5d Index Score	4	Hemiarthroplasty	Reoperated Internal Fixation	107	Mean difference	0.20	-	0.005	Favors Hemi
Frihagen et al 2007	Eq-5d Index Score	12	Hemiarthroplasty	Reoperated Internal Fixation	94	Mean difference	0.20	-	0.07	NS
Frihagen et al 2007	Eq-5d Index Score	24	Hemiarthroplasty	Reoperated Internal Fixation	79	Mean difference	0.10	-	0.07	NS
Frihagen et al 2007	Eq-5d Visual Analogue Scale	4	Hemiarthroplasty	Reoperated Internal Fixation	93	Mean difference	13.00	-	0.005	Favors Hemi
Frihagen et al 2007	Eq-5d Visual Analogue Scale	12	Hemiarthroplasty	Reoperated Internal Fixation	81	Mean difference	4.00	-	0.47	NS
Frihagen et al 2007	Eq-5d Visual Analogue Scale	24	Hemiarthroplasty	Reoperated Internal Fixation	66	Mean difference	0.00	-	0.91	NS
Waaler Bjornelv et al 2012	Health-Related Quality of Life	4 months	Hemiarthroplasty	Internal Fixation	166	Mean difference	0.10	0.03	N/A	Favors Hemiarthroplasty

Table 42. Arthroplasty Versus Internal Fixation: Quality of Life

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Waaler Bjornelv et al 2012	Health-Related Quality of Life	12 months	Hemiarthroplasty	Internal Fixation	166	Mean difference	0.10	0.07	N/A	NS
Waaler Bjornelv et al 2012	Health-Related Quality of Life	24 months	Hemiarthroplasty	Internal Fixation	166	Mean difference	0.20	0.00	N/A	Arthroplasty
Waaler Bjornelv et al 2012	Quality Adjusted Life Year	2 years	Hemiarthroplasty	Internal Fixation	166	Mean difference	0.20	0.00	N/A	Arthroplasty

Table 43. Arthroplasty Versus Internal Fixation: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Parker et. al. 2002	Pain (w/ little-no pain)	12	Hemiarthroplasty	Internal Fixation	323	Risk ratio	0.88	0.15	N/A	NS
Parker et. al. 2002	Pain (w/ little-no pain)	24	Hemiarthroplasty	Internal Fixation	228	Risk ratio	1.10	0.19	N/A	NS
Parker et. al. 2002	Pain (w/ little-no pain)	36	Hemiarthroplasty	Internal Fixation	165	Risk ratio	0.99	0.92	N/A	NS
Parker et. al. 2002	Pain (Charnley Pain Scale)	12	Hemiarthroplasty	Internal Fixation	323	Mean difference	0.20	-	No, p=0.91	No Difference
Parker et. al. 2002	Pain (Charnley Pain Scale)	24	Hemiarthroplasty	Internal Fixation	228	Mean difference	-0.10	-	No, p=0.82	No Difference
Roden et al 2003	Pain (Consumption of Analgesics)	4	Hemiarthroplasty	Internal Fixation	88	Risk ratio	0.29	0.00	N/A	Hemiarthroplasty
Ravikumar et al, 2000	Pain (Sikorski and Barrington Grade 3 or 4)	12	Arthroplasty	Internal Fixation	271	% risk difference	-12.09	0.00	N/A	Arthroplasty
Ravikumar et al, 2000	Pain (Sikorski and Barrington Grade 3 or 4)	156	Arthroplasty	Internal Fixation	271	Risk ratio	0.05	0.00	N/A	Arthroplasty
Bachrach-Lindstrom et al, 2000	Pain (Harris Hip)	3	Primary Total Hip Arthroplasty	Osteosynthesis	88	Risk ratio	0.11	0.00	N/A	Arthroplasty

Table 43. Arthroplasty Versus Internal Fixation: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Bachrach-Lindstrom et al, 2000	Pain (Harris Hip)	12	Primary Total Hip Arthroplasty	Osteosynthesis	66	Risk ratio	0.15	0.01	N/A	Arthroplasty
Bray et al 1988	Pain Grade	19.2-19.7	Hemiarthroplasty	Internal Fixation	34	Mean difference	-0.20	-	NR	NS
Jonsson et al 1996	No Pain at Rest	1	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.75	0.19	N/A	NS
Jonsson et al 1996	No Pain at Rest	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.99	0.94	N/A	NS
Jonsson et al 1996	No Pain at Rest	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.18	0.40	N/A	NS
Jonsson et al 1996	No Pain at Rest	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.25	0.24	N/A	NS
Jonsson et al 1996	No Pain when Walking	1	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.28	0.48	N/A	NS
Jonsson et al 1996	No Pain when Walking	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.85	0.64	N/A	NS
Jonsson et al 1996	No Pain when Walking	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.70	0.12	N/A	NS
Jonsson et al 1996	No Pain when Walking	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.23	0.47	N/A	NS
Jonsson et al 1996	No use of Analgetics	1	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.73	0.43	N/A	NS
Jonsson et al 1996	No use of Analgetics	4	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.83	0.48	N/A	NS
Jonsson et al 1996	No use of Analgetics	12	Total Hip Replacement	Hook- Pins	47	Risk ratio	1.04	0.86	N/A	NS
Jonsson et al 1996	No use of Analgetics	24	Total Hip Replacement	Hook- Pins	47	Risk ratio	0.97	0.90	N/A	NS
Chammout et al 2012	Pain in Operated Hip	17 years	Total Hip Replacement	Internal Fixation	100	N/A	-	-	<0.001	Favors THR

Table 43. Arthroplasty Versus Internal Fixation: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Keating et al 2005	Hip Rating Questionnaire: Pain	4	Hemiarthroplasty	Fixation	207	Mean difference	2.40	0.00	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Pain	12	Hemiarthroplasty	Fixation	207	Mean difference	2.20	0.01	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Pain	24	Hemiarthroplasty	Fixation	207	Mean difference	0.90	0.32	N/A	NS

Table 44. Arthroplasty Versus Internal Fixation: Complications

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Skinner et al 1989	Complications	12	Hemi arthroplasty	Internal fixation	278	N/A	-	-	>.05	NS
van Dortmont et. al. 2000	Wound complications	Intra-op	Hemiarthroplasty	Internal Fixation	60	Mean difference	20.00	-	Yes, p<0.001	Internal Fixation
Parker et. al. 2002	Complications (Total)	36	Hemiarthroplasty	Internal Fixation	455	Risk ratio	1.12	0.38	N/A	NS
Parker et. al. 2002	Deep wound infection	36	Hemiarthroplasty	Internal Fixation	455	% risk difference	2.62	0.01	N/A	Internal Fix
Parker et. al. 2010	Implant Survival Rate	11 years	Hemiarthroplasty	Internal Fixation	455	Risk ratio	1.51	0.00	N/A	Hemiarthroplasty
Roden et al 2003	Blood loss	Intra-op	Hemiarthroplasty	Internal Fixation	100	N/A	-	-	Yes, p<0.001	Internal Fixation
Roden et al 2003	Complications (Blood transfusion)	Unclear	Hemiarthroplasty	Internal Fixation	100	N/A	-	-	Yes, p<0.001	Internal Fixation
Johansson et al 2000	Complication (Heterotopic Ossification)	12	THA	Internal Fixation	84	Risk ratio	27.73	0.00	N/A	Internal fixation
Tidermark et al 2003	Complications (Blood transfusion)	24	THA	Internal Fixation	102	Risk ratio	13.70	0.00	N/A	Internal fixation

Table 44. Arthroplasty Versus Internal Fixation: Complications

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Rogmark et al 2002	Complications (Operation Time) minutes	Intra-op	Arthroplasty	Internal Fixation	409	N/A	-	-	<0.001	Internal Fix
Rogmark et al 2002	Complications	24	Arthroplasty	Internal Fixation	409	Risk ratio	1.54	0.04	N/A	Internal Fix
Rogmark et al 2002	Complications (Total Failure Rate)	24	Arthroplasty	Internal Fixation	409	Risk ratio	0.15	0.00	N/A	Arthroplasty
Rogmark et al 2002	Complications (Severe or slight hip pain when walking)	4	Arthroplasty	Internal Fixation	409	Risk ratio	0.56	0.00	N/A	Arthroplasty
Rogmark et al 2002	Complications (Severe or slight hip pain when walking)	12	Arthroplasty	Internal Fixation	409	Risk ratio	0.58	0.00	N/A	Arthroplasty
Rogmark et al 2002	Complications (Severe hip pain when walking)	24	Arthroplasty	Internal Fixation	409	Risk ratio	0.26	0.03	N/A	Arthroplasty
Bray et al 1988	Blood Loss (cc)	Immediate	Hemiarthroplasty	Internal Fixation	34	Mean difference	384.00	-	< 0.001	Favors Internal Fixation
Bray et al 1988	Complications	Immediate	Hemiarthroplasty	Internal Fixation	34	Risk ratio	0.89	0.73	N/A	NS
Frihagen et al 2007	Intraoperative problems	Perioperative	Hemiarthroplasty	Internal Fixation	218	Risk ratio	0.78	0.42	N/A	NS
Frihagen et al 2007	Intraoperative blood loss (ml)	Perioperative	Hemiarthroplasty	Internal Fixation	217	Mean difference	313	-	0.001	Favors Internal Fixation
Frihagen et al 2007	Received blood transfusion while admitted	Hospital Stay	Hemiarthroplasty	Internal Fixation	220	Risk ratio	2.38	0.00	N/A	Favors Internal Fixation
Frihagen et al 2007	Any medical complication	Hospital Stay	Hemiarthroplasty	Internal Fixation	220	Risk ratio	1.09	0.70	N/A	NS
Frihagen et al 2007	Postoperative Confusion	Hospital Stay	Hemiarthroplasty	Internal Fixation	220	Risk ratio	1.20	0.55	N/A	NS
Frihagen et al 2007	Cognitive Failure (MMSE-12 Score <10)	4	Hemiarthroplasty	Internal Fixation	173	Risk ratio	1.01	0.94	N/A	NS

Table 44. Arthroplasty Versus Internal Fixation: Complications

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Frihagen et al 2007	Total Complications	24	Hemiarthroplasty	Internal Fixation	219	Risk ratio	0.23	0.00	N/A	Favors Hemi

Table 45. Arthroplasty Versus Internal Fixation: Additional Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Rogmark et al 2002	Return Home	Days	Arthroplasty	Internal Fixation	409	Risk ratio	0.84	0.13	N/A	NS
Mouzopoulos et al 2008	Harris Hip score (hemi vs if)	12	Hemiarthroplasty	Internal Fixation	72	Mean difference	6.50	0.00	N/A	Arthroplasty
Mouzopoulos et al 2008	Harris Hip score (hemi vs if)	36	Hemiarthroplasty	Internal Fixation	72	Mean difference	5.90	0.00	N/A	Arthroplasty
Mouzopoulos et al 2008	Hospital Stay (hemi vs if)	n/a	Hemiarthroplasty	Internal fixation	72	Mean difference	-3.90	0.00	N/A	Arthroplasty
Mouzopoulos et al 2008	Harris hip score(tha vs if)	12	Total Hip Arthroplasty	Internal Fixation	75	Mean difference	10.30	0.00	N/A	Arthroplasty
Mouzopoulos et al 2008	Harris hip score(tha vs if)	16	Total Hip Arthroplasty	Internal Fixation	75	Mean difference	10.10	0.00	N/A	Arthroplasty
Mouzopoulos et al 2008	Hospital Stay (tha vs if)	n/a	Total arthroplasty	Internal fixation	75	Mean difference	-4.70	0.00	N/A	Arthroplasty
Bray et al 1988	Anesthesia Time (min)	Immediate	Hemiarthroplasty	Internal Fixation	34	Mean difference	86.60	-	< 0.001	Favors Internal Fixation
Bray et al 1988	Surgery Time (min)	Immediate	Hemiarthroplasty	Internal Fixation	34	Mean difference	78.30	-	< 0.001	Favors Internal Fixation
Frihagen et al 2007	Harris Hip Score	4	Hemiarthroplasty	Internal Fixation	173	Mean difference	8.10	-	0.003	Favors Hemi
Frihagen et al 2007	Harris Hip Score	12	Hemiarthroplasty	Internal Fixation	161	Mean difference	6.80	-	0.01	Favors Hemi
Frihagen et al 2007	Harris Hip Score	24	Hemiarthroplasty	Internal Fixation	139	Mean difference	3.30	-	0.26	NS

Table 45. Arthroplasty Versus Internal Fixation: Additional Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Frihagen et al 2007	Harris Hip Score	4	Hemiarthroplasty	Healed Internal Fixation	121	Mean difference	4.30	-	0.16	NS
Frihagen et al 2007	Harris Hip Score	12	Hemiarthroplasty	Healed Internal Fixation	111	Mean difference	8.90	-	0.01	Favors Hemi
Frihagen et al 2007	Harris Hip Score	24	Hemiarthroplasty	Healed Internal Fixation	97	Mean difference	6.70	-	0.04	Favors Hemi
Frihagen et al 2007	Harris Hip Score	4	Hemiarthroplasty	Reoperated Internal Fixation	121	Mean difference	14.10	-	p< 0.001	Favors Hemi
Frihagen et al 2007	Harris Hip Score	12	Hemiarthroplasty	Reoperated Internal Fixation	111	Mean difference	6.40	-	0.06	NS
Frihagen et al 2007	Harris Hip Score	24	Hemiarthroplasty	Reoperated Internal Fixation	99	Mean difference	3.70	-	0.35	NS
Johansson et al 2006	Diseased	3	Total Hip Replacement	Internal Fixation	128	Risk ratio	0.53	0.35	N/A	NS
Johansson et al 2006	Diseased	12	Total Hip Replacement	Internal Fixation	135	Risk ratio	1.04	0.89	N/A	NS
Johansson et al 2006	Diseased	24	Total Hip Replacement	Internal Fixation	130	Risk ratio	0.98	0.95	N/A	NS
Rogmark et al 2002	Failure	12	Arthroplasty	Internal Fixation	172	Risk ratio	0.22	0.00	N/A	Favors Arthroplasty
Rogmark et al 2002	Duration of Surgery (min)	Intra-op	Arthroplasty	Internal Fixation	172	Mean difference	45.00	-	<0.001	Favors Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Global	4	Hemiarthroplasty	Fixation	207	Mean difference	2.00	0.01	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Overall	4	Hemiarthroplasty	Fixation	207	Mean difference	7.80	0.00	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Global	12	Hemiarthroplasty	Fixation	207	Mean difference	2.80	0.00	N/A	Arthroplasty
Keating et al 2005	Hip Rating Questionnaire: Overall	12	Hemiarthroplasty	Fixation	207	Mean difference	6.50	0.01	N/A	Arthroplasty

Table 45. Arthroplasty Versus Internal Fixation: Additional Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Keating et al 2005	Hip Rating Questionnaire: Global	24	Hemiarthroplasty	Fixation	207	Mean difference	1.30	0.22	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Overall	24	Hemiarthroplasty	Fixation	207	Mean difference	3.10	0.29	N/A	NS
Keating et al 2005	EQ-5D: Utility Score	4	Hemiarthroplasty	Fixation	207	Mean difference	0.00	1.00	N/A	NS

Figure 3. Internal Fixation Versus Total Arthroplasty: Mortality

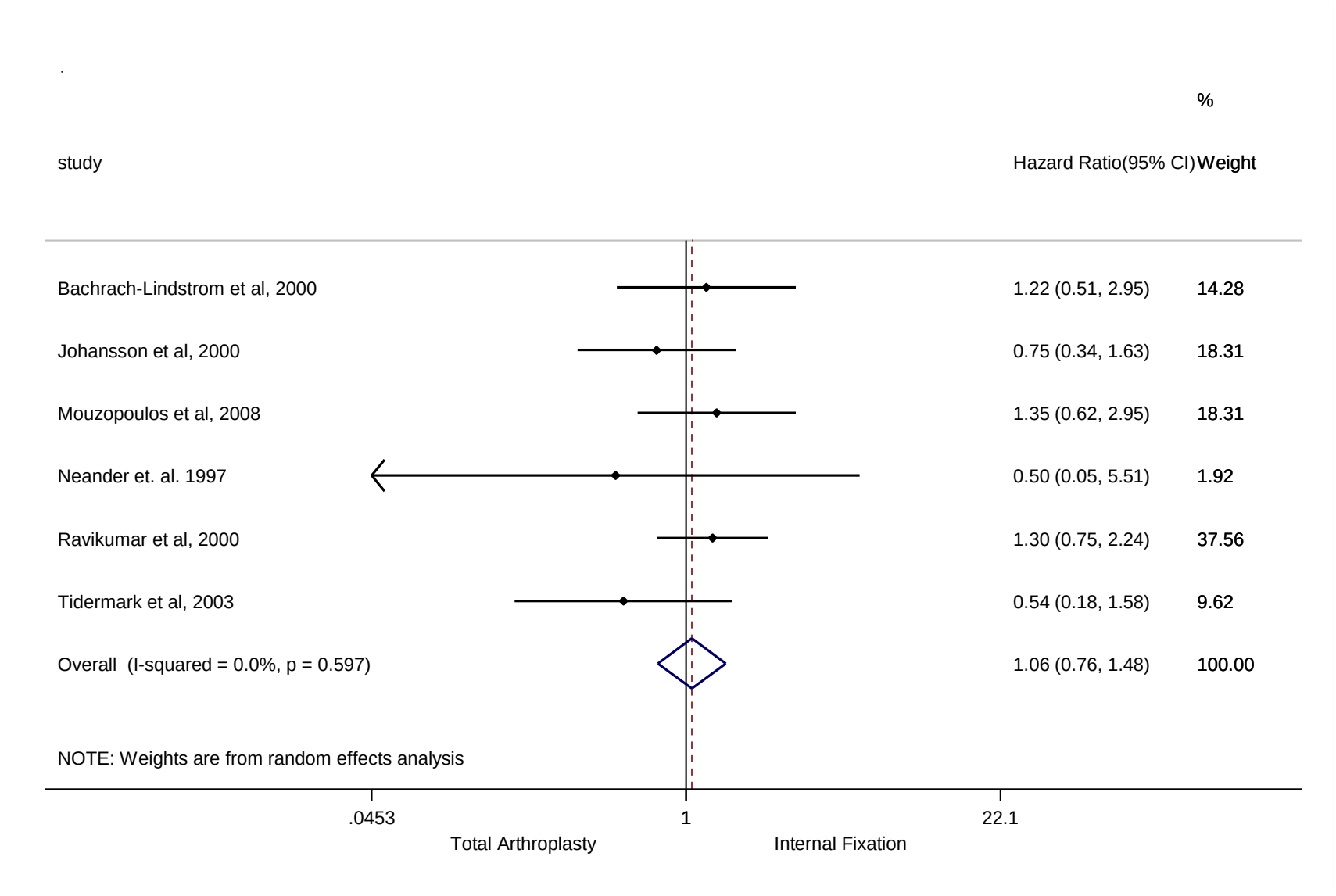
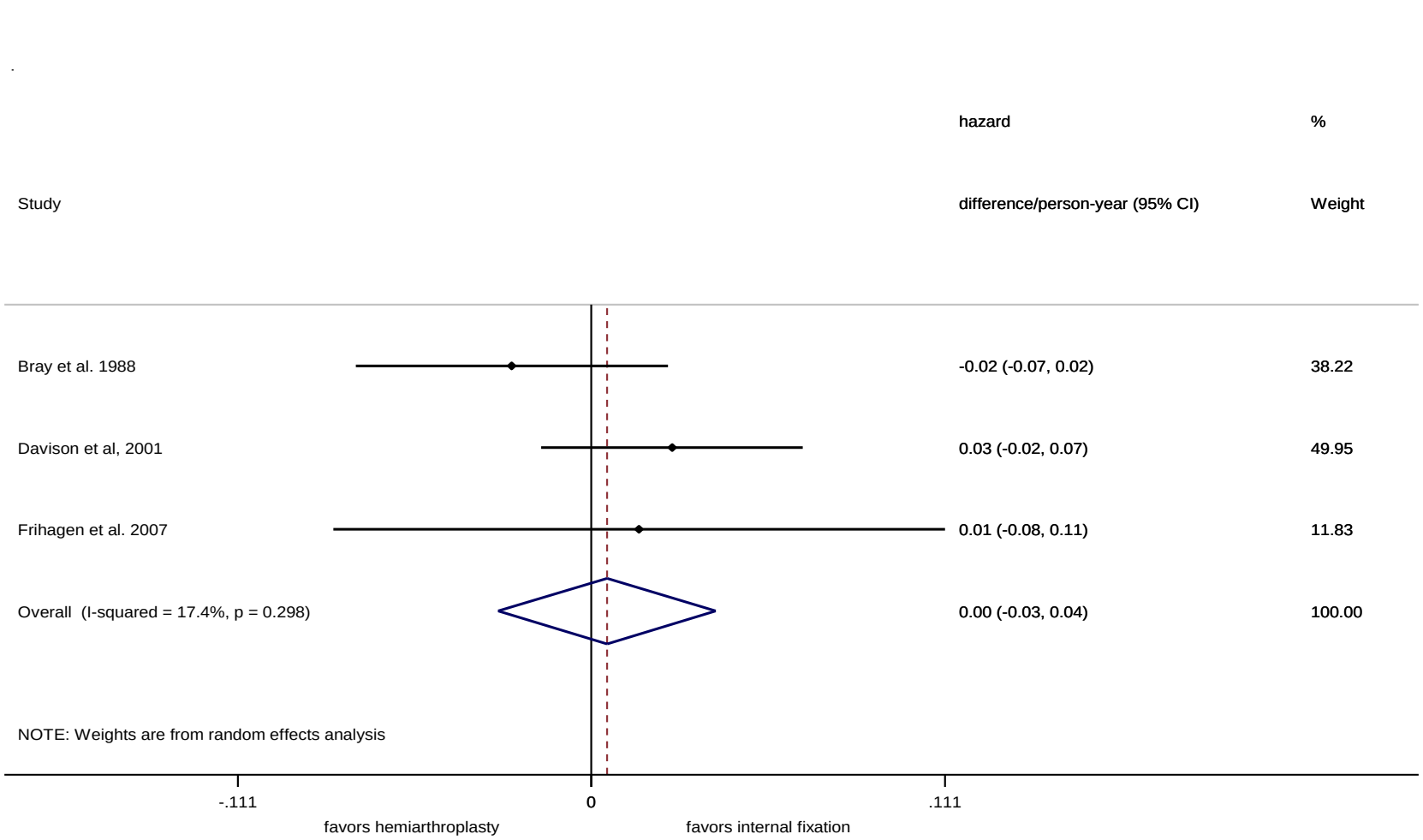


Figure 4. Internal Fixation Versus Hemi-Arthroplasty: Mortality



UNIPOLAR VERSUS BIPOLAR

Moderate evidence supports that the outcomes of unipolar and bipolar hemiarthroplasty for unstable (displaced) femoral neck fractures are similar.

Strength of Recommendation: Moderate 

RATIONALE

One high strength study (Davison et al [49]) and seven moderate strength (Raia et al [74], Cornell et al [75], Jeffcote et al [76], Calder et al [60], Calder et al [77], Hedbeck et al [78], Kenzora et al [79]) Kenzora studies compared unipolar and bipolar hemiarthroplasty for the treatment of displaced femoral neck fractures. All of the included studies showed equivalence in functional and radiographic outcomes, suggesting no significant benefit for bipolar articulation over unipolar hemiarthroplasty for displaced femoral neck fracture. A meta-analysis of mortality at six months and one year show no significant differences between unipolar and bipolar hemiarthroplasty.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

The majority of the reviewed studies reported that that unipolar heads were acknowledged as being significantly less expensive than the bipolar heads without any accompanying clinical difference recognized.

There is no apparent harm associated with implementing this recommendation and cost savings represent a direct economic benefit from the preferential use of unipolar articulations.

FUTURE RESEARCH

None needed

RESULTS

QUALITY AND APPLICABILITY

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Calder et al 1995	Nottingham Health Profile-pain	●	○	●	○	●	●	○	Moderate	○	○	○	●	Moderate	Moderate
Calder et al 1996	Function (Harris Score)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Function (No Limp)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Function (Return of Preinjury)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Hospital Stay	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Mortality	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Pain (None or Mild)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Calder et al 1996	Return Home	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Cornell et al 1998	Function (6 Minute Walk) feet per second	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Cornell et al 1998	Function (Get up and Go sec) seconds	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Cornell et al 1998	Function (Johansen Hip Score)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Cornell et al 1998	Hospital Stay	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Cornell et al 1998	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Davison et. al. 2001	Functional Status (return to preinjury state)	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Davison et. al. 2001	Mortality	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Davison et. al. 2001	Quality of Life (Unsatisfied)	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Davison et. al. 2001	Revision	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Hedbeck et al 2011	Complication (Blood Loss)	●	○	●	○	●	○	○	Low	○	○	●	●	Moderate	Low
Hedbeck et al 2011	Complication (Sx Length)	●	○	●	○	●	○	○	Low	○	○	●	●	Moderate	Low

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Hedbeck et al 2011	Complication (Transfused Blood Volume)	●	○	●	○	●	○	○	Low	○	○	●	●	Moderate	Low
Hedbeck et al 2011	Function (Harris Hip Score- Absence of Deformity)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Hip Score- Function)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Hip Score- Pain)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Hip Score- Range of Motion)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Hip Score-Pain)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Hip Score-Total)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Function (Harris Score-total)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Independence (Living Independently)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Hedbeck et al 2011	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Quality of Life (ADL Class A or B)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Quality of Life (EQ-5D)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Jeffcote et al 2009	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Raia et al 2003	Complication (Blood Loss)ml	●	○	●	○	●	○	○	Low	○	○	●	○	Moderate	Low
Raia et al 2003	Complication (Transfusions)	●	○	●	○	●	○	○	Low	○	○	●	○	Moderate	Low
Raia et al 2003	Complications (Major)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Complications (Minor)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Remain Community Ambulators)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Mental Health)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Raia et al 2003	Function (Short Form Score- Bodily Pain)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- General Health)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Mental Health)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Physical Function)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Role Limitations, Emotional)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Role Limitations, Physical)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Social Functioning)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function (Short Form Score- Vitality)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function(Musculoskeletal Functional Assessment	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
	score)- Mobility														
Raia et al 2003	Function(Musculoskeletal Functional Assessment score)- Raw Score	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Function(Musculoskeletal Functional Assessment score)- Self Care	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Length of Stay (on orthopedic service)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Raia et al 2003	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Hip pain	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Back pain	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Postoperative confusion	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Walking speed	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate

Table 46. Quality Table of Treatment Studies for Unipolar Versus Bipolar

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Kenzora et al 1998	Need for external support during walking	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Hospital stay	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Mortality	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Postoperative depression	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate
Kenzora et al 1998	Postoperative cognitive function	●	○	●	○	○	●	●	Moderate	○	○	●	○	Moderate	Moderate

FINDINGS

Table 47. Bipolar Versus Unipolar Hemiarthroplasty: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Calder et al 1996	Function (Return of Preinjury)	1.04 years to 2.4 years	Monk Bipolar	Thompson Unipolar	250	Risk ratio	1.41	0.05	N/A	Favors Bipolar arthroplasty
Calder et al 1996	Function (No Limp)	1.04 years to 2.4 years	Monk Bipolar	Thompson Unipolar	250	Risk ratio	1.22	0.45	N/A	NS
Calder et al 1996	Function (Harris Score)	1.04 years to 2.4 years	Monk Bipolar	Thompson Unipolar	250	N/A	-	-	p=0.23	NS
Raia et al 2003	Function (Remain Community Ambulators)	12	Bipolar	Unipolar	115	Risk ratio	0.98	0.88	N/A	NS
Raia et al 2003	Function(Musculoskeletal Functional Assessment score)- Raw Score	12	Bipolar	Unipolar	115	Mean difference	0.10	-	p=0.99	NS
Raia et al 2003	Function(Musculoskeletal Functional Assessment score)- Mobility	12	Bipolar	Unipolar	115	Mean difference	-0.50	-	p=0.94	NS
Raia et al 2003	Function(Musculoskeletal Functional Assessment score)- Self Care	12	Bipolar	Unipolar	115	Mean difference	4.10	-	p=0.65	NS
Raia et al 2003	Function (Short Form Score-Physical Function)	3	Bipolar	Unipolar	115	Mean difference	-3.20	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Physical Function)	12	Bipolar	Unipolar	115	Mean difference	2.60	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Bodily Pain)	3	Bipolar	Unipolar	115	Mean difference	-1.80	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Bodily Pain)	12	Bipolar	Unipolar	115	Mean difference	-2.20	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Role Limitations, Physical)	3	Bipolar	Unipolar	115	Mean difference	-2.70	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Role Limitations, Physical)	12	Bipolar	Unipolar	115	Mean difference	3.30	-	>.05	NS

Table 47. Bipolar Versus Unipolar Hemiarthroplasty: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Raia et al 2003	Function (Short Form Score-Role Limitations, Emotional)	3	Bipolar	Unipolar	115	Mean difference	-5.30	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Role Limitations, Emotional)	12	Bipolar	Unipolar	115	Mean difference	-10.90	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Mental Health)	3	Bipolar	Unipolar	115	Mean difference	4.30	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Mental Health)	12	Bipolar	Unipolar	115	Mean difference	-1.80	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Social Functioning)	3	Bipolar	Unipolar	115	Mean difference	2.10	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Social Functioning)	12	Bipolar	Unipolar	115	Mean difference	-7.50	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Vitality)	3	Bipolar	Unipolar	115	Mean difference	-11.30	-	>.05	NS
Raia et al 2003	Function (Short Form Score-Vitality)	12	Bipolar	Unipolar	115	Mean difference	-6.10	-	>.05	NS
Raia et al 2003	Function (Short Form Score-General Health)	3	Bipolar	Unipolar	115	Mean difference	3.20	-	>.05	NS
Raia et al 2003	Function (Short Form Score-General Health)	12	Bipolar	Unipolar	115	Mean difference	1.60	-	>.05	NS
Cornell et al 1998	Function (Get up and Go sec) seconds	6	Bipolar	Unipolar	48	Mean difference	5.80	0.36	N/A	NS
Cornell et al 1998	Function (6 Minute Walk) feet per second	6	Bipolar	Unipolar	48	Mean difference	0.74	-	<.03	Bipolar
Cornell et al 1998	Function (Johansen Hip Score)	6	Bipolar	Unipolar	48	Mean difference	-1.70	0.72	N/A	NS
Hedbeck et al 2011	Function (Harris Score-total)	4	Bipolar	Unipolar	115	Mean difference	1.70	-	p=0.17	NS
Hedbeck et al 2011	Function (Harris Hip Score-Pain)	4	Bipolar	Unipolar	115	Mean difference	0.80	-	p=0.22	NS

Table 47. Bipolar Versus Unipolar Hemiarthroplasty: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al 2011	Function (Harris Hip Score-Function)	4	Bipolar	Unipolar	115	Mean difference	1.00	-	p=0.38	NS
Hedbeck et al 2011	Function (Harris Hip Score-Absence of Deformity)	4	Bipolar	Unipolar	115	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Function (Harris Hip Score-Range of Motion)	4	Bipolar	Unipolar	115	Mean difference	-0.10	-	p=0.05	Unipolar
Hedbeck et al 2011	Function (Harris Hip Score-Total)	12	Bipolar	Unipolar	99	Mean difference	-0.50	-	p=1	NS
Hedbeck et al 2011	Function (Harris Hip Score-Pain)	12	Bipolar	Unipolar	99	Mean difference	-0.80	-	p=0.92	NS
Hedbeck et al 2011	Function (Harris Hip Score-Function)	12	Bipolar	Unipolar	99	Mean difference	0.30	-	p=0.91	NS
Hedbeck et al 2011	Function (Harris Hip Score-Absence of Deformity)	12	Bipolar	Unipolar	99	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Function (Harris Hip Score-Range of Motion)	12	Bipolar	Unipolar	99	Mean difference	-0.10	-	p=0.26	NS
Hedbeck et al 2011	Independence (Living Independently)	4	Bipolar	Unipolar	115	Risk ratio	1.01	0.82	N/A	NS
Hedbeck et al 2011	Independence (Living Independently)	12	Bipolar	Unipolar	99	Risk ratio	1.02	0.64	N/A	NS
Kenzora et al 1998	Postoperative confusion	24	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Kenzora et al 1998	Walking speed	24	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	<.05	Bipolar arthroplasty
Kenzora et al 1998	Need for external support during walking	24	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	<.05	Bipolar arthroplasty
Davison et al 2001	Functional Status (return to preinjury state)	24	monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.85	0.00	N/A	Bipolar

Table 48. Bipolar Versus Unipolar Hemiarthroplasty: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Calder et al 1996	Pain (None or Mild)	1.4 to 2.4 year follow up	Monk Bipolar	Thompson Unipolar	250	Risk ratio	1.04	0.74	N/A	NS
Calder et al 1995	Nottingham Health Profile Pain	6 months	Monk Bipolar	Thompson Unipolar	128	N/A	-	-	.065	NS
Kenzora et al 1998	Hip pain	Post-op	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Kenzora et al 1998	Back pain	Post-op	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS

Table 49. Bipolar Versus Unipolar Hemiarthroplasty: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Calder et al 1996	Mortality	12	Monk Bipolar	Thompson Unipolar	250	N/A	-	-	>.05	NS
Kenzora et al 1998	Mortality	24	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Raia et al 2003	Mortality	12	Bipolar	Unipolar	115	Risk ratio	1.09	0.81	N/A	NS
Cornell et al 1998	Mortality	6	Bipolar	Unipolar	48	Risk ratio	0.91	0.94	N/A	NS
Hedbeck et al 2011	Mortality	12	Bipolar	Unipolar	120	Risk ratio	1.86	0.15	N/A	NS
Jeffcote et al 2009	Mortality	24	Bipolar Hemiarthroplasty	Unipolar Hemiarthroplasty	51	Risk ratio	1.13	0.78	N/A	NS
Davison et al 2001	Mortality	6	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.43	0.45	N/A	NS
Davison et al 2001	Mortality	12	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.09	0.82	N/A	NS

Table 49. Bipolar Versus Unipolar Hemiarthroplasty: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Davison et al 2001	Mortality	18	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.00	1.00	N/A	NS
Davison et al 2001	Mortality	24	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	0.85	0.59	N/A	NS
Davison et al 2001	Mortality	30	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	0.76	0.31	N/A	NS
Davison et al 2001	Mortality	36	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	0.79	0.33	N/A	NS

Table 50. Bipolar Versus Unipolar Hemiarthroplasty: Length of Stay

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Calder et al 1996	Hospital Stay, days	Varied	Monk Bipolar	Thompson Unipolar	250	N/A	-	-	p=0.40	NS
Kenzora et al 1998	Hospital stay	In hospital	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Raia et al 2003	Length of Stay (on orthopedic service),days	Varied	Bipolar	Unipolar	115	Mean difference	-0.30	-	>.05	NS
Cornell et al 1998	Hospital Stay, days	Varied	Bipolar	Unipolar	48	Mean difference	3.10	-	>.05	NS

Table 51. Bipolar Versus Unipolar Hemiarthroplasty: Complications

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Raia et al 2003	Complication (Blood Loss)ml	Peri-op	Bipolar	Unipolar	115	Mean difference	-15.00	-	>.05	NS

Table 51. Bipolar Versus Unipolar Hemiarthroplasty: Complications

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Raia et al 2003	Complication (Transfusions)	12	Bipolar	Unipolar	115	Risk ratio	0.91	0.75	N/A	NS
Raia et al 2003	Complications (Minor)	12	Bipolar	Unipolar	115	N/A	-	-	>.05	NS
Raia et al 2003	Complications (Major)	12	Bipolar	Unipolar	115	N/A	-	-	>.05	NS
Hedbeck et al 2011	Complication (Blood Loss), ml	Peri-op	Bipolar	Unipolar	120	Mean difference	-50.00	-	p=0.31	NS
Hedbeck et al 2011	Complication (Transfused Blood Volume), ml	Peri-op	Bipolar	Unipolar	120	Mean difference	10.00	-	p=0.42	NS
Hedbeck et al 2011	Complication (Sx Length)	Peri-op	Bipolar	Unipolar	120	Mean difference	-3.00	-	p=0.11	NS

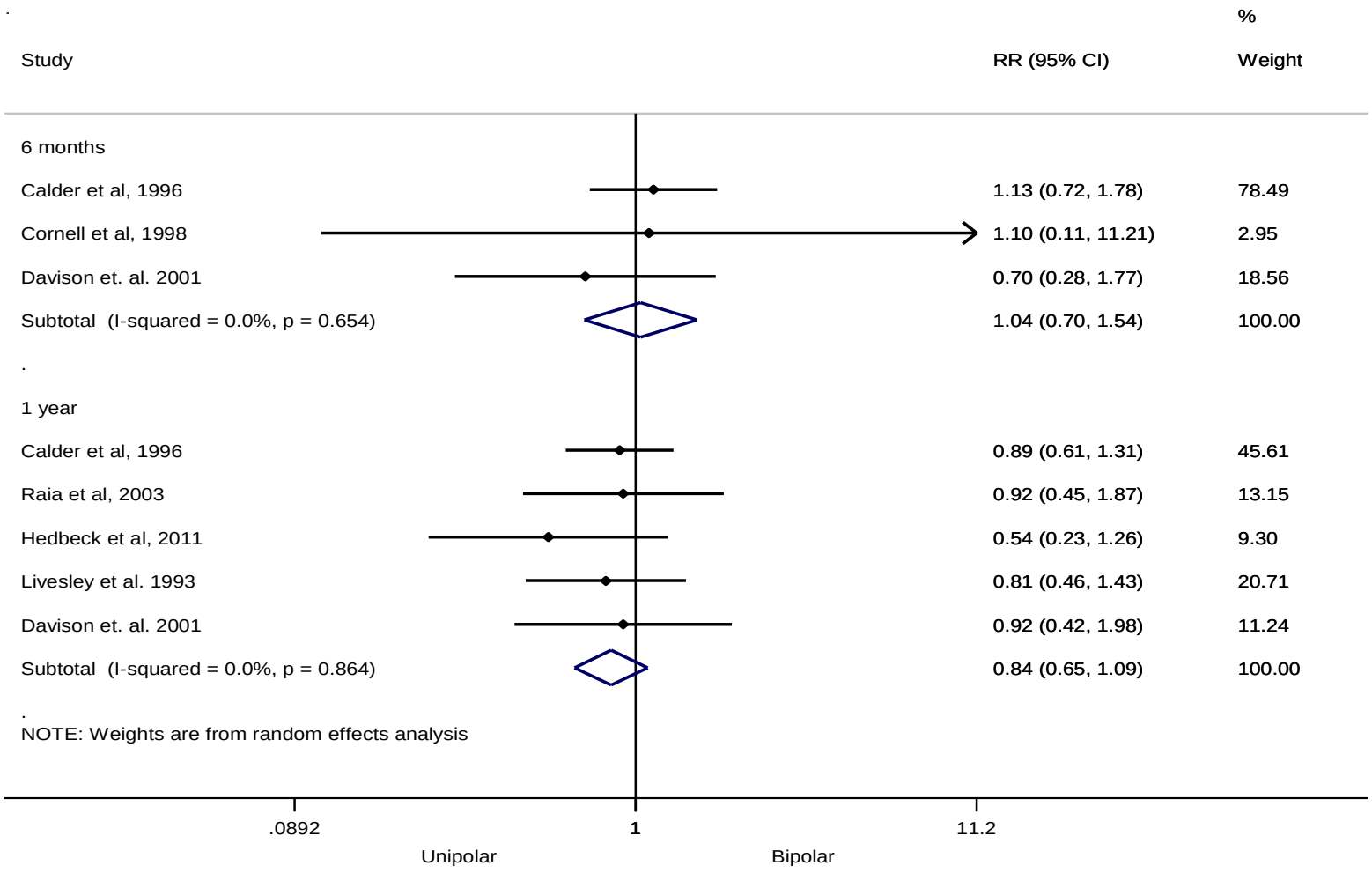
Table 52. Bipolar Versus Unipolar Hemiarthroplasty: Additional Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Calder et al 1996	Return Home	Varied	Monk Bipolar	Thompson Unipolar	250	Risk ratio	0.96	0.78	N/A	NS
Hedbeck et al 2011	Quality of Life (EQ-5D)	4	Bipolar	Unipolar	115	Mean difference	0.08	-	p=0.06	NS
Hedbeck et al 2011	Quality of Life (EQ-5D)	12	Bipolar	Unipolar	99	Mean difference	0.03	-	p=0.51	NS
Hedbeck et al 2011	Quality of Life (ADL Class A or B)	4	Bipolar	Unipolar	115	Risk ratio	1.00	0.98	N/A	NS
Hedbeck et al 2011	Quality of Life (ADL Class A or B)	12	Bipolar	Unipolar	99	Risk ratio	1.06	0.59	N/A	NS
Kenzora et al 1998	Postoperative depression	Post-op	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Kenzora et al 1998	Postoperative cognitive function	Post-op	Cemented or press fit bipolar hemiarthroplasty	Uncemented unipolar hemiarthroplasty	270	N/A	-	-	>.05	NS
Davison et al 2001	Revision	6	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.00	1.00	N/A	NS
Davison et al 2001	Revision	12	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.00	1.00	N/A	NS
Davison et al 2001	Revision	18	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	1.00	1.00	N/A	NS
Davison et al 2001	Revision	24	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	2.00	0.57	N/A	NS
Davison et al 2001	Revision	30	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	2.00	0.57	N/A	NS

Table 52. Bipolar Versus Unipolar Hemiarthroplasty: Additional Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Davison et al 2001	Revision	36	Monk cemented bipolar hemiarthroplasty	Cemented Thompson unipolar hemiarthroplasty	280	Risk ratio	2.00	0.57	N/A	NS

Figure 5. Unipolar Versus Bipolar Arthroplasty: Mortality Meta-Analysis



HEMI VERSUS TOTAL HIP ARTHROPLASTY

Moderate evidence supports a benefit to total hip arthroplasty in properly selected patients with unstable (displaced) femoral neck fractures.

Strength of Recommendation: Moderate 

RATIONALE

One high strength (Keating et al [50]) and four moderate strength studies (Blomfeldt et al [80], Hedbeck et al [81], Macaulay et al [82], van den Bekerom et al [83]) examined this question. Though various methodologic issues preclude strong recommendations, the evidence on this question generally demonstrates a benefit to patients who received total hip arthroplasty (Hedbeck et al [81], Macaulay et al [82]). This benefit was largely manifest in lower pain related scores and lower revision rates for acetabular wear. Mortality rates and infection rates were largely unaffected within the first 4 years after treatment.

However, patient exclusion criteria in some of these studies also reflects the general bias amongst surgeons towards performing total hip arthroplasty in patients who are higher functioning and more likely to be independent community ambulators (Macaulay et al [82]). Cautious decision making for lower functioning patients may be justified; studies also demonstrate a higher dislocation rate among total hip arthroplasty patients (van den Bekerom et al [83]).

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Implementing this recommendation does not result in additional harm in the patient beyond that conferred by usual surgical risk. The choice of appropriate treatment requires discussion of risk and benefit with patients and families. This may help determine which patients stand to benefit from the superior pain relief and lower likelihood of revision surgery conferred by total hip arthroplasty, and which patients whose preoperative function does not justify a surgical procedure involving greater risks.

FUTURE RESEARCH

Further areas of investigation include whether potential delays in surgery occur when total hip arthroplasty is the chosen treatment, and whether this has an effect on postoperative morbidity. Another important but unanswered question is whether the demand for total hip arthroplasty following fracture can be met by surgeons who currently employ hemiarthroplasty, or if the increasing use of total hip arthroplasty by less experienced surgeons will offset potential benefits seen in previous studies.

RESULTS

QUALITY AND APPLICABILITY

Table 53. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Blomfeldt et al 2005	Absence of Deformity (Mean Harris Hip Score)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Blomfeldt et al 2005	Harris Hip Total Score	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Blomfeldt et al 2005	Harris Hip: Function, 12 months	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Blomfeldt et al 2005	Harris Hip: Pain, 12 months	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Blomfeldt et al 2005	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Blomfeldt et al 2005	Range of Movement (Mean Harris Hip Score)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Complications	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	EQ-5D index score	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Functional Status (Harris Hip Score: Absence of	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 53. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
	deformity)														
Hedbeck et al 2011	Functional Status (Harris Hip Score: Function)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Functional Status (Harris Hip Score: Pain)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Functional Status (Harris Hip Score: Range of motion)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Functional Status (Total Harris Hip Score)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Harris Hip Score: Absence of deformity	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Harris Hip Score: Function	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Harris Hip Score: Pain	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Harris Hip Score: Range of Motion	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Harris Hip Score: Total Score	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 53. Quality Table of Treatment Studies for Advanced Imaging

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Hedbeck et al 2011	Health-related quality of life (EQ-5D index score)	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Mortality Rate	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Hedbeck et al 2011	Overall mortality rate	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Keating et al 2005	EQ-5D: Utility Score	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	EQ-5D: Worse general level of health compared with before fracture	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Function	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Global	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Overall	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Pain	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High
Keating et al 2005	Hip Rating Questionnaire: Walking	●	○	●	●	●	●	●	High	○	○	●	●	Moderate	High

Table 53. Quality Table of Treatment Studies for Advanced Imaging

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Macaulay et al 2008b	Harris Hip Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	Mean Length of Hospital Stay	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	Mortality	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	SF-36: Bodily Pain	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	SF-36: Mental Component Summary Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	SF-36: Physical Component Summary Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	SF-36: Physical Function	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	Timed 'Up & Go" (sec)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	WOMAC: Function	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate

Table 53. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Macaulay et al 2008b	WOMAC: Pain (injured site)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008b	WOMAC: Stiffness	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	Harris Hip Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	Length of Hospital Stay	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	Mortality	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	SF-36: Bodily Pain	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	SF-36: Mental Health	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	SF-36: Physical Component Summary Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	SF-36: Physical Function	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	TUG	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate

Table 53. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Macaulay et al 2008a	WOMAC: Function	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	WOMAC: Pain (injured site)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Macaulay et al 2008a	WOMAC: Stiffness	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Complications (Total)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Complications (general patients)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Complications (local patients)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Dislocation of prosthesis	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Duration of Hospital Stay	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Functional Status (Mean Function Harris Hip Score)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

Table 53. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
van den Bekerom et al 2010	Functional status (Mean Total Harris Hip Score)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Pain (Mean Pain Harris Hip Score)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
van den Bekerom et al 2010	Revision Operations	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

FINDINGS

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al 2011	Functional Status (Total Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-5.00	0.03	N/A	THA
Hedbeck et al 2011	Functional Status (Total Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-7.80	0.00	N/A	THA
Hedbeck et al 2011	Functional Status (Total Harris Hip Score)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-9.30	0.00	N/A	THA
Hedbeck et al 2011	Functional Status (Total Harris Hip Score)	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-13.80	0.00	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Pain)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.00	0.00	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Pain)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.90	0.00	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Pain)	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-2.10	0.20	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Function)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.10	0.06	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Function)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.70	0.04	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Function)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.40	0.02	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Function)	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-5.80	0.01	N/A	THA
Hedbeck et al 2011	Functional Status (Harris Hip Score: Absence of deformity)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Absence of deformity)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al 2011	Functional Status (Harris Hip Score: Absence of deformity)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Absence of deformity)	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Range of motion)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Range of motion)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Range of motion)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Functional Status (Harris Hip Score: Range of motion)	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.10	0.04	N/A	THA
van den Bekerom et al 2010	Functional status (Mean Total Harris Hip Score)	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	Mean difference	-2.10	-	.4	NS
van den Bekerom et al 2010	Functional status (Mean Total Harris Hip Score)	5 years	Hemiarthroplasty	Total Hip Arthroplasty	252	Mean difference	-3.30	-	.2	NS
Blomfeldt et al 2005	Functional Status (Total Mean Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-5.00	-	.011	THA
Blomfeldt et al 2005	Functional Status (Total Mean Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-7.80	-	<.001	THA
Blomfeldt et al 2005	Functional status (Mean Function Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.10	-	.021	THA
Blomfeldt et al 2005	Functional status (Mean Function Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.70	-	.037	THA
Blomfeldt et al 2005	Absence of Deformity (Mean Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Blomfeldt et al 2005	Absence of Deformity (Mean Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Blomfeldt et al 2005	Range of Movement (Mean Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Blomfeldt et al 2005	Range of Movement (Mean Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Blomfeldt et al 2005	Activities of Daily Life (ADL) or living conditions (Grade A or B)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.92	0.31	N/A	NS
Blomfeldt et al 2005	Activities of Daily Life (ADL) or living conditions (Grade A or B)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.04	0.53	N/A	NS
Blomfeldt et al 2005	Living Independently	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.04	0.40	N/A	NS
Blomfeldt et al 2005	Living Independently	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.98	0.55	N/A	NS
Macaulay et al 2008a	SF-36: Physical Function	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-3.50	0.34	N/A	NS
Macaulay et al 2008a	SF-36: Mental Health	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-14.00	0.00	N/A	THA
Macaulay et al 2008a	SF-36: Physical Component Summary Score	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-2.10	0.54	N/A	NS
Macaulay et al 2008a	WOMAC: Function	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-16.70	0.00	N/A	THA
Macaulay et al 2008a	Harris Hip Score	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-2.90	0.45	N/A	NS
Macaulay et al 2008a	TUG	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	2.20	0.45	N/A	NS
Macaulay et al 2008b	SF-36: Physical Function	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	2.20	0.59	N/A	NS

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Macaulay et al 2008b	SF-36: Mental Component Summary Score	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	0.00	1.00	N/A	NS
Macaulay et al 2008b	SF-36: Physical Component Summary Score	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	1.00	0.85	N/A	NS
Macaulay et al 2008b	WOMAC: Function	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	15.80	0.09	N/A	NS
Macaulay et al 2008b	Harris Hip Score	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	1.00	0.87	N/A	NS
Macaulay et al 2008b	Timed 'Up & Go" (sec)	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	0.30	0.88	N/A	NS
Macaulay et al 2008b	SF-36: Physical Function	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-0.70	0.84	N/A	NS
Macaulay et al 2008b	SF-36: Mental Component Summary Score	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-6.70	0.14	N/A	NS
Macaulay et al 2008b	SF-36: Physical Component Summary Score	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-3.80	0.22	N/A	NS
Macaulay et al 2008b	WOMAC: Function	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	2.80	0.63	N/A	NS
Macaulay et al 2008b	Harris Hip Score	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-3.60	0.41	N/A	NS
Macaulay et al 2008b	Timed 'Up & Go" (sec)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-0.70	0.85	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Function	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.40	0.57	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Function	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.70	0.26	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Function	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-1.90	0.02	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Total Score	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-7.80	0.00	N/A	THA

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al 2011	Harris Hip Score: Function	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.70	0.04	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Absence of deformity	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Range of Motion	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Total Score	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-9.30	0.00	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Function	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.40	0.02	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Absence of deformity	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Range of Motion	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Total Score	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-13.80	0.00	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Function	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-5.80	0.01	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Absence of deformity	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Range of Motion	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.10	0.04	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Total Score	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-5.00	0.03	N/A	THA
Hedbeck et al 2011	Harris Hip Score: Function	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-3.10	0.06	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Absence of deformity	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	-	N/A	NS
Hedbeck et al 2011	Harris Hip Score: Range of Motion	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	0.00	1.00	N/A	NS

Table 54. Total Versus Hemiarthroplasty: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Keating et al 2005	Hip Rating Questionnaire: Walking	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-1.40	0.11	N/A	NS
Keating et al 2005	Hip Rating Questionnaire: Walking	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-2.40	0.01	N/A	THA
Keating et al 2005	Hip Rating Questionnaire: Walking	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-3.10	0.00	N/A	THA

Table 55. Total Versus Hemiarthroplasty: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Macaulay et al. 2008a	SF-36: Bodily Pain	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-10.10	0.00	N/A	THA
Macaulay et al. 2008a	WOMAC: Pain (injured site)	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-16.60	0.00	N/A	THA
Macaulay et al. 2008b	SF-36: Bodily Pain	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-0.30	0.94	N/A	NS
Macaulay et al. 2008b	WOMAC: Pain (injured site)	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-6.90	0.12	N/A	NS
Macaulay et al. 2008b	SF-36: Bodily Pain	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-10.80	0.00	N/A	THA
Macaulay et al. 2008b	WOMAC: Pain (injured site)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-4.00	0.38	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Pain	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	0.10	0.90	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Pain	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	0.70	0.38	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Pain	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.40	0.65	N/A	NS
Hedbeck et al. 2011	Harris Hip Score: Pain	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.00	0.00	N/A	THA
Hedbeck et al. 2011	Harris Hip Score: Pain	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.90	0.00	N/A	THA
Hedbeck et al. 2011	Harris Hip Score: Pain	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-7.90	0.00	N/A	THA
Hedbeck et al. 2011	Harris Hip Score: Pain	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-2.00	0.06	N/A	NS
Blomfeldt et al. 2005	Pain (Mean Pain Harris Hip Score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-2.00	-	.121	NS
Blomfeldt et al. 2005	Pain (Mean Pain Harris Hip Score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-4.00	-	<.001	NS

Table 55. Total Versus Hemiarthroplasty: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al. 2011	Functional Status (Harris Hip Score: Pain)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-2.00	0.06	N/A	NS

Table 56. Total Versus Hemiarthroplasty: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al. 2011	Complications	0-44 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.33	0.34	N/A	NS
van den Bekerom et al. 2010	Complications (Total)	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	1.02	0.93	N/A	NS
van den Bekerom et al. 2010	Complications (general patients)	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	0.69	0.14	N/A	NS
van den Bekerom et al. 2010	Complications (local patients)	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	0.74	0.36	N/A	NS
van den Bekerom et al. 2010	Dislocation of prosthesis	5 years	Hemiarthroplasty	Total Hip Arthroplasty	252	% risk difference	-6.96	0.00	N/A	Hemi
Blomfeldt et al. 2005	Complications (Superficial Infection)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.00	1.00	N/A	NS
Blomfeldt et al. 2005	Complications (Additional Fractures)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.50	0.65	N/A	NS
Blomfeldt et al. 2005	Complications (Total General Medical Complications)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.83	0.75	N/A	NS
Blomfeldt et al. 2005	Complications (Deep Vein Thrombosis)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	% risk difference	1.67	0.27	N/A	NS
Blomfeldt et al. 2005	Complications (Atrial Fibrillation)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	% risk difference	1.67	0.27	N/A	NS

Table 56. Total Versus Hemiarthroplasty: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Blomfeldt et al. 2005	Complications (Myocardial Infarction)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.00	1.00	N/A	NS
Blomfeldt et al. 2005	Complications (Pneumonia)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	% risk difference	-1.67	0.27	N/A	NS
Blomfeldt et al. 2005	Complications (Congestive Heart Failure)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	% risk difference	-1.67	0.27	N/A	NS
Blomfeldt et al. 2005	Complications (Decubitus Ulcer)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	% risk difference	-1.67	0.27	N/A	NS
Blomfeldt et al. 2005	Complications (Death)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	1.00	1.00	N/A	NS

Table 57. Total Versus Hemiarthroplasty: Additional Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
van den Bekerom et al. 2010	Revision Operations	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	% risk difference	0.73	0.30	N/A	NS
van den Bekerom et al. 2010	Revision Operations	5 years	Hemiarthroplasty	Total Hip Arthroplasty	252	risk ratio	2.52	0.25	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Global	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.90	0.30	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Global	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.50	0.61	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Global	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.70	0.47	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Overall	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-2.50	0.33	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Overall	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-2.90	0.28	N/A	NS
Keating et al. 2005	Hip Rating Questionnaire: Overall	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-6.10	0.04	N/A	THA

Table 57. Total Versus Hemiarthroplasty: Additional Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Macaulay et al. 2008a	Length of Hospital Stay	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-2.30	0.09	N/A	NS
Macaulay et al. 2008b	Mean Length of Hospital Stay	In hospital	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	2.30	0.12	N/A	NS
Macaulay et al. 2008a	WOMAC: Stiffness	24 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	-1.90	0.81	N/A	NS
Macaulay et al. 2008b	WOMAC: Stiffness	6 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	3.80	0.63	N/A	NS
Macaulay et al. 2008b	WOMAC: Stiffness	12 months	Hemiarthroplasty	Total Hip Arthroplasty	40	Mean difference	15.20	0.053	N/A	NS

Table 58. Total Versus Hemiarthroplasty: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Hedbeck et al. 2011	Mortality Rate	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.82	0.53	N/A	NS
van den Bekerom et al. 2010	Mortality During Hospital Stay	Immediately	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	1.18	0.78	N/A	NS
van den Bekerom et al. 2010	Mortality	1 year	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	0.94	0.86	N/A	NS
van den Bekerom et al. 2010	Mortality	5 years	Hemiarthroplasty	Total Hip Arthroplasty	252	Risk ratio	0.72	0.01	N/A	Hemi
Blomfeldt et al. 2005	Mortality	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.75	0.70	N/A	NS
Macaulay et al. 2008a	Mortality		Hemiarthroplasty	Total Hip Arthroplasty	40	Risk ratio	1.33	0.53	N/A	NS
Macaulay et al. 2008b	Mortality		Hemiarthroplasty	Total Hip Arthroplasty	40	Risk ratio	1.29	0.63	N/A	NS
Hedbeck et al. 2011	Overall mortality rate	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Risk ratio	0.82	0.53	N/A	NS

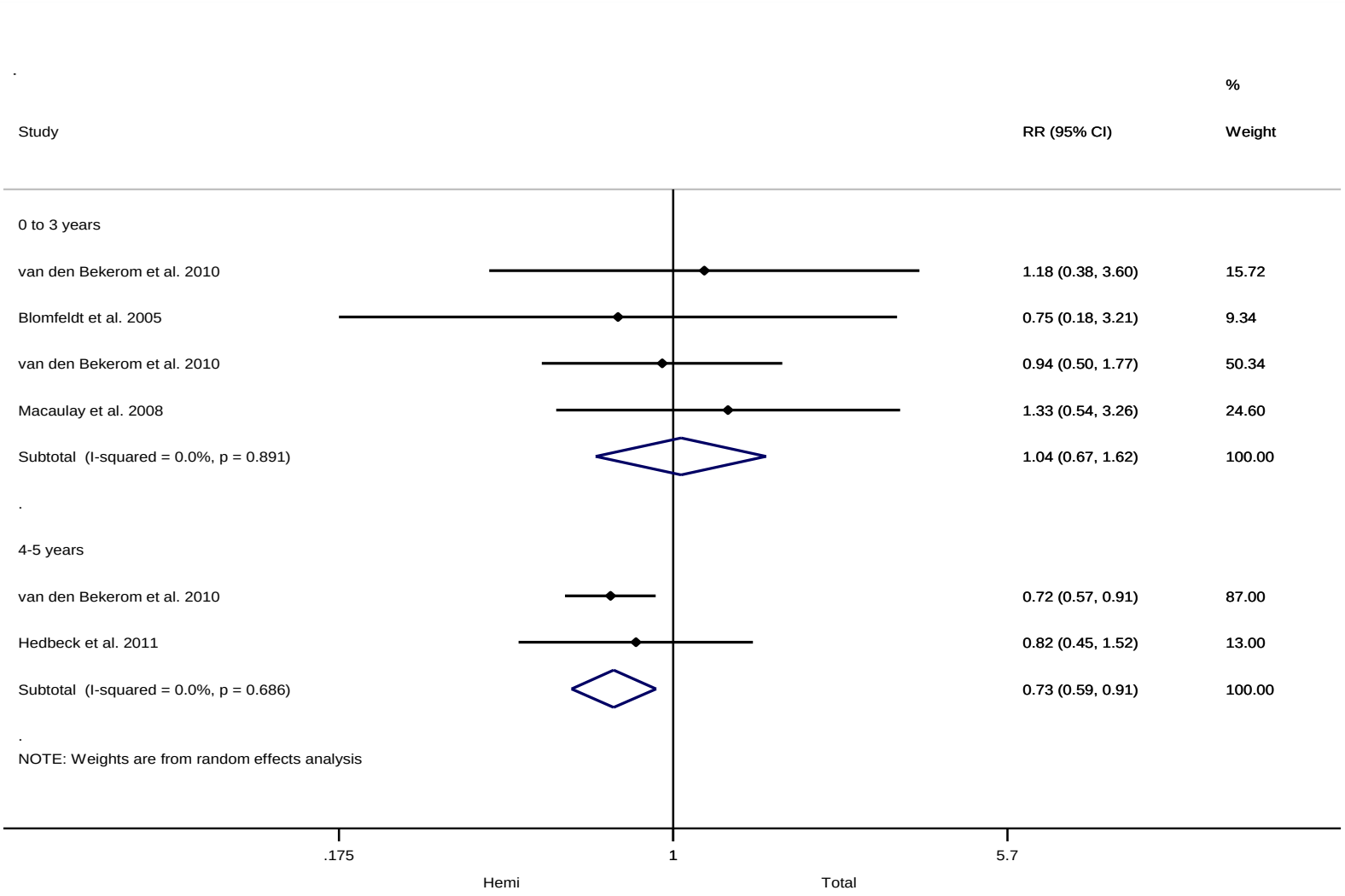
Table 59. Total Versus Hemiarthroplasty: Quality of Life

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Keating et al. 2005	EQ-5D: Worse general level of health compared with before fracture	4 months	Hemiarthroplasty	Total Hip Replacement	131	Risk ratio	0.93	0.85	N/A	NS
Keating et al. 2005	EQ-5D: Worse general level of health compared with before fracture	12 months	Hemiarthroplasty	Total Hip Replacement	131	Risk ratio	0.94	0.86	N/A	NS
Keating et al. 2005	EQ-5D: Worse general level of health compared with before fracture	24 months	Hemiarthroplasty	Total Hip Replacement	131	Risk ratio	1.02	0.96	N/A	NS
Keating et al. 2005	EQ-5D: Utility Score	4 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.08	.1	N/A	NS

Table 59. Total Versus Hemiarthroplasty: Quality of Life

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Keating et al. 2005	EQ-5D: Utility Score	12 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.04	.447	N/A	NS
Keating et al. 2005	EQ-5D: Utility Score	24 months	Hemiarthroplasty	Total Hip Replacement	131	Mean difference	-0.16	.008	N/A	THA
Blomfeldt et al. 2005	Health-related quality of life (EQ-5D index score)	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.05	-	>.05	NS
Blomfeldt et al. 2005	Health-related quality of life (EQ-5D index score)	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.05	-	>.05	NS
Hedbeck et al. 2011	EQ-5D index score	12 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.05	-	>.05	NS
Hedbeck et al. 2011	EQ-5D index score	24 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.08	-	>.05	NS
Hedbeck et al. 2011	EQ-5D index score	48 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.11	-	<.05	THA
Hedbeck et al. 2011	EQ-5D index score	4 months	Hemiarthroplasty	Total Hip Arthroplasty	120	Mean difference	-0.05	-	>.05	NS

Figure 6. Hemiarthroplasty Versus Total Arthroplasty: Meta-Analysis Mortality



CEMENTED FEMORAL STEMS

Moderate evidence supports the preferential use of cemented femoral stems in patients undergoing arthroplasty for femoral neck fractures.

Strength of Recommendation: Moderate 

RATIONALE

Eight moderate strength (Deangelis et al [84], Figved et al [85], Taylor et al [86],Santini et al[87], Lennox et al[88], Parker et al [89], Sonne-Holm et al [90], Singh et al [91]) studies address the question of cemented or press fit arthroplasty in the elderly. Randomized controlled trials have largely failed to demonstrate differences (Deangelis et al [84], Figved et al [85]), with the exception of fracture risk, which appears to be higher in press fit stems (Taylor et al [86]). This remains an infrequent event in other studies. In general, both approaches yielded acceptable functional results with low complication rates.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

As with all surgical procedures, there are potential risks and benefits which are unlikely to be affected by this recommendation.

FUTURE RESEARCH

Long term studies designed specifically to elucidate potential differences in postoperative fracture risk between cemented or press fit stems are needed.

RESULTS

QUALITY AND APPLICABILITY

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Deangelis et al 2012	Adverse event	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Intensive care unit stay	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Pneumonia	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	MI	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Wound Infection	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Reoperation	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Cerebral vascular accident	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Major hemorrhage	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Thromboembolitic event	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Deangelis et al 2012	Living at home	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Need walking assistance	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Physical ADL	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Instrumental ADL	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Energy/fatigue	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Deangelis et al 2012	Mortality	●	○	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Figved et al 2009	Blood transfusion needed	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Function (Able to walk independently)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Function (Harris Hip Score)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Hospital Stay (days)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Figved et al 2009	Independence (Living in own home)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Mortality	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Pain (No need for medication)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Quality of Life (Barthel Index of 19 or 20)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Quality of Life (EQ-5D index)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Quality of Life (EQ-5D visual analog scale)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Surgical time (minutes)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Total blood loss (ml)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Intraoperative blood loss (ml)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate
Figved et al 2009	Post op blood drainage (ml)	●	●	●	○	○	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Lennox et al 1991	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Parker et al 2010	Initial total Hospital Stay (Days)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Parker et al 2010	Mean Reduction in Mobility Scores	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Parker et al 2010	Mortality	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Parker et al 2010	Residual Pain	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Santini et al 2005	Complications (Blood units Transferred)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Complications (Lowest Hemoglobin value (g/dl)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Complications	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Complications (Surgical time)	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Function (VELCA- Daily Activities)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Santini et al 2005	Function (VELCA-Living Conditions)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Function (VELCA-Personal Activities)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Function (VELCA- Total Score)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Function (VELCA-Walking Ability)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Independence (Live Alone)	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Length of Stay	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Return Home	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Santini et al 2005	Mortality	●	○	●	○	●	●	●	Moderate	●	○	●	●	Moderate	Moderate
Singh et al 2006	Oxford Hip Score	●	○	●	○	●	●	○	Moderate	○	●	●	○	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Singh et al 2006	Oxford Hip Score-function	●	○	●	○	●	●	○	Moderate	○	●	●	○	Moderate	Moderate
Singh et al 2006	Oxford Hip Score-pain	●	○	●	○	●	●	○	Moderate	○	●	●	○	Moderate	Moderate
Singh et al 2006	Mortality	●	○	●	○	●	●	○	Moderate	○	●	●	○	Moderate	Moderate
Taylor et al 2012	Cardiovascular event	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Respiratory infection	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Superficial or deep wound infection	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Urinary tract infection	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Subsidence	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Post-op fracture	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Intraoperative fracture	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Taylor et al 2012	Reoperation	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Dislocation	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Other adverse events	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Mortality	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	VAS pain	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Oxford Hip Score	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Short Musculoskeletal Function Assessment	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Taylor et al 2012	Timed Up and Go score	●	●	●	●	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Sonne-Holm et al 1982	Maximal Gait Function	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate
Sonne-Holm et al 1982	Maximal Mobility Score	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

Table 60. Quality Table of Treatment Studies for Cemented Femoral Stems

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Sonne-Holm et al 1982	Merle d' Aubigne Maximal Pain Score	●	○	●	○	●	●	○	Moderate	●	○	●	○	Moderate	Moderate

FINDINGS

Table 61. Cemented Versus Uncemented Arthroplasty: Mortality

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Deangelis et al 2012	Mortality	In-hospital	Cemented arthroplasty	Press-fit hemiarthroplasty	130	% risk difference	-1	N/A	0.983	NS
Deangelis et al 2012	Mortality	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	% risk difference	5.1	N/A	0.265	NS
Deangelis et al 2012	Mortality	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	% risk difference	4.6	N/A	0.559	NS
Deangelis et al 2012	Mortality	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	% risk difference	3.1	N/A	0.811	NS
Figved et al 2009	Mortality	7 days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.73	0.67	N/A	NS
Figved et al 2009	Mortality	30 Days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.49	0.23	N/A	NS
Figved et al 2009	Mortality	90 Days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.84	0.63	N/A	NS
Figved et al 2009	Mortality	12 Months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.65	0.09	N/A	NS
Figved et al 2009	Mortality	24 Months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.86	0.47	N/A	NS
Santini et al 2005	Mortality	1 Year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	0.93	0.82	N/A	NS
Santini et al 2005	Mortality	1 Year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	0.93	0.82	N/A	NS
Santini 2006	Mortality	During Hospital Stay	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	1.50	0.65	N/A	NS
Singh et al 2006	Mortality	In hospital	Cemented arthroplasty	Uncemented hemiarthroplasty	160	Risk ratio	0.988	0.878	N/A	NS
Taylor et al 2012	Mortality	6 weeks	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Taylor et al 2012	Mortality	6 months	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS

Table 61. Cemented Versus Uncemented Arthroplasty: Mortality

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Taylor et al 2012	Mortality	1 year	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Taylor et al 2012	Mortality	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Lennox et al 1991	Mortality	3 months	Hasting cemented bipolar hemiarthroplasty	Monk Uncemented prosthesis	207	Risk ratio	0.64	0.11	N/A	NS
Parker et al 2010	Mortality	12 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Risk ratio	1.05	0.54	N/A	NS

Table 62. Cemented Versus Uncemented Arthroplasty: Function

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Deangelis et al 2012	Living at home	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.915	NS
Deangelis et al 2012	Living at home	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.575	NS
Deangelis et al 2012	Living at home	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.217	NS
Deangelis et al 2012	Need walking assistance	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.577	NS
Deangelis et al 2012	Need walking assistance	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.834	NS
Deangelis et al 2012	Need walking assistance	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.188	NS
Deangelis et al 2012	Physical ADL	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	0.2	N/A	0.73	NS
Deangelis et al 2012	Physical ADL	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	0.1	N/A	0.875	NS
Deangelis et al 2012	Physical ADL	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	-1.3	N/A	0.168	NS
Deangelis et al 2012	Instrumental ADL	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	-0.2	N/A	0.262	NS
Deangelis et al 2012	Instrumental ADL	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	-0.3	N/A	0.3	NS
Deangelis et al 2012	Instrumental ADL	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	-0.2	N/A	0.384	NS
Deangelis et al 2012	Energy/fatigue	1 month	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	0	N/A	0.938	NS
Deangelis et al 2012	Energy/fatigue	2 months	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	0	N/A	0.668	NS
Deangelis et al 2012	Energy/fatigue	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	Mean difference	0	N/A	0.608	NS
Figved et al 2009	Surgical time (minutes)	Peri-op	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Mean difference	12.40	0.00	N/A	Favors Uncemented
Figved et al 2009	Total blood loss (ml)	Peri-op	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	218	Mean difference	77.00	0.04	N/A	Favors Uncemented
Figved et al 2009	Function (Harris Hip Score)	Baseline	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Mean difference	-2.20	0.30	N/A	NS

Table 62. Cemented Versus Uncemented Arthroplasty: Function

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Figved et al 2009	Function (Harris Hip Score)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	189	Mean difference	-1.20	0.67	N/A	NS
Figved et al 2009	Function (Harris Hip Score)	12 Months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	167	Mean difference	-0.90	0.73	N/A	NS
Figved et al 2009	Independence (Living in own home)	Baseline	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Risk ratio	0.98	0.79	N/A	NS
Figved et al 2009	Independence (Living in own home)	Discharge (7 Days)	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	215	Risk ratio	0.78	0.70	N/A	NS
Figved et al 2009	Independence (Living in own home)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	190	Risk ratio	0.97	0.79	N/A	NS
Figved et al 2009	Independence (Living in own home)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	168	Risk ratio	0.85	0.09	N/A	NS
Figved et al 2009	Function (Able to walk independently)	Baseline	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Risk difference	0.00	1.00	N/A	NS
Figved et al 2009	Function (Able to walk independently)	Discharge (7 Days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	215	Risk ratio	1.07	0.35	N/A	NS
Figved et al 2009	Function (Able to walk independently)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	190	Risk ratio	1.03	0.45	N/A	NS
Figved et al 2009	Function (Able to walk independently)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	168	Risk ratio	1.04	0.37	N/A	NS
Santini et al 2005	Function (VELCA- Walking Ability)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	-0.28	0.53	N/A	NS
Santini et al 2005	Function (VELCA- Personal Activities)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.07	0.80	N/A	NS
Santini et al 2005	Function (VELCA- Daily Activities)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.31	0.36	N/A	NS
Santini et al 2005	Function (VELCA- Living Conditions)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.09	0.91	N/A	NS
Santini et al 2005	Function (VELCA- Total Score)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.18	0.88	N/A	NS

Table 62. Cemented Versus Uncemented Arthroplasty: Function

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Santini et al 2005	Independence (Live Alone)	1 year	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	1.17	0.77	N/A	NS
Singh et al 2006	Oxford Hip Score	1 year	Uncemented Austin-Moore hemiarthroplasty	Cemented Thompson-Unipolar hemiarthroplasty	40	Mean difference	-7.97	N/A	0.017	NS
Singh et al 2006	Oxford Hip Score-function	1 year	Uncemented Austin-Moore hemiarthroplasty	Cemented Thompson-Unipolar hemiarthroplasty	40	Mean difference	-4.11	N/A	0.042	NS
Sonne-Holm et al 1982	Maximal Mobility Score	6 weeks	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.76	0.11	N/A	NS
Sonne-Holm et al 1982	Maximal Mobility Score	3 months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.87	0.07	N/A	NS
Sonne-Holm et al 1982	Maximal Mobility Score	6 months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.43	0.19	N/A	NS
Sonne-Holm et al 1982	Maximal Mobility Score	12 Months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.44	0.14	N/A	NS
Sonne-Holm et al 1982	Maximal Gait Function	6 weeks	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.66	0.35	N/A	NS
Sonne-Holm et al 1982	Maximal Gait Function	3 months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	2.69	0.04	N/A	Cemented
Sonne-Holm et al 1982	Maximal Gait Function	6 months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	2.49	0.07	N/A	NS
Sonne-Holm et al 1982	Maximal Gait Function	12 months	Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.45	0.31	N/A	NS
Taylor et al 2012	Oxford Hip Score	6 weeks	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	<.05	NS
Taylor et al 2012	Oxford Hip Score	6 months	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Taylor et al 2012	Oxford Hip Score	1 year	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS

Table 62. Cemented Versus Uncemented Arthroplasty: Function

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Taylor et al 2012	Oxford Hip Score	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Taylor et al 2012	Short Musculoskeletal Function Assessment	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Taylor et al 2012	Timed Up and Go score	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	<.01	NS
Parker et al 2010	Mean Reduction in Mobility Scores	3 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.90	0.00	N/A	Favors Cemented
Parker et al 2010	Mean Reduction in Mobility Scores	6 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.80	0.00	N/A	Favors Cemented
Parker et al 2010	Mean Reduction in Mobility Scores	9 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.60	0.00	N/A	Favors Cemented
Parker et al 2010	Mean Reduction in Mobility Scores	1 year	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.70	0.00	N/A	Favors Cemented
Parker et al 2010	Mean Reduction in Mobility Scores	2 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.10	0.63	N/A	NS
Parker et al 2010	Mean Reduction in Mobility Scores	3 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.40	0.06	N/A	NS
Parker et al 2010	Mean Reduction in Mobility Scores	4 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.50	0.02	N/A	NS
Parker et al 2010	Mean Reduction in Mobility Scores	5 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.10	0.65	N/A	NS

Table 63. Cemented Versus Uncemented Arthroplasty: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Figved et al 2009	Pain (No need for medication)	Baseline	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Risk ratio	0.96	0.57	N/A	NS
Figved et al 2009	Pain (No need for medication)	Discharge (7 Days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	215	Risk ratio	1.17	0.79	N/A	NS
Figved et al 2009	Pain (No need for medication)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	190	Risk ratio	1.00	1.00	N/A	NS
Figved et al 2009	Pain (No need for medication)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	168	Risk ratio	0.93	0.37	N/A	NS
Singh et al 2006	Mortality	in hospital	Cemented arthroplasty	Uncemented hemiarthroplasty	160	Risk ratio	0.988	0.878	N/A	NS
Sonne-Holm et al 1982	Merle d' Aubigne Maximal Pain Score	6 weeks	Cemented Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	2.18	0.02	N/A	Cemented
Sonne-Holm et al 1982	Merle d' Aubigne Maximal Pain Score	3 months	Cemented Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.90	0.04	N/A	Cemented
Sonne-Holm et al 1982	Merle d' Aubigne Maximal Pain Score	6 months	Cemented Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	2.18	0.02	N/A	Cemented
Sonne-Holm et al 1982	Merle d' Aubigne Maximal Pain Score	12 months	Cemented Hemiarthroplasty	Non-cemented prosthesis	112	Risk ratio	1.83	0.04	N/A	Cemented
Taylor et al 2012	vas pain	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	>.05	NS
Parker et al 2010	Residual Pain	8 weeks	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.20	0.11	N/A	NS
Parker et al 2010	Residual Pain	3 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.60	0.00	N/A	Favors Cemented
Parker et al 2010	Residual Pain	6 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.60	0.00	N/A	Favors Cemented
Parker et al 2010	Residual Pain	9 months	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.30	0.02	N/A	Favors Cemented
Parker et al 2010	Residual Pain	1 year	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.40	0.00	N/A	Favors Cemented

Table 63. Cemented Versus Uncemented Arthroplasty: Pain

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Parker et al 2010	Residual Pain	2 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.40	0.00	N/A	Favors Cemented
Parker et al 2010	Residual Pain	3 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.10	0.42	N/A	NS
Parker et al 2010	Residual Pain	4 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.10	0.41	N/A	NS
Parker et al 2010	Residual Pain	5 years	Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-0.30	0.01	N/A	NS

Table 64. Cemented Versus Uncemented Arthroplasty: Complications

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Deangelis et al 2012	Adverse event	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.756	NS
Deangelis et al 2012	Intensive care unit stay	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.694	NS
Deangelis et al 2012	Pneumonia	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.325	NS
Deangelis et al 2012	MI	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.577	NS
Deangelis et al 2012	Wound Infection	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.983	NS
Deangelis et al 2012	Reoperation	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	0.323	NS
Deangelis et al 2012	Cerebral vascular accident	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	1	NS
Deangelis et al 2012	Major hemorrhage	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	1	NS
Deangelis et al 2012	Thromboembolitic event	1 year	Cemented arthroplasty	Press-fit hemiarthroplasty	130	N/A	N/A	N/A	1	NS

Table 64. Cemented Versus Uncemented Arthroplasty: Complications

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Figved et al 2009	Intraoperative blood loss (ml)	Peri-op	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	219	Mean difference	90.00	0.00	N/A	Favors Uncemented
Figved et al 2009	Post op blood drainage (ml)	Peri-op	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	206	Mean difference	-13.00	0.54	N/A	NS
Figved et al 2009	Blood transfusion needed	Peri-op	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	217	Risk ratio	1.25	0.21	N/A	NS
Santini et al 2005	Complications (Lowest Hemoglobin value (g/dl)	48 Hrs	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.80	0.51	N/A	NS
Santini et al 2005	Complications (Blood units Transferred)	Peri-op	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	0.05	0.90	N/A	NS
Santini et al 2005	Complications (Surgical time)	Peri-op	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	18.02	0.03	N/A	Favors Cementless
Santini et al 2005	Complications	Post-op	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	0.73	0.23	N/A	NS
Taylor et al 2012	Cardiovascular event	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.99	NS
Taylor et al 2012	Respiratory infection	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	1	NS
Taylor et al 2012	Superficial or deep wound infection	Post-op	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.99	NS
Taylor et al 2012	Urinary tract infection	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	1	NS
Taylor et al 2012	Subsidence	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	<.001	Cemented
Taylor et al 2012	Post-op fracture	Post-op	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.0023	Cemented

Table 64. Cemented Versus Uncemented Arthroplasty: Complications

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Taylor et al 2012	Intraoperative fracture	Intra-op	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.028	Cemented
Taylor et al 2012	Reoperation	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.5	NS
Taylor et al 2012	Dislocation	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	0.5	NS
Taylor et al 2012	Other adverse events	2 years	Cemented arthroplasty	Uncemented hemiarthroplasty	160	N/A	N/A	N/A	1	NS

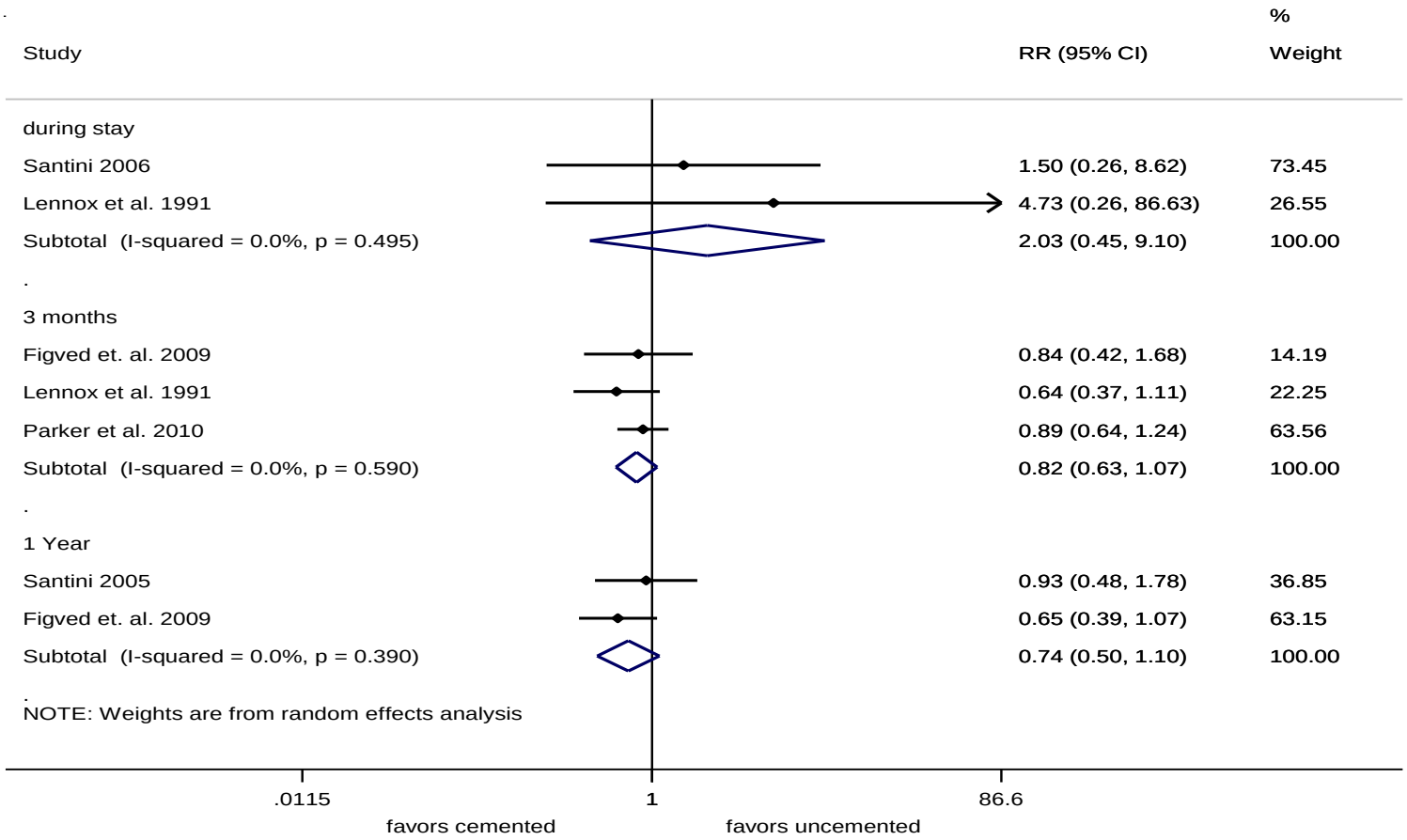
Table 65. Cemented Versus Uncemented Arthroplasty: Additional Outcomes

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Figved et al 2009	Hospital Stay (days)	Varied	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	215	Mean difference	-0.60	0.53	N/A	NS
Figved et al 2009	Quality of Life (Barthel Index of 19 or 20)	Baseline	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	220	Risk ratio	0.98	0.88	N/A	NS
Figved et al 2009	Quality of Life (Barthel Index of 19 or 20)	7 days	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	213	Risk ratio	0.55	0.15	N/A	NS
Figved et al 2009	Quality of Life (Barthel Index of 19 or 20)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	190	Risk ratio	0.88	0.41	N/A	NS
Figved et al 2009	Quality of Life (Barthel Index of 19 or 20)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	168	Risk ratio	0.79	0.09	N/A	NS
Figved et al 2009	Quality of Life (EQ-5D index)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	143	Mean difference	0.06	0.20	N/A	NS
Figved et al 2009	Quality of Life (EQ-5D index)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	113	Mean difference	0.07	0.19	N/A	NS
Figved et al 2009	Quality of Life (EQ-5D visual analog scale)	3 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	146	Mean difference	-2.00	0.55	N/A	NS

Table 65. Cemented Versus Uncemented Arthroplasty: Additional Outcomes

Study	Outcome	Time	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Figved et al 2009	Quality of Life (EQ-5D visual analog scale)	12 months	Cemented Hemiarthroplasty	Uncemented Hemiarthroplasty	121	Mean difference	-4.00	0.25	N/A	NS
Santini et al 2005	Length of Stay	Varied	Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Mean difference	-0.23	0.88	N/A	NS
Santini et al 2005	Return Home		Cemented Bipolar Hemiarthroplasty	Cementless Bipolar Hemiarthroplasty	106	Risk ratio	0.72	0.29	N/A	NS
Parker et al 2010	Initial total Hospital Stay (Days)		Cemented Thompson hemiarthroplasty	Uncemented Moore prosthesis	400	Mean difference	-3.80	0.09	N/A	NS

Figure 7. Cemented Versus Uncemented Arthroplasty: Meta-Analysis of Pain



SURGICAL APPROACH

Moderate evidence supports higher dislocation rates with a posterior approach in the treatment of displaced femoral neck fractures with hip arthroplasty.

Strength of Recommendation: Moderate 

RATIONALE

Two moderate strength articles (Bieber et al [92] and Skoldenberg et al[93]) compared the posterior approach to the direct lateral approach for arthroplasty in femoral neck fracture surgery. Alternative nomenclature for the posterior approach to the hip identified in the literature includes the Southern, the posterior, the Moore or the dorsal approach. Similarly, the direct lateral approach can also be called the anterolateral, the transgluteal or more commonly the Modified Hardinge approach. While neither of the included studies specifically addressed any functional outcomes, they both demonstrated statistically significant differences in dislocation rates, favoring the Modified Hardinge approach.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There is no inherent harm in either approach or any associated complications other than the primary outcome of dislocation of the prosthesis postoperatively. This information should be considered in the context of both patient and surgeon specific factors when deciding on a surgical approach.

FUTURE RESEARCH

The existing evidence only compares posterior and lateral approaches and only allows comparison of dislocation as the primary end point. Future well designed RCTs should include a comparison of the increasingly popular anterior approach with either the posterior and/or the lateral approach. Any future studies related to surgical approach should also include functional data associated with the approaches. This may have important implications for patient selection and recovery needs such as assistive devices or therapy needs.

RESULTS

QUALITY AND APPLICABILITY

Table 66. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Bieber et al 2012	Dislocation	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Bieber et al 2012	Infection	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Bieber et al 2012	Hematoma	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Bieber et al 2012	Seroma	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Bieber et al 2012	Perioperative fracture	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Bieber et al 2012	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Skoldenberg et al 2010	Dislocation	●	○	○	○	○	●	○	Low	●	●	●	●	High	Moderate
Skoldenberg et al 2010	Deep infection leading to reoperation	●	○	○	○	○	●	○	Low	●	●	●	●	High	Moderate
Skoldenberg et al 2010	Periprosthetic fracture leading to reoperation	●	○	○	○	○	●	○	Low	●	●	●	●	High	Moderate

Table 66. Quality Table of Treatment Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Skoldenberg et al 2010	Early aeseptic loosening leading to reoperation	●	○	○	○	○	●	○	Low	●	●	●	●	High	Moderate

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Table 67. Posterior Versus Direct Lateral Surgical Approach

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Bieber et al 2012	Dislocation	Either inpatient or causing re-admission	Dorsal approach	Transgluteal approach	704	Risk ratio	8.47	0.04	N/A	Favors transgluteal approach
Bieber et al 2012	Infection	Unclear	Dorsal approach	Transgluteal approach	704	Risk ratio	0.76	0.57	N/A	NS
Bieber et al 2012	Hematoma	Unclear	Dorsal approach	Transgluteal approach	704	Risk ratio	0.22	0.00	N/A	Favors transgluteal approach
Bieber et al 2012	Seroma	Unclear	Dorsal approach	Transgluteal approach	704	Risk ratio	2.01	0.37	N/A	NS
Bieber et al 2012	Perioperative fracture	Intraoperatively or early postoperatively	Dorsal approach	Transgluteal approach	704	Risk ratio	1.34	0.80	N/A	NS
Skoldenberg et al 2010	Dislocation	Varied	Posterolateral	Anterolateral	372	Risk ratio	7.97	0.01	N/A	Favors anterolateral
Skoldenberg et al 2010	Deep infection leading to reoperation	Varied	Posterolateral	Anterolateral	372	Risk ratio	2.34	0.30	N/A	NS
Skoldenberg et al 2010	Periprosthetic fracture leading to reoperation	Varied	Posterolateral	Anterolateral	372	Risk ratio	0.70	0.64	N/A	NS
Skoldenberg et al 2010	Early aeseptic loosening leading to reoperation	Varied	Posterolateral	Anterolateral	372	% risk difference	0.52	0.28	N/A	NS

STABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports the use of either a sliding hip screw or a cephalomedullary device in patients with stable intertrochanteric fractures.

Strength of Recommendation: Moderate 

RATIONALE

One high quality (Ahrengart et al[94]) and two moderate strength (Utrilla et al [95], Varela et al[96]) studies compared the use of an extramedullary sliding hip screw device with a cephalomedullary device for stable intertrochanteric fractures. The high strength study compared a cephalomedullary device and sliding hip screw in both stable and unstable intertrochanteric fractures (Ahrengart et al [94]). Subgroup evaluation of the stable fractures favored the use of a sliding hip screw with respect to operative time and blood loss. One moderate strength study (Utrilla et al [95]) found no difference in walking ability with either a sliding hip screw or cephalomedullary nail for the stable intertrochanteric fractures. The other moderate strength study (Varela et al[96]) found no difference in functional outcome, hospital stay, fracture collapse, or mortality between a cephalomedullary nail and an extramedullary sliding hip screw and plate device that offers two points of fixation into the femoral head.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation.

FUTURE RESEARCH

Randomized, prospective trials comparing modern cephalomedullary nails with extramedullary devices in a large cohort of patients with only stable intertrochanteric fractures (OTA 31.A1) should specifically assess functional outcomes, radiographic parameters, complications, and cost. These studies should control for patient demographics as well as quality of fracture reduction and placement of fixation (tip-to-apex distance). The potential difficulty with conversion to total hip arthroplasty for failed fracture treatment also should be considered when comparing fixation methods.

RESULTS

QUALITY AND APPLICABILITY

Table 68. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Ahrengart et al 2002	Healed Fracture	●	●	●	●	●	○	●	High	●	○	●	●	Moderate	High
Ahrengart et al 2002	Lateral Pain Over Femoral Head Screw	●	●	●	●	●	○	●	High	●	○	●	●	Moderate	High
Ahrengart et al 2002	Lives at Home	●	●	●	●	●	○	●	High	●	○	●	●	Moderate	High
Ahrengart et al 2002	Need Walking Aid	●	●	●	●	●	○	●	High	●	○	●	●	Moderate	High
Ahrengart et al 2002	Pain at Top of Greater Trochanter	●	●	●	●	●	○	●	High	●	○	●	●	Moderate	High
Utrilla et al 2013	Mortality	●	○	●	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Utrilla et al 2013	Operating Time (mins)	●	○	●	●	●	○	○	Moderate	○	○	●	●	Moderate	Moderate
Utrilla et al 2013	Stable Fractures	●	○	●	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Utrilla et al 2013	Walking Ability	●	○	●	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Utrilla et al 2013	Walking ability score	●	○	●	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Domain free of flaws: ●
Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Varela et al 2009	Activity Level: Cane	●	○	●	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Activity Level: No Help	●	○	●	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Activity Level: No Walk	●	○	●	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Activity Level: Walker	●	○	●	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Postoperative Stay (days)	●	○	●	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Surgical Time (min)	●	○	●	○	●	○	●	Moderate	○	○	●	○	Moderate	Moderate
Varela et al 2009	Surgical Time (min)	●	○	●	○	●	○	●	Moderate	○	○	●	○	Moderate	Moderate

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Table 69. Cephalomedullary Device Versus Sliding Hip Screw: Function

Study	Comparison	Outcome	Follow-up	Statistic	Result	p value	Favors
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Need Walking Aid	6 months	Risk ratio	1.02	0.81	NS
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Lives at Home	6 months	Risk ratio	1.05	0.55	NS
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Healed Fracture	6 months	Risk ratio	1.01	0.89	NS
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Fracture Healed in Peroperative Position	6 months	Risk ratio	1.32	<.001	Favors Gamma Nail
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Activity Level: No Walk	12 months	Risk ratio	0.2	0.29	NS
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Activity Level: Walker	12 months	Risk ratio	1	1	NS
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Activity Level: No Help	12 months	Risk ratio	0.82	0.61	NS
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Activity Level: Cane	12 months	Risk ratio	1.4	0.18	NS
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Walking Ability	12 months	Mean difference	0.2	0.65	NS

Table 70. Cephalomedullary Device Versus Sliding Hip Screw: Mortality

Study	Comparison	Outcome	Follow-up	Statistic	Result	p value	Favors
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Mortality	31-90 days	Risk ratio	0.2	0.14	NS
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Mortality	91-180 days	Risk ratio	7.13	0.19	NS
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Mortality	181-365 days	Risk ratio	1.36	0.56	NS
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Mortality	30 days	Risk ratio	0.71	0.48	NS

Table 71. Cephalomedullary Device Versus Sliding Hip Screw: Complications

Study	Comparison	Outcome	Follow-up	Statistic	Result	p value	Favors
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Stable Fractures	12 months	Mean difference	0.3	0.41	NS
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Walking ability score	12 months	Mean difference	1.2	<.01	Trochanteric Gamma Nail

Table 72. Cephalomedullary Device Versus Sliding Hip Screw: Additional Outcomes

Study	Comparison	Outcome	Follow-up	Statistic	Result	p value	Favors
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Lateral Pain Over Femoral Head Screw	6 months	Risk ratio	1.04	0.84	NS
Ahrengart et al 2002	Gamma Nail versus Compression Hip Screw	Pain at Top of Greater Trochanter	6 months	Risk ratio	3.27	<.001	Favors Compression Screw
Utrilla et al 2005	Trochanteric Gamma Nail versus Compression Hip Screw	Operating Time (mins)	In hospital	Mean difference	2	0.27	NS
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Surgical Time (min)	In hospital	Mean difference	-0.69	>.05	NS
Varela et al 2009	Gamma 3 versus Percutaneous Compression Plate	Postoperative Stay (days)	In hospital	Mean difference	1.03	>.05	NS

SUBTROCHANTERIC OR REVERSE OBLIQUITY FRACTURES

Strong evidence supports using a cephalomedullary device for the treatment of patients with subtrochanteric or reverse obliquity fractures.

Strength of Recommendation: Strong ★★★★

RATIONALE

There were 3 high (Sadowski et al [97], Zhang et al [98], Schipper et al [99]), and 2 moderate strength (Miedel et al [100], Hardy et al [101]) studies evaluating the use of cephalomedullary devices in the treatment of unstable intertrochanteric and subtrochanteric fractures. Although many comparative studies have been done, the variability of fracture classification systems and implants used makes interpretation of the literature challenging. Evaluation of these studies shows an apparent treatment benefit with cephalomedullary devices for unstable peritrochanteric fractures.

One high strength study (Sadowski et al [97]) that specifically evaluated reverse oblique and transverse intertrochanteric fractures (OTA 31.A3) found lower failure rates, blood loss, and operating room time in the cephalomedullary nail cohort versus a 95º fixed-angle device with no difference in functional results. Two high strength comparative studies showed similar results and outcomes between different cephalomedullary devices in unstable fractures (Zhang et al [98], Schipper et al [99]).

A moderate strength study (Miedel et al [100]) demonstrated a lower complication rate with use of a cephalomedullary versus an extramedullary device in treatment of unstable intertrochanteric and subtrochanteric fractures. Another moderate strength study (Hardy et al [101]) showed improved mobility and decreased limb shortening in unstable intertrochanteric fractures treated with a cephalomedullary device versus a sliding hip screw.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation

FUTURE RESEARCH

Continued comparative studies between modern cephalomedullary and extramedullary devices in unstable subtrochanteric and reverse obliquity fractures (OTA 31.A3) which control for fracture reduction and implant position (specifically tip-to-apex distance) may further clarify the utility of cephalomedullary devices for this fracture cohort.

UNSTABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports using a cephalomedullary device for the treatment of patients with unstable intertrochanteric fractures.

Strength of Recommendation: Moderate 

RATIONALE

Five moderate (Adams et al [102], Knobe et al [103], Papasimos 2005 [104],Utrilla et al [95], Leung et al [105]) and one high strength (Verettas et al [106]) studies evaluated the use of cephalomedullary devices in unstable intertrochanteric fractures with a separate lesser trochanteric fragment but no subtrochanteric involvement (OTA 31.A2). Although many studies have been done, the variability of fracture classification systems and implants used makes interpretation of the literature challenging. Evaluation of these studies shows moderate strength evidence supporting the treatment benefit of cephalomedullary devices for unstable intertrochanteric fractures.

Two moderate strength studies (Utrilla et al [95]; Leung et al [105]) recommended a cephalomedullary device over sliding hip screw. Utrilla et al [95] found improved postoperative walking ability and fewer blood transfusions in the cephalomedullary group. Leung et al. [105] showed no difference in mortality or ultimate hip function but did show a shorter convalescence in the cephalomedullary cohort. A high strength study (Verettas et al [106]) found no difference in pain and the systemic physiologic responses (O2 requirement, mental status, hematocrit) between treatment with a either sliding hip screw or a cephalomedullary device for this fracture pattern. Similarly, a moderate strength study (Knobe et al [103]) found similar mortality and functional results between an extramedullary and a cephalomedullary device. Papasimos et al [104] conducted a moderate strength study evaluating treatment with a sliding hip screw and two different cephalomedullary devices showing no difference between devices with respect to ultimate fracture consolidation and a return to pre-fracture level of function. Adams et al [102] conducted a moderate strength comparative study evaluating a cephalomedullary device to an extramedullary plate and screw including 31.A1, 31.A2 and 31.A3 fractures and found the use of an intramedullary device in the treatment of intertrochanteric femoral fractures is associated with a higher but nonsignificant risk of postoperative complications. By controlling for TAD, there was found to be no statistical difference in the performance of the implants when looking at fracture stability.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation

FUTURE RESEARCH

The current trend for increasing use of cephalomedullary devices in the treatment of intertrochanteric fractures (Yli-Kyyny, Injury 2012; 2008, Jeffery Anglen, JBJS) in the absence of strong supporting evidence as well as the recent concerns regarding increased complication rates with conversion of failed cephalomedullary implants to total hip arthroplasty (Pui et al JOA 2013) warrants caution and further investigation. High level trials comparing modern cephalomedullary devices with sliding hip screws in a large cohort of patients with intertrochanteric fractures classified as OTA 31.A2 should specifically assess functional

outcomes, radiographic outcomes, complications, and cost. These studies should control for patient demographics, quality of fracture reduction, hardware placement (specifically tip-to-apex distance) and the changing experience of practicing surgeons.

RESULTS

QUALITY AND APPLICABILITY

Table 73. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present:○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Adams et al 2001	Failure of fixation	●	○	●	○	●	○	○	Moderate	●	○	●	●	Moderate	Moderate
Hardy et al 1998	Mobility	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Hardy et al 1998	Ability to walk outside	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Hardy et al 1998	Mortality	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Difference in Harris hip score (mean, SD)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Difference in d'Aubigne & Postel score (mean, SD)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Hospitalization time (days, mean, SD)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	In-hospital death (number of patients)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Operative time (minutes, mean, SD)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Fluoroscopy time (seconds, mean, SD)	●	○	●	○	●	○	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Reoperation rate (number of patients)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate

Table 73. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present:○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Knobe et al 2012	Removal/change/correction of implant	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Knobe et al 2012	Hip prosthesis (number of patients)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Leung et al 1992	General debilitation	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Weeks to full weight bearing	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Independent walking ability	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Walking with aids	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Chair/bedbound	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Acute hospital stay (days)	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Convalescent hospital stay (days)	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Leung et al 1992	Operation time (min)	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Miedel et al 2005	Katz ADL index category A or B (independent in at least 5 of 6 functions)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Health related quality of life	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 73. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present:○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Miedel et al 2005	Intra-operative femoral fracture	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	No complication	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Penetration of lag screw	●	○	●	○	●	○	○	Low	●	○	●	●	Moderate	Low
Miedel et al 2005	Redisplacement/medialisation	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Revision	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Severe complication (cardiacpulmonary, thromboembolic or cerebrovascular)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Superficial wound infection	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Miedel et al 2005	Mortality	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 73. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present:○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Papasimos et al 2005	Return to prefracture level of ambulation and independence	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Low
Papasimos et al 2005	Hospital stay (days)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Low
Papasimos et al 2005	In hospital mortality	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Low
Papasimos et al 2005	Fracture consolidation time (months)	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Low
Papasimos et al 2005	Reoperation rate	●	○	●	○	●	●	○	Moderate	○	○	●	○	Moderate	Low
Utrilla et al 2005	Walking ability: Parker and Palmer mobility score (0-9)	●	○	●	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Verettas et al 2010	Number of independent walking days	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Verettas et al 2010	Hospital stay	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Verettas et al 2010	Mini Mental State Examination	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Verettas et al 2010	Hct (%)	●	○	●	○	●	○	●	Moderate	●	○	●	●	High	High
Verettas et al 2010	PO2 (mmHg)	●	○	●	○	●	○	●	Moderate	●	○	●	●	High	High
Verettas et al 2010	SO (%)	●	○	●	○	●	○	●	Moderate	●	○	●	●	High	High

Table 73. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●
Domain flaws present:○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength*
Verettas et al 2010	ASA score	●	○	●	○	●	●	●	Moderate	●	●	●	●	High	High
Zhang et al 2013	Cardiovascular disorder	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Pressure sore	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Urinary tract infection	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Harris Hip score	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Hospital stay (days)	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Mortality	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Anatomical reduction	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Delayed union	●	●	●	●	●	○	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Hip pain	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Thigh pain	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High
Zhang et al 2013	Reoperation	●	●	●	●	●	●	●	High	●	○	●	○	Moderate	High

FINDINGS

Table 74. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Home discharge	post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	0.48	0.35	N/A	NS
Sadowski et al 2002	Nursing home/rehabilitation hospital discharge	post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	1.01	0.94	N/A	NS
Sadowski et al 2002	Jensen social function score	12 months	Proximal Femoral Nail	Dynamic Hip Screw	28	Mean difference	0.10	0.82	N/A	NS
Sadowski et al 2002	Parker and palmer function score	12 months	Proximal Femoral Nail	Dynamic Hip Screw	28	Mean difference	-1.00	0.40	N/A	NS
Sadowski et al 2002	Home residence	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	Risk ratio	1.70	0.23	N/A	NS
Sadowski et al 2002	Nursing home residence	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	Risk ratio	1.70	0.23	N/A	NS
Miedel et al 2005	Katz ADL index category A or B (independent in at least 5 of 6 functions)	12 months	Gamma nail	Medoff sliding plate	168	Risk ratio	0.82	0.15	N/A	NS
Miedel et al 2005	Katz ADL index category A or B (independent in at least 5 of 6 functions)	4 months	Gamma nail	Medoff sliding plate	156	Risk ratio	0.90	0.43	N/A	NS
Miedel et al 2005	Health related quality of life	12 months	Gamma nail	Medoff sliding plate	217	N/A	-	-	>.05	NS
Hardy et al 1998	Mobility	12 months	Intramedullary Hip Screw	Compression hip screw	71	Mean difference	1.90	0.02	N/A	Favors intra-medullary hip scr
Hardy et al 1998	Ability to walk outside	12 months	Intramedullary Hip Screw	Compression hip screw	71	Mean difference	1.28	0.02	N/A	Favors intra-medullary hip scr

Table 75. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	In hospital mortality	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	% risk difference	10.00	0.12	N/A	NS
Sadowski et al 2002	Mortality	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	Risk ratio	1.89	0.59	N/A	NS
Miedel et al 2005	Mortality	12 months	Gamma nail	Medoff sliding plate	217	Risk ratio	0.50	0.04	N/A	Gamma nail
Hardy et al 1998	Mortality	12 months	Intramedullary Hip Screw	Compression hip screw	71	Risk ratio	0.69	0.32	N/A	NS

Table 76. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Hospital Stay

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Hospital stay	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	Mean difference	-5.00	0.01	N/A	PFN

Table 77. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Fracture Healing

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Nn union	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	Risk ratio	0.94	0.97	N/A	NS
Sadowski et al 2002	Consolidation time	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	Mean difference	1.50	0.14	N/A	NS

Table 78. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Reoperation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Hip prosthesis reoperation	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	-5.88	0.26	N/A	NS
Sadowski et al 2002	Change of implant reoperation	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	-5.88	0.26	N/A	NS
Sadowski et al 2002	Change of implant and bone graft reoperation	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	-23.53	0.02	N/A	PFN
Sadowski et al 2002	Conversion from static to dynamic construct	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	11.11	0.12	N/A	NS
Miedel et al 2005	Revision trochanteric fractures	12 months	Gamma nail	Medoff sliding plate	189	Risk ratio	0.52	0.34	N/A	NS
Miedel et al 2005	Revision subtrochanteric fractures	12 months	Gamma nail	Medoff sliding plate	28	% risk difference	-25.00	0.03	N/A	Gamma nail

Table 79. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Blood transfused (units)	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Mean difference	-1.50	0.01	N/A	PFN
Sadowski et al 2002	No. of patients receiving blood	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	0.58	0.01	N/A	PFN
Sadowski et al 2002	Urinary infection	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	2.38	0.26	N/A	NS
Sadowski et al 2002	Pneumonia	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	0.63	0.59	N/A	NS
Sadowski et al 2002	Cardiac failure or infarction	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	0.95	0.97	N/A	NS
Sadowski et al 2002	Decibotis	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	% risk difference	-5.26	0.26	N/A	NS
Sadowski et al 2002	Cerebrovascular accident	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	% risk difference	5.00	0.28	N/A	NS
Sadowski et al 2002	Wound complications	Post-op	Proximal Femoral Nail	Dynamic Hip Screw	39	Risk ratio	1.43	0.68	N/A	NS
Sadowski et al 2002	Implant fracture	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	-35.29	0.00	N/A	PFN
Sadowski et al 2002	Infection	12 months	Proximal Femoral Nail	Dynamic Hip Screw	35	% risk difference	-5.88	0.26	N/A	NS
Miedel et al 2005	No complication Trochanteric fractures	12 months	Gamma nail	Medoff sliding plate	189	Risk ratio	0.99	0.72	N/A	NS
Miedel et al 2005	Penetration of lag screw Trochanteric fractures	12 months	Gamma nail	Medoff sliding plate	189	Risk ratio	0.77	0.73	N/A	NS
Miedel et al 2005	Redisplacement/medialisation Trochanteric fractures	12 months	Gamma nail	Medoff sliding plate	189	% risk difference	-1.04	0.28	N/A	NS
Miedel et al 2005	Intra-operative femoral fracture Trochanteric fractures	Intra-op	Gamma nail	Medoff sliding plate	189	% risk difference	3.23	0.06	N/A	NS

Table 79. Advanced Imaging- Cephalomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Miedel et al 2005	No complication Subtrochanteric fractures	12 months	Gamma nail	Medoff sliding plate	28	% risk difference	16.67	0.09	N/A	NS
Miedel et al 2005	Penetration of lag screw Subtrochanteric fractures	12 months	Gamma nail	Medoff sliding plate	28	% risk difference	0.00	1.00	N/A	NS
Miedel et al 2005	Redisplacement/medialisation Subtrochanteric fractures	12 months	Gamma nail	Medoff sliding plate	28	% risk difference	-16.67	0.09	N/A	NS
Miedel et al 2005	Intra-operative femoral fracture Subtrochanteric fractures	intra-op	Gamma nail	Medoff sliding plate	28	% risk difference	0.00	1.00	N/A	NS
Miedel et al 2005	Superficial wound infection	12 months	Gamma nail	Medoff sliding plate	217	Risk ratio	0.33	0.17	N/A	NS
Miedel et al 2005	Severe complication (cardiacpulmonary, thromboembolic or cerebrovascular)	12 months	Gamma nail	Medoff sliding plate	217	Risk ratio	0.74	0.69	N/A	NS
Hardy et al 1998	Limb length discrepancy (cm)	12 months	Intramedullary Hip Screw	Compression hip screw	62	N/A	-	-	>.05	NS

Table 80. Cephalomedullary Device Versus Sliding Hip Screw: Other Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sadowski et al 2002	Operative time (min)	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Mean difference	-84.00	0.00	N/A	PFN
Sadowski et al 2002	Fluoroscopy time (min)	Intra-operative	Proximal Femoral Nail	Dynamic Hip Screw	39	Mean difference	0.19	0.77	N/A	NS

Table 81. Comparison of Cephalomedullary Devices

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Zhang et al 2013	Blood loss (ml)	Perioperative	Proximal femoral nail antirotation	Inter-tan nail	113	Mean difference	-37.80	0.08	N/A	NS
Zhang et al 2013	Iatrogenic femoral shaft fracture	Intraoperative	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	2.04	0.56	N/A	NS
Zhang et al 2013	Lateral greater trochanter fracture	Intraoperative	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	0.17	0.10	N/A	NS
Zhang et al 2013	Distal interlocking problem	Intraoperative	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	1.02	0.99	N/A	NS
Zhang et al 2013	Proximal end of femoral nail penetrating top of trochanter	Intraoperative	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	4.07	0.20	N/A	NS
Zhang et al 2013	Local complications	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.53	0.29	N/A	NS
Zhang et al 2013	Superficial wound infection	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	0.68	0.67	N/A	NS
Zhang et al 2013	Deep infection	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	0.51	0.58	N/A	NS
Zhang et al 2013	Hematoma	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	0.68	0.67	N/A	NS
Zhang et al 2013	Cutout	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	% risk difference	4.35	0.12	N/A	NS
Zhang et al 2013	Lateral migration hip screw	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	% risk difference	8.70	0.03	N/A	Favors InterTan group
Zhang et al 2013	Femoral shaft fracture	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	% risk difference	2.17	0.27	N/A	NS
Zhang et al 2013	General complications	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.18	0.47	N/A	NS
Zhang et al 2013	Deep venous thrombosis	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	0.88	0.80	N/A	NS

Table 81. Comparison of Cephalomedullary Devices

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Zhang et al 2013	Pulmonary embolism	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	% risk difference	-2.13	0.28	N/A	NS
Zhang et al 2013	Cardiovascular disorder	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.43	0.51	N/A	NS
Zhang et al 2013	Pressure sore	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.36	0.67	N/A	NS
Zhang et al 2013	Urinary tract infection	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.53	0.48	N/A	NS
Zhang et al 2013	Harris Hip score	12 months	Proximal femoral nail antirotation	Inter-tan nail	113	Mean difference	2.40	0.31	N/A	NS
Zhang et al 2013	Hospital stay (days)	Varied	Proximal femoral nail antirotation	Inter-tan nail	113	Mean difference	-0.30	0.27	N/A	NS
Zhang et al 2013	Mortality	12 months	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	0.89	0.81	N/A	NS
Zhang et al 2013	Anatomical reduction	Perioperative	Proximal femoral nail antirotation	Inter-tan nail	113	Risk ratio	1.09	0.41	N/A	NS
Zhang et al 2013	Delayed union	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	% risk difference	6.52	0.05	N/A	NS
Zhang et al 2013	Hip pain	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.02	0.98	N/A	NS
Zhang et al 2013	Thigh pain	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	4.09	0.02	N/A	Favors InterTan group
Zhang et al 2013	Reoperation	12 months	Proximal femoral nail antirotation	Inter-tan nail	93	Risk ratio	1.53	0.63	N/A	NS
Schipper et al 2004	Harris hip Score Mobility	Pre-op	Proximal femoral Nail	Gamma Nail	424	Mean difference	-1.30	0.34	N/A	NS
Schipper et al 2004	Mortality	4 weeks	Proximal femoral Nail	Gamma Nail	424	Risk ratio	1.21	0.50	N/A	NS
Schipper et al 2004	Re-operation	4 weeks	Proximal femoral Nail	Gamma Nail	424	Risk ratio	0.71	0.47	N/A	NS

Table 81. Comparison of Cephalomedullary Devices

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Schipper et al 2004	Local complication	4 weeks	Proximal femoral Nail	Gamma Nail	424	Risk ratio	0.77	0.22	N/A	NS
Schipper et al 2004	Mortality	4 months	Proximal femoral Nail	Gamma Nail	424	Risk ratio	1.38	0.41	N/A	NS
Schipper et al 2004	Fracture Consolidation	4 months	Proximal femoral Nail	Gamma Nail	424	Risk ratio	0.88	0.27	N/A	NS
Schipper et al 2004	Re-operation	4 months	Proximal femoral Nail	Gamma Nail	424	Risk ratio	3.03	0.05	N/A	NS
Schipper et al 2004	Local complication	4 months	Proximal femoral Nail	Gamma Nail	424	Risk ratio	2.16	0.08	N/A	NS
Schipper et al 2004	Mortality	1 year	Proximal femoral Nail	Gamma Nail	424	Risk ratio	0.64	0.35	N/A	NS
Schipper et al 2004	Fracture Consolidation	1 year	Proximal femoral Nail	Gamma Nail	424	Risk ratio	1.22	0.21	N/A	NS
Schipper et al 2004	Local complication	1 year	Proximal femoral Nail	Gamma Nail	424	Risk ratio	2.02	0.32	N/A	NS
Schipper et al 2004	Reoperation	1 year	Proximal femoral Nail	Gamma Nail	424	Risk ratio	1.77	0.36	N/A	NS

Table 82. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Utrilla et al 2005	Walking ability: Parker and Palmer mobility score (0-9)	12 months	Gamma nail	Compression hip screw	156	Mean difference	1.20	0.00	N/A	Gamma nail
Leung et al 1992	General debilitation	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	1.54	0.56	N/A	NS
Leung et al 1992	Weeks to full weight bearing	Varied	Gamma nail	Dynamic hip screw	136	Mean difference	-0.50	0.00	N/A	Gamma nail

Table 82. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Function

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Leung et al 1992	Independent walking ability	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	1.11	0.67	N/A	NS
Leung et al 1992	Walking with aids	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	0.99	0.96	N/A	NS
Leung et al 1992	Chair/bedbound	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	0.72	0.55	N/A	NS
Knobe et al 2012	Difference in Harris hip score (mean, SD)	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	39	Mean difference	0.40	0.91	N/A	NS
Knobe et al 2012	Difference in d'Aubigne & Postel score (mean, SD)	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	6.5	Mean difference	0.00	1.00	N/A	NS
Verettas et al 2010	Number of independent walking days	10 days	Gamma nail	Dynamic hip screw	118	Mean difference	-0.80	0.12	N/A	NS
Papasimos et al 2005	Return to prefracture level of ambulation and independence	In surgery	Gamma nail	Dynamic hip screw	80	N/A	-	-	>.05	NS
Papasimos et al 2005	Return to prefracture level of ambulation and independence	In surgery	Proximal Femoral Nail	Dynamic hip screw	80	N/A	-	-	>.05	NS

Table 83. Advanced Imaging4B-Cephallomedullary Device Versus Sliding Hip Screw: Pain

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Verettas et al 2010	VAS pain	5 days	Gamma nail	Dynamic hip screw	118	Mean difference	-0.20	-	.563	NS
Verettas et al 2010	VAS pain	10 days	Gamma nail	Dynamic hip screw	118	Mean difference	-0.10	-	.747	NS

Table 84. Advanced Imaging4B-Cephallomedullary Device Versus Sliding Hip Screw: Mortality

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Knobe et al 2012	In-hospital death (number of patients)	In hospital	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	Risk ratio	2.00	0.41	N/A	NS
Papasimos et al 2005	In hospital mortality	Varied	Gamma nail	Dynamic hip screw	80	Mean difference	1.00	1	-	NS
Papasimos et al 2005	In hospital mortality	Varied	Proximal Femoral Nail	Dynamic hip screw	80	Mean difference	0.00	-	>.05	NS

Table 85. Advanced Imaging4B-Cephallomedullary Device Versus Sliding Hip Screw: Hospital Stay

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Leung et al 1992	Acute hospital stay (days)	Varied	Gamma nail	Dynamic hip screw	136	Mean difference	-0.10	0.88	N/A	NS
Leung et al 1992	Convalescent hospital stay (days)	Varied	Gamma nail	Dynamic hip screw	136	Mean difference	-3.20	0.05	N/A	NS
Knobe et al 2012	Hospitalization time (days, mean, SD)	Varied	Proximal Femoral Nail antirotation	Percutaneous compression plate	26	Mean difference	2.00	0.17	N/A	NS
Verettas et al 2010	Hospital stay	Varied	Gamma nail	Dynamic hip screw	118	Mean difference	-0.10	-	.144	NS
Papasimos et al 2005	Hospital stay (days)	Varied	Gamma nail	Dynamic hip screw	80	Mean difference	-1.30	-	>.05	NS
Papasimos et al 2005	Hospital stay (days)	Varied	Proximal Femoral Nail	Dynamic hip screw	80	Mean difference	-1.10	-	>.05	NS

Table 86. Advanced Imaging4B-Cephallomedullary Device Versus Sliding Hip Screw: Fixation Failure

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Papasimos et al 2005	Fracture consolidation time (months)	Varied	Gamma nail	Dynamic hip screw	80	Mean difference	-0.30	-	>.05	NS
Papasimos et al 2005	Fracture consolidation time (months)	Varied	Proximal Femoral Nail	Dynamic hip screw	80	Mean difference	-0.20	-	>.05	NS
Adams et al 2001	Failure of fixation	8.4 average follow up	IM nail	Dynamic screw and plate	367	N/A	-	-	>.05	NS

Table 87. Advanced Imaging4B-Cephallomedullary Device Versus Sliding Hip Screw: Revision

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Knobe et al 2012	Reoperation rate (number of patients)	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	Risk ratio	0.83	0.75	N/A	NS
Knobe et al 2012	Removal/change/correction of implant	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	Risk ratio	0.80	0.73	N/A	NS
Knobe et al 2012	Hip prosthesis (number of patients)	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	% risk difference	-1.85	0.27	N/A	NS
Papasimos et al 2005	Reoperation rate	12	Gamma nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Reoperation rate	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	1.33	0.69	N/A	NS

Table 88. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Mental State

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Verettas et al 2010	Mini Mental State Examination	1st postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-1.17	0.33	N/A	NS
Verettas et al 2010	Mini Mental State Examination	3rd postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-1.34	0.28	N/A	NS
Verettas et al 2010	Mini Mental State Examination	10th postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.83	0.49	N/A	NS
Verettas et al 2010	Mini Mental State Examination	Minimum value	Gamma nail	Dynamic hip screw	118	Mean difference	-1.14	0.35	N/A	NS
Papasimos et al 2005	Mental disturbances	12 months	Gamma nail	Dynamic hip screw	80	Risk ratio	1.50	0.65	N/A	NS

Table 89. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Knobe et al 2012	Units transfused 24 hours (mean, SD)	24 hours	Proximal Femoral Nail antirotation	Percutaneous compression plate	3.5	Mean difference	0.60	0.06	N/A	NS
Knobe et al 2012	Patients transfused 24 hours (number of patients)	24 hours	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	Risk ratio	1.29	0.18	N/A	NS
Knobe et al 2012	Femoral shaft fracture	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	% risk difference	1.85	0.27	N/A	NS
Knobe et al 2012	Cerclage	2 years	Proximal Femoral Nail antirotation	Percutaneous compression plate	108	% risk difference	1.85	0.27	N/A	NS
Leung et al 1992	Blood loss ml	intra-operative	Gamma nail	Dynamic hip screw	136	Mean difference	-174.44	0.04	N/A	Favors Gamma Nail
Leung et al 1992	Chest infection	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	0.77	0.77	N/A	NS
Leung et al 1992	Heart failure	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	0.29	0.26	N/A	NS

Table 89. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Leung et al 1992	Renal failure	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	4.63	0.17	N/A	NS
Leung et al 1992	Cerebrovascular accident	6 months	Gamma nail	Dynamic hip screw	136	Risk ratio	0.58	0.65	N/A	NS
Papasimos et al 2005	Blood loss (ml)	In surgery	Gamma nail	Dynamic hip screw	80	Mean difference	-32.40	-	>.05	NS
Papasimos et al 2005	Chest infection	12	Gamma nail	Dynamic hip screw	80	% risk difference	0.00	1.00	N/A	NS
Papasimos et al 2005	Pulmonary embolism	12	Gamma nail	Dynamic hip screw	80	Risk ratio	0.50	0.56	N/A	NS
Papasimos et al 2005	Respiratory distress	12	Gamma nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Urinary tract infection	12	Gamma nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Urinary retention	12	Gamma nail	Dynamic hip screw	80	% risk difference	-2.50	0.27	N/A	NS
Papasimos et al 2005	DVT	12	Gamma nail	Dynamic hip screw	80	Risk ratio	0.50	0.56	N/A	NS
Papasimos et al 2005	Hematoma	12	Gamma nail	Dynamic hip screw	80	Risk ratio	0.67	0.65	N/A	NS
Papasimos et al 2005	Superficial wound infection	12	Gamma nail	Dynamic hip screw	80	% risk difference	-2.50	0.27	N/A	NS
Papasimos et al 2005	Delayed wood healing	12	Gamma nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Blood loss (ml)	in surgery	Proximal Femoral Nail	Dynamic hip screw	80	Mean difference	-17.40	-	>.05	NS
Papasimos et al 2005	Chest infection	12	Proximal Femoral Nail	Dynamic hip screw	80	% risk difference	0.00	1.00	N/A	NS
Papasimos et al 2005	Pulmonary embolism	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	0.50	0.56	N/A	NS

Table 89. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Papasimos et al 2005	Respiratory distress	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	2.00	0.56	N/A	NS
Papasimos et al 2005	Urinary tract infection	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	0.50	0.56	N/A	NS
Papasimos et al 2005	Urinary retention	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	DVT	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	0.50	0.56	N/A	NS
Papasimos et al 2005	Hematoma	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Superficial wound infection	12	Proximal Femoral Nail	Dynamic hip screw	80	Risk ratio	1.00	1.00	N/A	NS
Papasimos et al 2005	Delayed wood healing	12	Proximal Femoral Nail	Dynamic hip screw	80	% risk difference	-2.50	0.27	N/A	NS
Papasimos et al 2005	Intra-operative fracture	in surgery	Gamma nail	Dynamic hip screw	80	% risk difference	2.50	0.27	N/A	NS
Papasimos et al 2005	Intra-operative fracture	in surgery	Proximal Femoral Nail	Dynamic hip screw	80	% risk difference	0.00	1.00	N/A	NS
Utrilla et al 2005	Blood transfusions	intra-operative	Gamma nail	compression hip screw	210	Mean difference	-0.30	0.05	N/A	NS
Verettas et al 2010	Blood loss (ml)	10 days	Gamma nail	Dynamic hip screw	118	Mean difference	-50.00	-	.237	NS
Verettas et al 2010	Blood units transfused	10 days	Gamma nail	Dynamic hip screw	118	Mean difference	0.00	-	.847	NS
Verettas et al 2010	Respiratory complication	10 days	Gamma nail	Dynamic hip screw	118	% risk difference	1.69	0.27	N/A	NS
Verettas et al 2010	Cardiovascular complication	10 days	Gamma nail	Dynamic hip screw	118	Risk ratio	1.00	1.00	N/A	NS
Verettas et al 2010	DVT	10 days	Gamma nail	Dynamic hip screw	118	Risk ratio	2.00	0.57	N/A	NS

Table 89. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Complications

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Verettas et al 2010	Neurologic complication	10 days	Gamma nail	Dynamic hip screw	118	Risk ratio	2.00	0.57	N/A	NS
Verettas et al 2010	Intensive Care unit admissions	10 days	Gamma nail	Dynamic hip screw	118	Risk ratio	1.00	1.00	N/A	NS
Verettas et al 2010	Superficial wound infection	10 days	Gamma nail	Dynamic hip screw	118	% risk difference	-3.39	0.12	N/A	NS
Verettas et al 2010	Delayed wound healing	10 days	Gamma nail	Dynamic hip screw	118	Risk ratio	1.00	1.00	N/A	NS

Table 90. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Other Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Verettas et al 2010	Hct (%)	1st postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	0.88	0.17	N/A	NS
Verettas et al 2010	Hct (%)	3rd postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.10	0.87	N/A	NS
Verettas et al 2010	Hct (%)	10th postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	0.22	0.59	N/A	NS
Verettas et al 2010	Hct (%)	Minimum value	Gamma nail	Dynamic hip screw	118	Mean difference	0.97	0.12	N/A	NS
Verettas et al 2010	PO2 (mmHg)	1st postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.32	0.84	N/A	NS
Verettas et al 2010	PO2 (mmHg)	3rd postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.78	0.65	N/A	NS
Verettas et al 2010	PO2 (mmHg)	10th postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.37	0.80	N/A	NS
Verettas et al 2010	PO2 (mmHg)	Minimum value	Gamma nail	Dynamic hip screw	118	Mean difference	-0.86	0.55	N/A	NS
Verettas et al 2010	SO (%)	1st postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	0.71	0.42	N/A	NS

Table 90. Advanced Imaging-Cephallomedullary Device Versus Sliding Hip Screw: Other Outcomes

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Verettas et al 2010	SO (%)	3rd postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.59	0.41	N/A	NS
Verettas et al 2010	SO (%)	10th postoperative day	Gamma nail	Dynamic hip screw	118	Mean difference	-0.26	0.59	N/A	NS
Verettas et al 2010	SO (%)	Minimum value	Gamma nail	Dynamic hip screw	118	Mean difference	-0.17	0.88	N/A	NS
Verettas et al 2010	ASA score	Postoperative	Gamma nail	Dynamic hip screw	118	Mean difference	-0.10	0.41	N/A	NS

VTE PROPHYLAXIS

Moderate evidence supports use of venous thromboembolism prophylaxis (VTE) in hip fracture patients.

Strength of Recommendation: Moderate 

RATIONALE

One high strength study (PE Prevention Trial Collaborative Group[107]), three moderate strength studies (Moskovits et al[167]; Xabregas et al[168]; Morris et al[169]), and eight low strength studies (Chatanaphutiet al [108]; Sasaki et al[109]; Sasaki et al[110]; Checketts et al[111]; Jorgensen et al[112]; Lahnborg et al[113]; Kew et al[114]; Eskeland et al[115]) were identified comparing various pharmacological prophylaxis interventions to placebo. One moderate strength study (Stranks et al[115]) compared mechanical prophylaxis to a group that received no mechanical prophylaxis. These studies show the risk of DVT/VTE/PE complications is significantly less with VTE prophylaxis than control. Most general complications were not significantly different between treatment groups, with the exception of Lahnborg et al[113] which found hematoma complications were higher in pharmacological prophylaxis groups. There was no difference in hospital stay and there is some evidence that mortality is less with prophylaxis.

Given the significant established risk factors for VTE present in this patient population including age, presence of hip fracture, major surgery, delays to surgery, and the potential serious consequences of failure to provide prophylaxis in the hip fracture population, it is the recommendation of the workgroup that VTE prophylaxis be used

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Patients with hip fracture are at high risk for deep venous thrombosis and pulmonary embolism. The consequences of symptomatic VTE are significant and include both increased morbidity and mortality. The harms associated with this recommendation include those associated with VTE prophylaxis, bleeding and thrombotic complications.

FUTURE RESEARCH

The issue of VTE prophylaxis in patients who have sustained a hip fracture is complex. There are many unanswered questions that have the potential to have a significant impact on clinical outcomes for this patient population. A multi-armed randomized controlled study would be optimal. Such a study would potentially need to evaluate the comparative effectiveness of a multitude of chemical agents, at different dosages, with multiple time points (such as pre and post-op), and include assorted durations of therapy, while utilizing contemporary diagnostic methodologies. Barriers to such a study include the low incidence of the complication implicating a requirement for a substantially large sample size. Furthermore, such a study carries ethical concerns given the potential risks associated with under-treatment. Potentially, well organized patient outcome registries may ultimately help improve our knowledge in this area.

RESULTS

QUALITY AND APPLICABILITY

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Checkets et al 1974	DVT	●	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Checkets et al 1974	unilateral DVT	●	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Chotanaphuti et al 2009	blood loss between<300 ml	●	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Chotanaphuti et al 2009	mortality (Hazard ratio)	●	○	○	○	●	●	○	Low	●	○	●	●	Moderate	Low
Eskander et al 1997	DVT	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Eskander et al 1997	fall in haemoglobin concentration	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Eskander et al 1997	needed transfusion	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Eskander et al 1997	nonfatal PE	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Eskander et al 1997	wound drainage (ml)	●	○	●	○	○	●	○	Low	○	○	●	●	Moderate	Low
Eskeland et al 1966	mortality	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Jorgensen et al 1992	Radioactive I fibrogen test for DVT inconclusive	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	Radioactive I fibrogen test for DVT positive	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	Radioactive I fibrogen test for DVT probable	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	cariace arrest death	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	median bleeding in drainage (ml)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Jorgensen et al 1992	median hemoglobin difference	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	median hospital stay	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	median intraoperative bleeding (ml)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	median transfusion (g erythocytes)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	multiple PE related death	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	pnemonia death	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	required transfusion	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1992	total DVT	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1998	DVT	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Jorgensen et al 1998	mortality	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1998	operative bleeding (ml)	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1998	peroperative transfusion requirements (units [1 unit=350 ml concentrated erytrocytes])	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1998	postoperative transfusion requirements (units [1 unit=350 ml concentrated erytrocytes])	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Jorgensen et al 1998	proximal dvt	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Kew et al 1999	DVT	●	○	●	○	○	●	○	Low	○	○	●	○	Moderate	Low

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Kew et al 1999	development of contralateral dvt	●	○	●	○	○	●	○	Low	○	○	●	○	Moderate	Low
Lahnborg et al 1980	DVT	●	○	○	○	○	●	○	Low	●	○	●	●	Moderate	Low
Lahnborg et al 1980	local haematoma at injection site	●	○	○	○	○	●	○	Low	●	○	●	●	Moderate	Low
Lahnborg et al 1980	mortality due to cardiac failure	●	○	○	○	○	●	○	Low	●	○	●	●	Moderate	Low
Morris et al 1976	Bilateral DVT	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	DVT	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	Mortality	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	Mortality due to PE	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	excessivve wound leakage	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Morris et al 1976	gross haematuria	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	large wound haematoma	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	minor heamorrhagic complications	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	moratlity from Cerebellar haemorrhage	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	small haematemesis	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	unilateral DVT on opposite side of fracture	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Morris et al 1976	unilateral DVT on side of fracture	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate
Moskovits et al et al 1978	PE related mortality	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Moskovits et al et al 1978	bleeding complications	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
Moskovits et al et al 1978	mortality	●	●	●	●	○	●	○	Moderate	●	○	●	●	Moderate	Moderate
PE prevention Group	All vascular deaths	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to All non-vascular deaths	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to Heart failure	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to Other non-vascular cause	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to Other vascular cause	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention	Death due to Pneumonia or	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Group	bronchitis														
PE prevention Group	Death due to Pulmonary embolism	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to Stroke	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to Unknown cause of vascular death	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Death due to lschaemic heart disease	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	Distal DVT	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	any DVT	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
PE prevention Group	any PE	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	any VTE	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	definite PE	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	nonfatal Deep-vein thrombosis	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	nonfatal Myocardial infarction	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	nonfatal Pulmonary embolism	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	nonfatal Stroke	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
PE prevention Group	nonfatal Venous thromboembolism	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	probable PE	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	proximal DVT	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	total mortality	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	total number of DVT diagnosed by other test than venograph	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
PE prevention Group	total number of venographic indicated DVT	●	●	●	●	●	●	○	High	○	●	●	○	Moderate	High
Sasaki et al 2009	Drainage volume (ml)	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Sasaki et al 2009	Hospital stay (days)	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low
Sasaki et al 2009	Total Drainage volume (ml)	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low
Sasaki et al 2009	hematoma	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low
Sasaki et al 2009	hemoglobin loss of > 2 g/dl	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low
Sasaki et al 2009	wound necrosis and hematoma	●	○	○	○	●	○	●	Low	○	○	●	●	Moderate	Low
Sasaki et al 2011	Drainage volume (ml)	●	○	○	○	○	●	○	Low	●	○	○	○	Moderate	Low
Sasaki et al 2011	Fatal bleeding	●	○	○	○	○	●	○	Low	●	○	○	○	Moderate	Low
Sasaki et al 2011	Major bleeding	●	○	○	○	○	●	○	Low	●	○	○	○	Moderate	Low
Sasaki et al 2011	Minor bleeding	●	○	○	○	○	●	○	Low	●	○	○	○	Moderate	Low

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Sasaki et al 2011	Total Drainage volume (ml)	●	○	○	○	○	●	○	Low	●	○	○	○	Moderate	Low
Stranks et al 1992	clear evidence of proximal DVT	●	○	○	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Stranks et al 1992	swelling (difference in calf circumference in centimeters compared to control)	●	○	○	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Stranks et al 1992	swelling (difference in thigh circumference in centimeters compared to control)	●	○	○	○	●	●	●	Moderate	●	○	●	○	Moderate	Moderate
Xabregas et al 1978	DVT	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	PE	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	blood loss (ml)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Table 91. Quality Table of Treatment Studies for Advanced Imaging5

●: Domain free of flaws

○: Domain flaws present

◐: Moderate power

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention and Expertise	Compliance and Adherence	Analysis	*Applicability*	*Strength of Evidence*
Xabregas et al 1978	extensive bruising at injection site	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	haematuria (microscopic)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	mild bruising at injection site	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	wound haematoma	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Xabregas et al 1978	wound infection	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

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Table 92. Pharmacological Prophylaxis Versus Control: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sasaki et al 2011	Drainage volume (ml)	Postop 1 day to tube removal	Enoxaparin subcutaneously 2000 IU once or twice perday depending on creatinine level and compression stockings	compression stockings only	57	mean difference	3.50	0.85	N/A	NS
Sasaki et al 2011	Total Drainage volume (ml)	post-op	Enoxaparin subcutaneously 2000 IU once or twice perday depending on creatinine level and compression stockings	compression stockings only	57	mean difference	-6.30	0.89	N/A	NS
Sasaki et al 2011	Major bleeding	post op	Enoxaparin subcutaneously 2000 IU once or twice perday depending on creatinine level and compression stockings	compression stockings only	57	% risk difference	0.00	1.00	N/A	NS
Sasaki et al 2011	Minor bleeding	post op	Enoxaparin subcutaneously 2000 IU once or twice perday depending on creatinine level and compression stockings	compression stockings only	57	% risk difference	3.57	0.27	N/A	NS

Table 92. Pharmacological Prophylaxis Versus Control: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Chotanaphuti et al 2009	blood loss between<300 ml	post-op	Enoxiparin sodium 40mg and Coumadin 3mg with pneumatic devices	only pneumatic devices	25	risk ratio	1.11	0.08	N/A	NS
Sasaki et al 2011	Drainage volume (ml)	Postop. 1 day to tube removal	Fondaparinux 1.5 or 2.5 mg/day with injection for 14 days with compression stockings	compression stockings only	56	mean difference	12.40	0.55	N/A	NS
Sasaki et al 2011	Total Drainage volume (ml)	post-op	Fondaparinux 1.5 or 2.5 mg/day with injection for 14 days with compression stockings	compression stockings only	56	mean difference	1.30	0.98	N/A	NS
Sasaki et al 2011	Major bleeding	post op	Fondaparinux 1.5 or 2.5 mg/day with injection for 14 days with compression stockings	compression stockings only	56	% risk difference	7.41	0.11	N/A	NS
Sasaki et al 2011	Minor bleeding	post op	Fondaparinux 1.5 or 2.5 mg/day with injection for 14 days with compression stockings	compression stockings only	56	% risk difference	0.00	1.00	N/A	NS

Table 92. Pharmacological Prophylaxis Versus Control: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sasaki et al 2009	Drainage volume (ml)	Postop 1 day to tube removal	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	mean difference	36.80	0.02	N/A	compression stockings only
Sasaki et al 2009	Total Drainage volume (ml)	post op	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	mean difference	2.60	0.94	N/A	NS
Sasaki et al 2009	hemoglobin loss of > 2 g/dl	post op	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	% risk difference	5.26	0.12	N/A	NS
Xabregas et al 1978	blood loss (ml)	post-op	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	mean difference	95.00	0.13	N/A	NS
Jorgensen et al 1992	median intraoperative bleeding (ml)	intra-op	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	mean difference	0.00	-	>.05	NS

Table 92. Pharmacological Prophylaxis Versus Control: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1992	median bleeding in drainage (ml)	intra-op	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	mean difference	-42.00	-	>.05	NS
Jorgensen et al 1992	median transfusion (g erythocytes)	postop	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	mean difference	310.00	-	<.05	placebo
Jorgensen et al 1992	median hemoglobin difference	postop	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	mean difference	0.45	-	>.05	NS

Table 93. Pharmacological Prophylaxis Versus Control: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
PE prevention Group 2000 2000	total number of venographic indicated DVT	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.69	0.10	N/A	NS
PE prevention Group 2000	nonfatal Myocardial infarction	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.56	0.09	N/A	NS
PE prevention Group 2000	nonfatal Stroke	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.13	0.62	N/A	NS
Sasaki et al 2009	wound necrosis and hematoma	post op	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	% risk difference	2.63	0.27	N/A	NS
Sasaki et al 2009	hematoma	post op	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	% risk difference	2.63	0.27	N/A	NS
Xabregas et al 1978	mild bruising at injection site	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	risk ratio	1.00	1.00	N/A	NS
Xabregas et al 1978	extensive bruising at injection site	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	risk ratio	1.00	1.00	N/A	NS

Table 93. Pharmacological Prophylaxis Versus Control: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Xabregas et al 1978	haematuria (microscopic)	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	risk ratio	0.50	0.56	N/A	NS
Xabregas et al 1978	wound haematoma	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	risk ratio	2.00	0.56	N/A	NS
Xabregas et al 1978	wound infection	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	risk ratio	1.00	1.00	N/A	NS
Jorgensen et al 1992	cariace arrest death	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	2.53	0.44	N/A	NS
Jorgensen et al 1992	pnemonia death	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	0.63	0.70	N/A	NS

Table 93. Pharmacological Prophylaxis Versus Control: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1992	required transfusion	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	0.93	0.79	N/A	NS
Moskovits et al et al 1978	bleeding complications	unclear follow up	Heparin 5000 USP units per ml	placebo	52	risk ratio	1.09	0.82	N/A	NS
Lahnborg et al 1980	local haematoma at injection site	10 days	Heparin 5000 units every 12 hours for 10 days	placebo	139	% risk difference	74.29	0.00	N/A	placebo
Lahnborg et al 1980	local haematoma at injection site	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	Heparin 5000units every 12 hours for 10 days+placebo	141	% risk difference	69.01	0.00	N/A	Heparin 5000units every 12 hours for 10 days+placebo
Lahnborg et al 1980	local haematoma at injection site	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	placebo	140	% risk difference	69.01	0.00	N/A	placebo
Morris et al 1976	minor heamorrhagic complications	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	1.58	0.40	N/A	NS

Table 93. Pharmacological Prophylaxis Versus Control: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Morris et al 1976	excessivve wound leakage	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	4.00	0.06	N/A	NS
Morris et al 1976	large wound haematoma	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	4.00	0.06	N/A	NS
Morris et al 1976	gross haematuria	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	1.33	0.28	N/A	NS
Morris et al 1976	small haematemesis	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	1.33	0.28	N/A	NS

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
PE prevention Group 2000	total number of DVT diagnosed by other test than venograph	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.73	0.16	N/A	NS

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
PE prevention Group 2000	proximal DVT	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.60	0.04	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	Distal DVT	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.80	0.26	N/A	NS
PE prevention Group 2000	any DVT	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.71	0.03	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	definite PE	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.53	0.00	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	probable PE	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.68	0.25	N/A	NS
PE prevention Group 2000	any PE	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.57	0.00	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	any VTE	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.64	0.00	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	nonfatal Deep-vein thrombosis	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.71	0.03	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	nonfatal Pulmonary embolism	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.74	0.22	N/A	NS
PE prevention Group 2000	nonfatal Venous thromboembolism	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.71	0.02	N/A	Aspirin 160mg over 35 days

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
PE prevention Group 2000	Death due to Pulmonary embolism	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.42	0.00	N/A	Aspirin 160mg over 35 days
Kew et al 1999	DVT	1 week	Fraxaparine	no Fraxiparine	78	risk ratio	0.70	0.43	N/A	NS
Kew et al 1999	DVT	2 weeks	Fraxaparine	no Fraxiparine	78	risk ratio	1.79	0.42	N/A	NS
Kew et al 1999	development of contralateral dvt	3 weeks	Fraxaparine	no Fraxiparine	78	risk ratio	1.20	0.88	N/A	NS
Xabregas et al 1978	DVT	3 weeks	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	% risk difference	-48.00	0.00	N/A	Heparin every 8 hours at 100 international units per kilogram of body weight
Xabregas et al 1978	DVT	1 week after treatment was stopped	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	% risk difference	16.00	0.02	N/A	placebo
Xabregas et al 1978	PE	1 week after treatment was stopped	Heparin every 8 hours at 100 international units per kilogram of body weight	placebo	50	% risk difference	8.00	0.12	N/A	NS
Jorgensen et al 1992	Radioactive I fibrogen test for DVT positive	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	0.35	0.02	N/A	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1992	Radioactive I fibrogen test for DVT probable	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	1.69	0.47	N/A	NS
Jorgensen et al 1992	Radioactive I fibrogen test for DVT inconclusive	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	% risk difference	-2.63	0.30	N/A	NS
Jorgensen et al 1992	total DVT	hospital stay	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	risk ratio	0.52	0.03	N/A	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days
Jorgensen et al 1992	multiple PE related death	10 days	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	% risk difference	-2.63	0.30	N/A	NS
Moskovits et al et al 1978	PE related mortality	unclear follow up	Heparin 5000 USP units per ml	placebo	52	% risk difference	-4.35	0.25	N/A	NS

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lahnborg et al 1980	DVT	10 days	Heparin 5000 units every 12 hours for 10 days	placebo	139	risk ratio	0.53	0.02	N/A	Heparin 5000 units every 12 hours for 10 days
Checkets et al 1974	DVT	10 days	Heparin 5000 units subcutaneously on admission and then 25 units 6-hourly for 7 days	no heparin	51	risk ratio	1.36	0.20	N/A	NS
Checkets et al 1974	unilateral DVT	10 days	Heparin 5000 units subcutaneously on admission and then 25 units 6-hourly for 7 days	no heparin	51	risk ratio	1.87	0.19	N/A	NS
Checkets et al 1974	unilateral DVT	10 days	Heparin 5000 units subcutaneously on admission and then 25 units 6-hourly for 7 days	no heparin	51	risk ratio	1.04	0.92	N/A	NS
Lahnborg et al 1980	DVT	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	Heparin 5000units every 12 hours for 10 days+placebo	141	risk ratio	0.79	0.50	N/A	NS
Lahnborg et al 1980	DVT	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	placebo	140	risk ratio	0.42	0.00	N/A	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days

Table 94. Pharmacological Prophylaxis Versus Control: Complications: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Morris et al 1976	DVT	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	0.45	0.00	N/A	Warfarin using the thrombotest method until independently mobile
Morris et al 1976	unilateral DVT on side of fracture	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	0.83	0.53	N/A	NS
Morris et al 1976	unilateral DVT on opposite side of fracture	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	0.62	0.38	N/A	NS
Morris et al 1976	Bilateral DVT	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	0.09	0.00	N/A	Warfarin using the thrombotest method until independently mobile

Table 95. Pharmacological Prophylaxis Versus Control: Mortality

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
PE prevention Group 2000	Death due to lschaemic heart disease	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.23	0.24	N/A	NS
PE prevention Group 2000	Death due to Stroke	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.05	0.87	N/A	NS
PE prevention Group 2000	Death due to Heart failure	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.20	0.32	N/A	NS
PE prevention Group 2000	Death due to Other vascular cause	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.52	0.03	N/A	Aspirin 160mg over 35 days
PE prevention Group 2000	Death due to Unknown cause of vascular death	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.96	0.83	N/A	NS
PE prevention Group 2000	All vascular deaths	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.93	0.43	N/A	NS
PE prevention Group 2000	Death due to Pneumonia or bronchitis	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	0.90	0.43	N/A	NS
PE prevention Group 2000	Death due to Other non-vascular cause	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.18	0.26	N/A	NS
PE prevention Group 2000	Death due to All non-vascular deaths	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.01	0.88	N/A	NS
PE prevention Group 2000	total mortality	35 days	Aspirin 160mg over 35 days	placebo	13356	risk ratio	1.01	0.84	N/A	NS

Table 95. Pharmacological Prophylaxis Versus Control: Mortality

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sasaki et al 2011	Fatal bleeding	post op	Enoxaparin subcutaneously 2000 IU once or twice perday depending on creatinine level and compression stockings	compression stockings only	57	% risk difference	0.00	1.00	N/A	NS
Chotanaphuti et al 2009	mortality (Hazard ratio)	1 year	Enoxiparin sodium 40mg and Coumadin 3mg with pneumatic devices	only pneumatic devices	25	N/A	-	-	0.67	NS
Sasaki et al 2011	Fatal bleeding	post op	Fondaparinux 1.5 or 2.5 mg/day with injection for 14 days with compression stockings	compression stockings only	56	% risk difference	0.00	1.00	N/A	NS
Moskovits et al et al 1978	mortality	unclear follow up	Heparin 5000 USP units per ml	placebo	52	% risk difference	-13.04	0.04	N/A	Heparin 5000 USP units per ml
Lahnborg et al 1980	mortality due to cardiac failure	10 days	Heparin 5000 units every 12 hours for 10 days	placebo	139	% risk difference	0.00	1.00	N/A	NS
Lahnborg et al 1980	mortality due to cardiac failure	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	Heparin 5000units every 12 hours for 10 days+placebo	141	% risk difference	2.82	0.12	N/A	NS

Table 95. Pharmacological Prophylaxis Versus Control: Mortality

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lahnborg et al 1980	mortality due to cardiac failure	10 days	Heparin 5000 units every 12 hours for 10 days+dyhydroergotamine .5mg every 12 hours for 10 days	placebo	140	% risk difference	2.82	0.12	N/A	NS
Eskeland et al 1966	mortality	3 months	Phenindione using the PP-test or Thrombotest method three times/week until stable level had been reached	no anticoagulant prophylaxis	200	risk ratio	1.26	0.39	N/A	NS
Morris et al 1976	Mortality	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	risk ratio	0.69	0.18	N/A	NS
Morris et al 1976	Mortality due to PE	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	-8.11	0.01	N/A	Warfarin using the thrombotest method until independently mobile
Morris et al 1976	moratlity from Cerebellar haemorrhage	10 days	Warfarin using the thrombotest method until independently mobile	no treatment	149	% risk difference	1.33	0.28	N/A	NS

Table 96. Pharmacological Prophylaxis Versus Control: Hospital Stay

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Sasaki et al 2009	Hospital stay (days)	post op	Fondaparinux subcutaneously 2.5 mg/day for 14 days with compression stocking	compression stockings only	76	mean difference	5.80	0.39	N/A	NS
Jorgensen et al 1992	median hospital stay	postop	Heparin 2500 IU or 5000 IU antifactor at 2 and 12 postoperatively, and then every morning in the 6 following days	placebo	68	mean difference	-2.00	-	>.05	NS

Table 97. Mechanical Prophylaxis Versus Control: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Stranks et al 1992	swelling (difference in thigh circumference in centimeters compared to control)	3 days	A/V impulse system with compression stockings for 7-10 days	compression stockings only	79	mean difference	-2.36	-	<.001	A/V impulse system with compression stockings for 7-10 days
Stranks et al 1992	swelling (difference in thigh circumference in centimeters compared to control)	7-10 days	A/V impulse system with compression stockings for 7-10 days	compression stockings only	79	mean difference	-3.27	-	<.001	A/V impulse system with compression stockings for 7-10 days
Stranks et al 1992	swelling (difference in calf circumference in centimeters compared to control)	3 days	A/V impulse system with compression stockings for 7-10 days	compression stockings only	79	mean difference	-1.25	-	<.001	A/V impulse system with compression stockings for 7-10 days
Stranks et al 1992	swelling (difference in calf circumference in centimeters compared to control)	7-10 days	A/V impulse system with compression stockings for 7-10 days	compression stockings only	79	mean difference	-1.55	-	<.001	A/V impulse system with compression stockings for 7-10 days

Table 98. Mechanical Prophylaxis Versus Control: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Stranks et al 1992	clear evidence of proximal DVT	7-10 days	A/V impulse system with compression stockings for 7-10 days	compression stockings only	79	% risk difference	-23.08	0.00	N/A	A/V impulse system with compression stockings for 7-10 days

Table 99. Pharmacological Timing: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1998	operative bleeding (ml)	6-13 days	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	mean difference	0.00	-	>.05	NS
Jorgensen et al 1998	peroperative transfusion requirements (units [1 unit=350 ml concentrated erytrocytes])	preoperative	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	mean difference	0.04	-	>.05	NS
Jorgensen et al 1998	postoperative transfusion requirements (units [1 unit=350 ml concentrated erytrocytes])	post-op	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	mean difference	-0.02	-	>.05	NS

Table 100. Pharmacological Timing: DVT/VTE/PE

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1998	DVT	6-13 days	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	risk ratio	0.58	0.17	N/A	NS
Jorgensen et al 1998	proximal dvt	6-13 days	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	risk ratio	0.97	0.96	N/A	NS

Table 101. Pharmacological Timing: Mortality

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Jorgensen et al 1998	mortality	6-13 days	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	risk ratio	2.92	0.18	N/A	NS
Jorgensen et al 1998	mortality	1 month	preop Enoxaparin 40mg once daily until operation and post-op until phlebography	preop placebo once daily until operation and post-op daily Enoxaparin 40mg until until phlebography	146	% risk difference	0.00	1.00	N/A	NS

Table 102. Pharmacological Versus Mechanical Prophylaxis: Blood Loss

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Eskander et al 1997	fall in haemoglobin concentration	day 2	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	mean difference	0.20	-	>.05	NS
Eskander et al 1997	fall in haemoglobin concentration	day 7	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	mean difference	0.30	-	>.05	NS
Eskander et al 1997	needed transfusion	post-op	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	risk ratio	1.04	0.81	N/A	NS
Eskander et al 1997	wound drainage (ml)	post-op	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	mean difference	88.00	-	>.05	NS

Table 103. Pharmacological Versus Mechanical Prophylaxis: Complications

Author	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Eskander et al 1997	DVT	1 weeks	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	% risk difference	8.33	0.13	N/A	NS
Eskander et al 1997	DVT	6 weeks	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	risk ratio	0.88	0.89	N/A	NS
Eskander et al 1997	nonfatal PE	between 1 and 6 weeks	Enoxaparin from addmission to 7 days after surgery	intermittent calf compression garments at the time of admission until 48 hours post-op, and then Enoxaparin injections until 7th post op day	45	% risk difference	-4.76	0.26	N/A	NS

TRANSFUSION THRESHOLD

Strong evidence supports a blood transfusion threshold of no higher than 8g/dl in asymptomatic postoperative hip fracture patients.

Strength of Recommendation: Strong ★★★★

RATIONALE

Two high-strength studies (Carson et al [116] and Carson et al [117]) support this recommendation. Carson et al [116] (FOCUS trial) is the largest (n=2016) and most robust study to address transfusion threshold in hip fracture patients. FOCUS considered patient-centered and clinically important outcomes in a prospective, randomized, multicenter, controlled trial. This study showed that a restrictive transfusion threshold of hemoglobin 8g/dl in asymptomatic hip fracture patients with cardiovascular disease or risk factors resulted in no significant difference in primary or secondary outcomes at 30 or 60 days including mortality, independent walking ability, residence, other functional outcomes, cardiovascular events, or length of stay. Carson's 1998 trial [117] was also a high strength study and was the pilot study that led to FOCUS. Symptoms or signs that were considered indicative of anemia appropriate for transfusion were chest pain that was deemed to be cardiac in origin, congestive heart failure, and unexplained tachycardia or hypotension unresponsive to fluid replacement.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Implementation of this recommendation is likely to result in lower transfusion associated complications and cost. There is risk that cognitively impaired patients cannot report symptoms, so special attention to these individuals may be warranted; FOCUS automatically transfused significantly demented patients below hemoglobin 8mg/dl.

FUTURE RESEARCH

Confirmatory studies by other authors would strengthen evidence. Additional studies could further risk stratify and refine transfusion thresholds in subpopulations.

RESULTS

QUALITY AND APPLICABILITY

Table 104. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Carson et al 1998	Mortality	●	●	●	●	●	●	○	High	○	○	●	●	Moderate	High
Carson et al 2011	FACIT Fatigue Scale	●	●	○	●	●	●	●	High	○	●	●	●	Moderate	High
Carson et al 2011	Inability to walk independently	●	●	○	●	●	●	●	High	○	●	●	●	Moderate	High
Carson et al 2011	Instrumental ADL	●	●	○	●	●	●	●	High	○	●	●	●	Moderate	High
Carson et al 2011	Lower extremity physical ADL	●	●	○	●	●	●	●	High	○	●	●	●	Moderate	High
Carson et al 2011	Mortality	●	●	○	●	●	●	●	High	○	●	●	●	Moderate	High

FINDINGS

Table 105. Liberal Versus Conservative Transfusion Threshold: Function

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Carson et al 2011	Inability to walk independently	30 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	1995	Risk ratio	0.93	0.19	N/A	NS
Carson et al 2011	Inability to walk independently	60 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	1999	Risk ratio	0.98	0.80	N/A	NS
Carson et al 2011	Lower extremity physical ADL	30 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	2016	Mean difference	-0.10	0.57	N/A	NS
Carson et al 2011	Instrumental ADL	30 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	2016	Mean difference	0.00	1.00	N/A	NS
Carson et al 2011	Lower extremity physical ADL	60 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	2016	Mean difference	0.00	1.00	N/A	NS
Carson et al 2011	Instrumental ADL	60 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per deciliter	2016	Mean difference	0.00	1.00	N/A	NS

Table 106. Liberal Versus Conservative Transfusion Threshold: Mortality

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Carson et al. 1998	Mortality	In-Hospital	Threshold Group	Symptomatic Group or physician discression at <8 g per decileter	84	% risk difference	0.00	1.00	N/A	NS
Carson et al. 1998	Mortality	30 days	Threshold Group	Symptomatic Group or physician discression at <8 g per decileter	84	Risk ratio	1.00	1.00	N/A	NS
Carson et al. 1998	Mortality	60 days	Threshold Group	Symptomatic Group or physician discression at <8 g per decileter	84	Risk ratio	0.40	0.26	N/A	NS
Carson et al 2011	Mortality	30 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per decileter	1995	Risk ratio	1.22	0.33	N/A	NS
Carson et al 2011	Mortality	60 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per decileter	1999	Risk ratio	1.15	0.37	N/A	NS

Table 107. Liberal Versus Conservative Transfusion Threshold: Other Outcomes

Study	Outcome	Month	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Carson et al 2011	FACIT Fatigue Scale	30 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per decileter	2016	Mean difference	0.10	0.77	N/A	NS
Carson et al 2011	FACIT Fatigue Scale	60 days	Threshold Group (10g per deciliter)	Symptomatic Group or physician discression at <8 g per decileter	2016	Mean difference	-0.50	0.13	N/A	NS

REHABILITATION

SUB-RECOMMENDATION SUMMARY

Occupational and Physical Therapy: Moderate evidence supports supervised occupational and physical therapy across the continuum of care, including home, to improve functional outcomes and fall prevention.

Strength of Recommendation: Moderate 

Intensive Physical Therapy: Strong evidence supports intensive home physical therapy to improve functional outcomes.

Strength of Recommendation: Strong 

Nutrition: Moderate evidence supports that nutritional supplementation in patients with underlying deficiency improves functional outcomes and reduces mortality; therefore nutritional status should be assessed.

Strength of Recommendation: Moderate 

Interdisciplinary Care Program: Strong evidence supports use of an interdisciplinary care program in those patients with mild to moderate dementia who have sustained a hip fracture to improve functional outcomes.

Strength of Recommendation: Strong 

RISKS AND HARMS OF IMPLEMENTING THESE RECOMMENDATIONS

The delivery and implementation of these therapies vary, but the benefits of rehabilitative services are demonstrated in a variety of settings and across the continuum of care. There are no harms associated with implementing this recommendation.

FUTURE RESEARCH

Further studies to establish more precise dosages and durations of rehabilitative therapies, as well as to determine the most appropriate settings would be beneficial. Further nutritional research needs to elucidate which type of protein supplementation is most beneficial and should clarify risks associated with malnutrition and benefits of supplementation, especially in diabetic patients.

OCCUPATIONAL AND PHYSICAL THERAPY

Moderate evidence supports that supervised occupational and physical therapy across the continuum of care, including home, improves functional outcomes and fall prevention.

Strength of Recommendation: Moderate 

RATIONALE

Two high-strength studies (Ziden et al [118], Crotty et al [119]) and five moderate-strength studies (Binder et al [120], Hagsten et al [121], Hagsten et al [122], Tsauo et al [123], Bischoff-Ferrari et al [124]) support that rehabilitative therapies delivered across the continuum of care have been shown to be effective in improving functional outcomes in the elderly patient with hip fracture, post-surgery. Binder et al [120] demonstrated a supervised home-based Physical Therapy (PT) program to be superior to conventional care in improving physical functioning and mobility. Hagsten et al's studies[121;122]) were moderate strength studies that similarly demonstrated utility of Occupational Therapy (OT) (initiated during hospital stay and continued at home) in improving functional outcomes as measured by Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) and Health-Related Quality of Life (HRQOL).

Four studies including one high strength (Ziden et al [118]) and three moderate strength (Tsauo et al [123]; Bischoff-Ferrari et al [124]; Ziden et al [125]) studies establish the beneficial effects of home-based PT on functional outcomes such as physical and social functioning, ADLs, mobility, HRQOL and patient satisfaction. In addition, Bischoff-Ferrari's et al [119] study showed reduction in falls although Crotty's study showed no change in fall rates; however, they demonstrated that accelerated discharge to home-based PT improved level of independence and physical functioning at same levels as hospital-based rehabilitation.

INTENSIVE PHYSICAL THERAPY

Strong evidence supports intensive physical therapy post-discharge to improve functional outcomes in hip fracture patients.

Strength of Recommendation: Strong ★★★★

RATIONALE

Two high strength (Mangione et al [126]; Sylliaas et al [127]) and two moderate strength (Allegrante et al [128]; Ryan et al [129]) studies evaluated benefits of intensive exercise training in elderly patients with hip fracture. Studies support that intensive exercise training administered by physical therapy to patients after discharge from hospital care, improves functional outcomes, leg strength and health status. Sylliaas et al[127] found that a 3-month leg-muscle strength-training program, performed at 70-80% 1-Repetition Maximum, administered at an outpatient rehabilitation clinic, showed improvement in balance, mobility and instrumental ADLs in home-dwelling hip fracture patients post-surgery. Mangione et al[126] found improved leg muscle strength, gait speed, 6-minute walk distance and physical performance scores with intensive leg strengthening exercise training performed by community-dwelling elderly patients, 6-month post hip fracture. Allegrante et al [128] found that high-intensity strength training along with motivational video and peer support, in addition to usual postoperative care, significantly improved SF-36 scores in the *role-physical* domain functional performance and social functioning. Ryan et al[129] found no significant difference in anxiety/depression scores of recently discharged postoperative hip fracture patients, with augmented in-home therapy compared to conventional care.

NUTRITION

Moderate evidence supports that postoperative nutritional supplementation reduces mortality and improves nutritional status in hip fracture patients.

Strength of Recommendation: Moderate 

RATIONALE

One high strength (Duncan et al)[130] and 2 low strength (Eneroth et al)[131] and Espaulella et al [132] studies were used to evaluate the relationship between nutritional supplementation and outcomes in elderly patients with hip fractures. These studies report that protein energy malnutrition is an important determinant of outcome in older patients with hip fracture. Use of a dietary assistant decreased death acutely 2.5 times (Duncan et al [130]) and at 4 months by half. Duncan et al is the largest randomized control study of nutritional support following hip fracture and the first that includes patients with cognitive impairment (57%). Energy intake in the intervention group (IV x 3d and PO x 7d) provided by supplements (Eneroth et al [131]) was optimal in 100% of patients in the intervention group vs. 54% in the control group. Fracture related complication rate was 15% (intervention group) vs. 70% (control group).Greater than 58% of the patients in each group were malnourished on admission. A 20g protein supplement daily with 800mg of calcium did not decrease mortality or increase functional status but significantly decreased complications within the hospital (odds ratio 1.88 in-hospital and overall 1.94 after discharge (Espaulella et al [132]).

INTERDISCIPLINARY CARE PROGRAM

Strong evidence supports use of an interdisciplinary care program in those patients with mild to moderate dementia who have sustained a hip fracture to improve functional outcomes.

Strength of Recommendation: Strong ★★★★

RATIONALE

Two high strength (Berggren et al[133] and Marcantonio et al [134]), and seven moderate strength (Huusko et al [135]; Huusko et al [136]; Krichbaum et al [137]; Shyu et al[138-140]; Stenvall et al [141]), studies found that an interdisciplinary rehabilitative program achieved better functional outcomes and fall prevention in post-surgical hip fracture patients. The most differences were found in the group of patients having mild to moderate dementia (Huusko et al [135]; and Shyu et al [138-140]).

The elements of the interdisciplinary rehabilitative programs varied minimally in the studies reviewed. For example, Shyu et al's study[140] included geriatric consultation, rehabilitative services, discharge planning and post-hospital services, while Berggren et al's [133] study included geriatric assessment, rehabilitation and active detection, prevention and treatment of fall risk factors.

RESULTS

QUALITY AND APPLICABILITY

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Allegrante, J. et al. 2006	Physical Functioning (SF-36)	●	○	●	○	●	●	○	Moderate	●	○	○	○	Moderate	Moderate
Allegrante, J. et al. 2006	Role-Physical (SF-36)	●	○	●	○	●	●	○	Moderate	●	○	○	○	Moderate	Moderate
Allegrante, J. et al. 2006	Social Functioning (SF-36)	●	○	●	○	●	●	○	Moderate	●	○	○	○	Moderate	Moderate
Berggren et al 2008	Berg's Balance Scale (12 month)	●	●	○	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Berggren et al 2008	Berg's Balance Scale (4 month)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Berggren et al 2008	Geriatric Depression Scale (12 month)	●	●	○	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Berggren et al 2008	Geriatric Depression Scale (4 month)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Berggren et al 2008	Manage Chair Stand Test with Arms (12 month)	●	●	○	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Berggren et al 2008	Manage Chair Stand Test with Arms (4 month)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Berggren et al 2008	Mini Mental State Exam (12 month)	●	●	○	○	●	●	●	Moderate	○	○	●	○	Moderate	Moderate
Berggren et al 2008	Mini Mental State Exam (4 month)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Binder et al 2004	Functional Status Questionnaire score (possible range, 0-36)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Binder et al 2004	Instrumental Activities of Daily Living score (possible range, 0-14)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Binder et al 2004	Instrumental Activities of Daily Living score (possible range, 0-14)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Binder et al 2004	Basic Activities of Daily Living score (possible range, 0-14)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Binder et al 2004	Basic Activities of Daily Living score (possible range, 0-14)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Binder et al 2004	Assistive device not used for gait, if required at, No. (%)	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-Ferrari et al 2010	Relative rate difference in falls	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-Ferrari et al 2010	Relative rate difference in hospital readmission	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Carmeli. et al 2005	SF-36	●	○	●	○	●	●	●	Moderate	○	○	○	○	Low	Low
Crotty et al 2002	Activities-specific Balance Confidence Scale	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	Berg Balance Scale	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	Caregiver Strain Index	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	Falls Efficacy Scale	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	London Handicap Scale: Mean (95% CI)	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Crotty et al 2002	Modified Barthel's Index (change from baseline)	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	Satisfaction total score	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	SF-36 MCS score (change from baseline)	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	SF-36 PCS score (change from baseline)	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	Timed Up-and-Go	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	One fall requiring hospitalization	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	One or more falls	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	SF-36 mental component score investigator evaluated	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High
Crotty et al 2002	SF-36 physical component score investigator evaluated	●	●	○	○	●	●	●	Moderate	●	●	●	●	High	High

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Duncan et al 2006	Length of Stay (days)	●	●	●	●	●	●	○	High	○	●	○	○	Moderate	High
Duncan et al 2006	Mortality	●	●	●	●	●	●	○	High	○	●	○	○	Moderate	High
Duncan et al 2006	Trauma ward complications	●	●	●	●	●	●	○	High	○	●	○	○	Moderate	High
Eneroth et al 2006	Deep vein thrombosis	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Infections	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Mortality	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Myocardial infarction	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Other Complications	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Pneumonia	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Pulmonary edema	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Eneroth et al 2006	Pulmonary embolism	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Thrombophlebitis	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Urinary Infection	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Eneroth et al 2006	Wound Infection	●	○	○	●	●	○	○	Low	○	○	○	●	Moderate	Low
Espaulella et al 2000	Complications	●	●	●	○	●	○	○	Moderate	○	○	○	○	Low	Low
Espaulella et al 2000	Functional Recovery	●	●	●	○	●	○	○	Moderate	○	○	○	○	Low	Low
Espaulella et al 2000	Mortality	●	●	●	○	●	○	○	Moderate	○	○	○	○	Low	Low
Espaulella et al 2000	Walking Aids	●	●	●	○	●	○	○	Moderate	○	○	○	○	Low	Low
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Bathing	●	○	○	○	●	●	●	Moderate	○	●	●	●	Moderate	Moderate
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Dressing	●	○	○	○	●	●	●	Moderate	○	●	●	●	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Mobility	●	○	○	○	●	●	●	Moderate	○	●	●	●	Moderate	Moderate
Hagsten et al 2004	Klein-Bell Activities of Daily Living: toilet visits	●	○	○	○	●	●	●	Moderate	○	●	●	●	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Degree of vitality	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): General health perception	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to emotional health problems	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to physical health problems	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Negative affect	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Hagsten et al 2006	SWED-QOL(higher is better): Pain	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Physical Function	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Positive affect	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with family life	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): satisfaction with physical functioning	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with relationship	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate
Hagsten et al 2006	SWED-QOL(higher is better): Sleep functioning	●	●	○	○	○	●	●	Moderate	○	●	●	○	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Huusko et al 2000	Complication rate	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Diceased: Mini Mental State Examination scores 0-11 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Diceased: Mini Mental State Examination scores 12-17 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Diceased: Mini Mental State Examination scores 18-23 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Diceased: Mini Mental State Examination scores 24-30 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	in hospital: Mini Mental State Examination scores 0-11 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	in hospital: Mini Mental State Examination scores 12-17 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Huusko et al 2000	in hospital: Mini Mental State Examination scores 18-23 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	in hospital: Mini Mental State Examination scores 24-30 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Independently living: Mini Mental State Examination scores 0-11 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Independently living: Mini Mental State Examination scores 12-17 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Independently living: Mini Mental State Examination scores 18-23 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Independently living: Mini Mental State Examination scores 24-	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
	30 subgroup														
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 0-11 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 12-17 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 18-23 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 24-30 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 0-11 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 12-17 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 18-23 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 24-30 subgroup	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2000	Mortality rate	●	●	○	●	●	●	●	High	○	○	○	○	Low	Moderate
Huusko et al 2002	Hospital stay (days)	●	●	○	●	●	●	○	Moderate	○	○	●	●	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Huusko et al 2002	Median difference in activities of daily living score (higher is better)	●	●	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Huusko et al 2002	Median difference in instrumental activities of daily living score (higher is better)	●	●	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: difficulty performing activities	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: difficulty performing amount of assistance needed	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: mobility	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: pain	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: personal care	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate

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Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Krichbaum et al 2007	Functional Status Index: social activity	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Functional Status Index: home chores	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Geriatric Depression Scale	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Krichbaum et al 2007	Global Health	●	○	●	○	○	●	●	Moderate	●	●	●	○	Moderate	Moderate
Mangione et al 2005	6-minute walk distance (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	6-minute walk distance (waitless control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Barthel Index of Activities of Daily Living Score (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Barthel Index of Activities of Daily Living Score (waitlist control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Mangione et al 2005	Folstein Mini-Mental Status Exam (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Folstein Mini-Mental Status Exam (waitless control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Geriatric Depression Scale (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Geriatric Depression Scale (waitless control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Lawton Instrumental Activities of Daily Living Index (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	Lawton Instrumental Activities of Daily Living Index (waitless control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Mangione et al 2005	SF-36 physical function (aerobic vs strength)	●	●	●	●	●	●	●	High	○	○	●	○	Moderate	High

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Mangione et al 2005	SF-36 physical function (waitless control)	●	●	○	●	●	●	●	High	○	○	●	○	Moderate	High
Marcantonio, E. et al. 2001	Delirium at hospital discharge	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High
Marcantonio, E. et al. 2001	Delirium: cumulative incidence during acute hospitalization	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High
Marcantonio, E. et al. 2001	Discharged to institutional setting (nursing home, rehab hospital)	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High
Marcantonio, E. et al. 2001	Hospital days of delirium per episode (mean ± SD)	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High
Marcantonio, E. et al. 2001	Hospital length of stay (median _ lOR)	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High
Marcantonio, E. et al. 2001	Severe delirium: cumulative incidence during acute hospitalization	●	○	●	●	●	●	●	High	○	○	○	●	Moderate	High

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Ryan et al. et al 2006	Barthel index	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Frenchay Activities Index	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Euroqol-5d-5D	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Euroqol-5d VAS	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Therapy Outcome Measure Impairment	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Therapy Outcome Measure Disability	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate

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Ryan et al. et al 2006	Therapy Outcome Measure Handicap	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	Therapy Outcome Measure Well being	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	HADS Anxiety	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ryan et al. et al 2006	HADS Depression	●	●	○	●	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Depressive symptoms	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Emergency Room Visit	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Hospital Readmission	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Institutionalization	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate

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Shyu, Y. et al. 2008	Mortality	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Occurrence of Falls	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Recovery of Walking ability	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2008	Self-care ability	●	○	○	●	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2010	Geriatric Depression Scale	●	○	○	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2010	Recovery to prefracture walking ability	●	○	○	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2010	Walking independently	●	○	○	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Shyu, Y. et al. 2013	Malnutrition	●	○	○	●	●	○	●	Moderate	○	○	○	●	Moderate	Moderate
Shyu, Y. et al. 2013	Risk of Depression	●	○	○	●	●	○	●	Moderate	○	○	○	●	Moderate	Moderate
Shyu, Y. et al. 2013	Self-Care Ability	●	○	○	●	●	●	●	Moderate	○	○	○	●	Moderate	Moderate

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Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Stenvall et al 2007	Decubitus ulcers	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Fall incidence rate ratio	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Hospital stay (days)	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Incident rate ratio among people with dementia	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent walking without walking aid indoors	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in bathing	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in continence	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in dressing	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in feeding	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in personal and primary activities of	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
	daily life														
Stenvall et al 2007	Independent in toiletnig	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent in transfer	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Independent walking ability	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Katz Activities of Daily Living	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Living independently	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Number of delirious days	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Number of fallers	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Number of fallers among people with dementia (n=28/36)	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Nutritional problems	●	○	●	○	●	○	●	Moderate	○	○	○	●	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Stenvall et al 2007	Post-op delirium	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Sleep disturbances	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Stenvall et al 2007	Urinary tract infections	●	○	●	○	●	●	●	Moderate	○	○	○	●	Moderate	Moderate
Sylliaas et al 2011	6 Min Walk Test (m)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	Berg Balance Scale	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	Max gait speed, 10 m (m/s)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	MCS (Mental Domain of SF-12)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	Nottingham Extended Activities of Daily Living Score	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	PCS-12 (Physical Domain of SF-12)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	Sit to stand Test (sec)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Sylliaas et al 2011	Step Height (cm)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Sylliaas et al 2011	Timed up and go test (sec)	●	●	○	●	●	●	●	High	○	○	○	●	Moderate	High
Tsauo et al 2005	Harris Hip Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Tsauo et al 2005	Harris Pain Score	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Tsauo et al 2005	Walking Speed	●	○	●	○	●	●	●	Moderate	○	○	●	●	Moderate	Moderate
Ziden et al 2008	Falls Efficacy Scale Instrumental Activities of Daily Life	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Falls Efficacy Scale Self Care	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Falls Efficacy Scale Stairs	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Falls Efficacy Scale Total	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Frequency of Activities Index: Domestic	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
	activities														
Ziden et al 2008	Frequency of Activities Index: leisure and work	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Frequency of Activities Index: outdoor activities	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Functional Independence Measure Locomotion	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Functional Independence Measure Mobility	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Functional Independence Measure self-care	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Instrumental Activities Measure: domestic activities	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Instrumental Activities Measure: outdoor activities	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Sit to stand time (seconds)	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Ziden et al 2008	Timed up and go test (sec)	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Walks outdoors	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Walks outdoors alone	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Walks outdoors at least once per week	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Walks outdoors not alone	●	○	○	●	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Ziden et al 2008	Frequency of Activities Index Domestic 12.0 (0–15)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Frequency of Activities Index Hobby/work 6.0 (0–14)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Frequency of Activities Index Outdoor 9.0 (0–14)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Frequency of Activities Index Total score 26.0 (0–41)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High

Table 108. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Ziden et al 2008	Functional Independence Measure total score 85 (61–90)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Functional Independence Measure Locomotion 31 (15–34)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Functional Independence Measure Self-care 40 (33–42)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Instrumental Activity Measure Domestic 20 (4–28)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Instrumental Activity Measure Outdoor 21 (4–28)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High
Ziden et al 2008	Instrumental Activity Measure total score 41 (8–56)	●	●	○	●	●	●	●	High	●	○	○	●	Moderate	High

FINDINGS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Binder et al 2004	Fast walking speed, m/min	6 months	Supervised physical therapy and exercise training	Home exercise	79	Mean difference	13.50	0.01	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Single limb stance time, s Fractured side	3 months	Supervised physical therapy and exercise training	Home exercise	72	Mean difference	2.20	0.22	N/A	NS
Binder et al 2004	Single limb stance time, s Fractured side	6 months	Supervised physical therapy and exercise training	Home exercise	72	Mean difference	4.00	0.01	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Single limb stance time, Unfractured side	3 months	Supervised physical therapy and exercise training	Home exercise	73	Mean difference	2.10	0.18	N/A	NS
Binder et al 2004	Single limb stance time, Unfractured side	6 months	Supervised physical therapy and exercise training	Home exercise	74	Mean difference	3.10	0.03	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Berg Balance Score (possible range, 0-56)	3 months	Supervised physical therapy and exercise training	Home exercise	82	Mean difference	4.00	0.04	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Berg Balance Score (possible range, 0-56)	6 months	Supervised physical therapy and exercise training	Home exercise	81	Mean difference	6.00	0.00	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Short-Form 36 score Change in Health subscale (possible range, 0-100)	3 months	Supervised physical therapy and exercise training	Home exercise	85	Mean difference	4.00	0.34	N/A	NS
Binder et al 2004	Short-Form 36 score Change in Health subscale (possible range, 0-100)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	17.00	0.00	N/A	Supervised physical therapy and exercise training

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Binder et al 2004	Short-Form 36 Physical Function subscale (possible range, 0-100)	3 months	Supervised physical therapy and exercise training	Home exercise	85	Mean difference	8.00	0.11	N/A	NS
Binder et al 2004	Short-Form 36 Physical Function subscale (possible range, 0-100)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	11.00	0.05	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Short-Form 36 Social Function subscale (possible range, 0-100)	3 months	Supervised physical therapy and exercise training	Home exercise	85	Mean difference	2.00	0.68	N/A	NS
Binder et al 2004	Short-Form 36 Social Function subscale (possible range, 0-100)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	5.00	0.27	N/A	NS
Binder et al 2004	Hip Rating Questionnaire total score (possible range, 0-100)	3 months	Supervised physical therapy and exercise training	Home exercise	85	Mean difference	3.00	0.25	N/A	NS
Binder et al 2004	Hip Rating Questionnaire total score (possible range, 0-100)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	4.00	0.10	N/A	NS
Binder et al 2004	Physical Performance Test score (possible range, 0-36)	3 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	2.80	0.08	N/A	NS
Binder et al 2004	Physical Performance Test score (possible range, 0-36)	6 months	Supervised physical therapy and exercise training	Home exercise	80	Mean difference	5.70	0.00	N/A	Supervised physical therapy and exercise training

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Binder et al 2004	Functional Status Questionnaire score (possible range, 0-36)	3 months	Supervised physical therapy and exercise training	Home exercise	86	Mean difference	2.10	0.07	N/A	NS
Binder et al 2004	Functional Status Questionnaire score (possible range, 0-36)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	2.50	0.05	N/A	Supervised physical therapy and exercise training
Binder et al 2004	Instrumental Activities of Daily Living score (possible range, 0-14)	3 months	Supervised physical therapy and exercise training	Home exercise	86	Mean difference	0.70	0.19	N/A	NS
Binder et al 2004	Instrumental Activities of Daily Living score (possible range, 0-14)	6 months	Supervised physical therapy and exercise training	Home exercise	83	Mean difference	0.60	0.29	N/A	NS
Binder et al 2004	Basic Activities of Daily Living score (possible range, 0-14)	3 months	Supervised physical therapy and exercise training	Home exercise	86	Mean difference	0.40	0.13	N/A	NS
Binder et al 2004	Basic Activities of Daily Living score (possible range, 0-14)	6 months	Supervised physical therapy and exercise training	Home exercise	84	Mean difference	0.40	0.15	N/A	NS
Binder et al 2004	Assistive device not used for gait, if required at, No. (%)	6 months	Supervised physical therapy and exercise training	Home exercise	68	Mean difference	8.00	0.48	N/A	NS
Bischoff-Ferrari et al 2010	Relative rate difference in falls	1 year	Extended physical therapy(extra 30 minutes of home program instruction)	Standard physical therapy (no home physical therapy instruction)	173	N/A	-	-	<.05	Extended physical therapy(extra 30 minutes of home program instruction)
Crotty et al 2002	Satisfaction total score: Mean (95% CI)	14 months	Accelerated discharge and home rehabilitation	Conventional Care	66	Mean difference	1.00	0.53	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Crotty et al 2002	Caregiver Strain Index	15 months	Accelerated discharge and home rehabilitation	Conventional Care	66	Mean difference	-1.00	0.62	N/A	NS
Crotty et al 2002	Modified Barthel Index (change from baseline)	16 months	Accelerated discharge and home rehabilitation	Conventional Care	66	Mean difference	3.00	0.54	N/A	NS
Crotty et al 2002	One or more falls	17 months	Accelerated discharge and home rehabilitation	Conventional Care	64	Risk ratio	1.41	0.56	N/A	NS
Crotty et al 2002	one fall requiring hospitalization	18 months	Accelerated discharge and home rehabilitation	Conventional Care	64	Risk ratio	0.94	0.96	N/A	NS
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Dressing	At discharge	Occupational therapy	Control Group	98	N/A	-	-	0.001	Occupational therapy
Hagsten et al 2004	Klein-Bell Activities of Daily Living: toilet visits	At discharge	Occupational therapy	Control Group	98	N/A	-	-	0.02	Occupational therapy
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Mobility	At discharge	Occupational therapy	Control Group	98	N/A	-	-	0.1	NS
Hagsten et al 2004	Klein-Bell Activities of Daily Living: Bathing	At discharge	Occupational therapy	Control Group	98	N/A	-	-	0.001	Occupational therapy
Hagsten et al 2006	SWED-QOL(higher is better): Physical Function	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-1.00	0.84	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Physical Function	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-1.00	0.76	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Hagsten et al 2006	SWED-QOL(higher is better): Physical Function	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	4.00	0.31	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): satisfaction with physical functioning	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-12.00	0.11	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): satisfaction with physical functioning	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-7.00	0.39	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): satisfaction with physical functioning	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	4.00	0.61	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Pain	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-11.00	0.08	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Pain	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-6.00	0.44	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Pain	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	1.00	0.88	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to physical health problems	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-1.00	0.89	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to physical health problems	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	29.00	0.00	N/A	Occupational Therapy
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to physical health problems	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-7.00	0.36	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to emotional health problems	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-20.00	0.24	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to emotional health problems	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-14.00	0.18	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Limitations due to emotional health problems	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-7.00	0.45	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Positive affect	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-5.00	0.36	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Positive affect	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-4.00	0.56	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Positive affect	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	3.00	0.67	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Hagsten et al 2006	SWED-QOL(higher is better): Negative affect	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-1.00	0.83	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Negative affect	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-1.00	0.89	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Negative affect	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-5.00	0.43	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Degree of vitality	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-8.00	0.07	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Degree of vitality	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	0.00	1.00	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Degree of vitality	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-4.00	0.37	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Sleep functioning	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-5.00	0.39	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Sleep functioning	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-9.00	0.17	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Sleep functioning	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	1.00	0.88	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): General health perception	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-3.00	0.59	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Hagsten et al 2006	SWED-QOL(higher is better): General health perception	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	-4.00	0.50	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): General health perception	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-7.00	0.24	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with family life	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	0.00	1.00	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with family life	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	3.00	0.34	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with family life	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-1.00	0.73	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with relationship	2-4 days after surgery	Occupational Therapy	Conventional Rehabilitation	80	Mean difference	-2.00	0.50	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with relationship	9-11 days after surgery	Occupational Therapy	Conventional Rehabilitation	67	Mean difference	1.00	0.73	N/A	NS
Hagsten et al 2006	SWED-QOL(higher is better): Satisfaction with relationship	2 month follow up	Occupational Therapy	Conventional Rehabilitation	75	Mean difference	-2.00	0.55	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Tsauo et al 2005	Walking Speed	discharge	Home PT	Control Group	25	Mean difference	-1.10	0.66	N/A	NS
Tsauo et al 2005	Walking Speed	1 month	Home PT	Control Group	25	Mean difference	-3.00	0.43	N/A	NS
Tsauo et al 2005	Walking Speed	3 months	Home PT	Control Group	25	Mean difference	-1.20	0.81	N/A	NS
Tsauo et al 2005	Walking Speed	6 months	Home PT	Control Group	25	Mean difference	0.60	0.92	N/A	NS
Tsauo et al 2005	Harris Hip Score	Discharge	Home PT	Control Group	25	Mean difference	4.00	0.40	N/A	NS
Tsauo et al 2005	Harris Hip Score	1 Month	Home PT	Control Group	25	Mean difference	7.90	0.04	N/A	Home PT
Tsauo et al 2005	Harris Hip Score	3 months	Home PT	Control Group	25	Mean difference	12.70	0.00	N/A	Home PT
Tsauo et al 2005	Harris Hip Score	6 months	Home PT	Control Group	25	Mean difference	4.80	0.05	N/A	NS
Tsauo et al 2005	Harris Pain Score	discharge	Home PT	Control Group	25	Mean difference	4.80	0.23	N/A	NS
Tsauo et al 2005	Harris Pain Score	1 month	Home PT	Control Group	25	Mean difference	4.10	0.06	N/A	NS
Tsauo et al 2005	Harris Pain Score	3 months	Home PT	Control Group	25	Mean difference	5.80	0.01	N/A	Home PT
Tsauo et al 2005	Harris Pain Score	6 months	Home PT	Control Group	25	Mean difference	-2.90	0.18	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2008	Sit to stand time (seconds)	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	-1.50	0.01	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2008	Timed up and go test (sec)	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	-5.90	0.06	N/A	NS
Ziden et al 2008	Functional Independence Measure self-care	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	4.80	0.00	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2008	Functional Independence Measure Mobility	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	-5.80	0.00	N/A	Conventional care and rehabilitation

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2008	Functional Independence Measure Locomotion	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	-6.00	0.00	N/A	Conventional care and rehabilitation
Ziden et al 2008	Instrumental Activities Measure: outdoor activities	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	1.20	0.41	N/A	NS
Ziden et al 2008	Instrumental Activities Measure: domestic activities	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	2.60	0.03	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2008	Frequency of Activities Index: Domestic activities	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	2.40	0.00	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2008	Frequency of Activities Index: outdoor activities	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	1.80	0.05	N/A	NS
Ziden et al 2008	Frequency of Activities Index: leisure and work	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	0.90	0.02	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2008	Falls Efficacy Scale Total	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	17.10	0.00	N/A	Conventional care and rehabilitation
Ziden et al 2008	Falls Efficacy Scale Self Care	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	1.90	0.30	N/A	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2008	Falls Efficacy Scale Stairs	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	2.70	0.00	N/A	Conventional care and rehabilitation
Ziden et al 2008	Falls Efficacy Scale Instrumental Activities of Daily Life	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Mean difference	12.60	0.00	N/A	Conventional care and rehabilitation
Ziden et al 2008	Walks outdoors	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Risk ratio	1.85	0.00	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2008	Walks outdoors alone	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Risk ratio	2.14	0.02	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2008	Walks outdoors not alone	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Risk ratio	1.65	0.06	N/A	NS
Ziden et al 2010	Functional Independence Measure total score	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	<0.001	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Functional Independence Measure Self-care	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.001	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2010	Functional Independence Measure Locomotion	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.008	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Instrumental Activity Measure total score	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.01	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Instrumental Activity Measure Domestic	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.004	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2010	Instrumental Activity Measure Outdoor	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Functional Independence Measure total score	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.001	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Functional Independence Measure Self-care	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.001	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2010	Functional Independence Measure Locomotion	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.012	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Instrumental Activity Measure total score	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.053	NS
Ziden et al 2010	Instrumental Activity Measure Domestic	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Instrumental Activity Measure Out-door	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2010	Frequency of Activities Index Total score	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.033	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)
Ziden et al 2010	Frequency of Activities Index Domestic	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Frequency of Activities Index Outdoor	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Frequency of Activities Index Hobby/work	6 months	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.01	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 109. Results for Advanced Imaging: Supervised Occupational and Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ziden et al 2010	Frequency of Activities Index Total score	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Frequency of Activities Index Domestic	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Frequency of Activities Index Outdoor	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	>.05	NS
Ziden et al 2010	Frequency of Activities Index Hobby/work	1 year	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	N/A	-	-	0.037	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 110. Results for Advanced Imaging: Home Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Allegrante, J. et al 2006	Physical Functioning (SF-36)	6 months	Intervention (video tape, supportive visit, physical therapy)	Usual care	58	Mean difference	5.00	0.48	N/A	NS
Allegrante, J. et al 2006	Role-Physical (SF-36)	6 months	Intervention (video tape, supportive visit, physical therapy)	Usual care	58	Mean difference	15.00	0.15	N/A	NS
Allegrante, J. et al 2006	Social Functioning (SF-36)	6 months	Intervention (video tape, supportive visit, physical therapy)	Usual care	58	Mean difference	-7.00	0.40	N/A	NS
Mangione et al 2005	6-minute walk distance	Posttraining	Aerobic Training	Resistance Training	23	Mean difference	42.20	0.36	N/A	NS
Mangione et al 2005	6-minute walk distance	Posttraining	Aerobic Training	Control Group	22	Mean difference	54.90	0.19	N/A	NS
Mangione et al 2005	6-minute walk distance	Posttraining	Resistance Training	Control Group	21	Mean difference	12.70	0.78	N/A	NS
Mangione et al 2005	Free Gait Speed	Posttraining	Aerobic Training	Resistance Training	23	Mean difference	0.08	0.49	N/A	NS
Mangione et al 2005	Free Gait Speed	Posttraining	Aerobic Training	Control Group	22	Mean difference	0.14	0.20	N/A	NS
Mangione et al 2005	Free Gait Speed	Posttraining	Resistance Training	Control Group	21	Mean difference	0.06	0.60	N/A	NS
Mangione et al 2005	SF-36 Physical Function	Baseline	Aerobic Training	Resistance Training	23	Mean difference	6.30	0.48	N/A	NS
Mangione et al 2005	SF-36 physical function	Baseline	Aerobic Training	Control Group	22	Mean difference	7.60	0.44	N/A	NS
Mangione et al 2005	SF-36 physical function	Baseline	Resistance Training	Control Group	21	Mean difference	1.40	0.89	N/A	NS

Table 110. Results for Advanced Imaging: Home Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Mangione et al 2005	SF-36 physical function	Posttraining	Aerobic Training	Resistance Training	23	Mean difference	-0.20	0.98	N/A	NS
Mangione et al 2005	SF-36 physical function	Posttraining	Aerobic Training	Control Group	22	Mean difference	9.50	0.33	N/A	NS
Mangione et al 2005	SF-36 physical function	Posttraining	Resistance Training	Control Group	21	Mean difference	9.70	0.28	N/A	NS
Ryan et al et al 2006	Barthel index	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	0.17	0.71	N/A	NS
Ryan et al et al 2006	Frenchay Activities Index	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.72	0.63	N/A	NS
Ryan et al et al 2006	Euroqol-5d-5D	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	0.00	1.00	N/A	NS
Ryan et al et al 2006	Euroqol-5d VAS	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.04	0.34	N/A	NS
Ryan et al et al 2006	Therapy Outcome Measure Impairment	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.02	0.92	N/A	NS
Ryan et al et al 2006	Therapy Outcome Measure Disability	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.28	0.11	N/A	NS
Ryan et al et al 2006	Therapy Outcome Measure Handicap	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.59	0.04	N/A	Intensive home based rehabilitation (6 or more contacts)

Table 110. Results for Advanced Imaging: Home Physical Therapy

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Ryan et al et al 2006	Therapy Outcome Measure Well being	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	-0.20	0.47	N/A	NS
Ryan et al et al 2006	HADS Anxiety	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	0.88	0.28	N/A	NS
Ryan et al et al 2006	HADS Depression	3 months	Intensive home based rehabilitation (6 or more contacts)	Non-intensive home rehabilitation (3 contacts)	58	Mean difference	1.15	0.06	N/A	NS
Sylliaas et al 2011	Berg Balance Scale	3 Months	Strength training	Conventional Care	150	Mean difference	4.7	0.00	N/A	Strength training
Sylliaas et al 2011	Sit to stand Test (sec)	3 Months	Strength training	Conventional Care	150	Mean difference	-15.8	0.00	N/A	Strength training
Sylliaas et al 2011	6 Min Walk Test (m)	3 Months	Strength training	Conventional Care	150	Mean difference	56.5	0.00	N/A	Strength training
Sylliaas et al 2011	Max gait speed, 10 m (m/s)	3 Months	Strength training	Conventional Care	150	Mean difference	0.07	0.18	N/A	NS
Sylliaas et al 2011	Timed up and go test (sec)	3 Months	Strength training	Conventional Care	150	Mean difference	-6.5	0.00	N/A	Strength training
Sylliaas et al 2011	Step Height (cm)	3 Months	Strength training	Conventional Care	150	Mean difference	9	0.00	N/A	Strength training
Sylliaas et al 2011	Nottingham Extended Activities of Daily Living Score	3 Months	Strength training	Conventional Care	150	Mean difference	4.9	0.03	N/A	Strength training
Sylliaas et al 2011	PCS-12 (Physical Domain of SF-12)	3 Months	Strength training	Conventional Care	150	Mean difference	0.1	0.92	N/A	NS
Sylliaas et al 2011	MCS (Mental Domain of SF-12)	3 Months	Strength training	Conventional Care	150	Mean difference	-1	0.50	N/A	NS

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Duncan, D. et al 2006	Length of Stay (days)	4 months	Diatetic assistant support	Routine nursing care	267	Mean difference	2.00	0.74	N/A	NS
Duncan, D. et al 2006	Trauma ward complications	4 months	Diatetic assistant support	Routine nursing care	255	Mean difference	-5.00	0.53	N/A	NS
Duncan, D. et al 2006	Mortality	In trauma unit	Diatetic assistant support	Routine nursing care	302	Risk ratio	0.41	0.05	N/A	NS
Duncan, D. et al 2006	Mortality	In hospital	Diatetic assistant support	Routine nursing care	302	Risk ratio	0.56	0.09	N/A	NS
Duncan, D. et al 2006	Mortality	4 months	Diatetic assistant support	Routine nursing care	302	Risk ratio	0.57	0.03	N/A	Diatetic assistant support
Eneroth, M. et al 2006	Infections	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-5.00	0.12	N/A	NS
Eneroth, M. et al 2006	Wound Infection	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Urinary Infection	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Pneumonia	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Other Complications	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	1.00	1.00	N/A	NS

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Eneroth, M. et al 2006	Thrombophlebitis	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	1.00	1.00	N/A	NS
Eneroth, M. et al 2006	Deep vein thrombosis	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary embolism	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary edema	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Myocardial infarction	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Mortality	3 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Infections	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.14	0.01	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days
Eneroth, M. et al 2006	Wound Infection	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.20	0.13	N/A	NS
Eneroth, M. et al 2006	Urinary Infection	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.25	0.21	N/A	NS
Eneroth, M. et al 2006	Pneumonia	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-12.50	0.01	N/A	Intervention

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Eneroth, M. et al 2006	Other Complications	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.50	0.56	N/A	NS
Eneroth, M. et al 2006	Thrombophlebitis	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.50	0.56	N/A	NS
Eneroth, M. et al 2006	Deep vein thrombosis	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary embolism	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary edema	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Myocardial infarction	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Mortality	10 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Infections	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.18	0.00	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days
Eneroth, M. et al 2006	Wound Infection	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.17	0.01	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days
Eneroth, M. et al 2006	Urinary Infection	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.33	0.08	N/A	NS

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Eneroth, M. et al 2006	Pneumonia	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-17.50	0.00	N/A	Intervention
Eneroth, M. et al 2006	Other Complications	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.25	0.21	N/A	NS
Eneroth, M. et al 2006	Thrombophlebitis	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.50	0.56	N/A	NS
Eneroth, M. et al 2006	Deep vein thrombosis	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Pulmonary embolism	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary edema	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Myocardial infarction	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Mortality	30 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Infections	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.15	0.00	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days
Eneroth, M. et al 2006	Wound Infection	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.17	0.01	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Eneroth, M. et al 2006	Urinary Infection	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.20	0.01	N/A	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days
Eneroth, M. et al 2006	Pneumonia	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-17.50	0.00	N/A	Intervention
Eneroth, M. et al 2006	Other Complications	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.20	0.13	N/A	NS
Eneroth, M. et al 2006	Thrombophlebitis	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	Risk ratio	0.50	0.56	N/A	NS
Eneroth, M. et al 2006	Deep vein thrombosis	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-2.50	0.27	N/A	NS
Eneroth, M. et al 2006	Pulmonary embolism	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Pulmonary edema	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-5.00	0.12	N/A	NS
Eneroth, M. et al 2006	Myocardial infarction	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	0.00	1.00	N/A	NS
Eneroth, M. et al 2006	Mortality	120 days	Intervention: 1000 kcal daily for 3 days then 400 kcal for 7 days	Control	80	% risk difference	-10.00	0.03	N/A	Intervention

Table 111 Results for Advanced Imaging: Nutritional Supplementation

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Espaulella, J. et al 2000	Functional Recovery	6 months	Intervention - Nutritional supplement containing 20g of protein and 800 mg of calcium	Control - placebo nutritional supplement	128	Risk ratio	1.10	0.53	N/A	NS
Espaulella, J. et al 2000	Complications	6 months	Intervention - Nutritional supplement containing 20g of protein and 800 mg of calcium	Control - placebo nutritional supplement	128	Risk ratio	0.85	0.08	N/A	NS
Espaulella, J. et al 2000	Mortality	6 months	Intervention - Nutritional supplement containing 20g of protein and 800 mg of calcium	Control - placebo nutritional supplement	128	Risk ratio	1.87	0.08	N/A	NS
Espaulella, J. et al 2000	Walking Aids	6 months	Intervention - Nutritional supplement containing 20g of protein and 800 mg of calcium	Control - placebo nutritional supplement	128	Risk ratio	0.91	0.25	N/A	NS
Ziden et al 2008	Walks outdoors at least once per week	1 month	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)	Conventional care and rehabilitation	102	Risk ratio	2.77	0.00	N/A	Home rehabilitation (focused on supportive discharge, independence in daily activities, enhancing physical activity, and enhancing confidence to perform physical activity)

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Berggren et al 2008	Berg's Balance Scale	4 months	Control	Intervention	189	Mean difference	-3.60	0.12	N/A	NS
Berggren et al 2008	Berg's Balance Scale	12 months	Control	Intervention	160	Mean difference	-4.90	0.07	N/A	NS
Berggren et al 2008	Geriatric Depression Scale	Hospitalization	Control	Intervention	199	Mean difference	-0.70	0.17	N/A	NS
Berggren et al 2008	Geriatric Depression Scale	4 months	Control	Intervention	175	Mean difference	-1.00	0.03	N/A	Control
Berggren et al 2008	Geriatric Depression Scale	12 months	Control	Intervention	160	Mean difference	-1.60	0.00	N/A	Control
Berggren et al 2008	Mini Mental State Exam	Hospitalization	Control	Intervention	199	Mean difference	-1.70	0.17	N/A	NS
Berggren et al 2008	Mini Mental State Exam	4 months	Control	Intervention	175	Mean difference	0.00	1.00	N/A	NS
Berggren et al 2008	Mini Mental State Exam	12 months	Control	Intervention	160	Mean difference	-1.60	0.26	N/A	NS
Berggren et al 2008	Manage Chair Stand Test with Arms	4 months	Intervention Group	Control Group	175	Risk ratio	1.09	0.43	N/A	NS
Berggren et al 2008	Manage Chair Stand Test with Arms	12 months	Intervention Group	Control Group	160	Risk ratio	1.10	0.60	N/A	NS
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 0-11 subgroup	In hospital	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	N/A	-	-	>.05	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 12-17 subgroup	In hospital	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	N/A	-	-	0.002	Intensive geriatric rehabilitation ward
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 18-23 subgroup	In hospital	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	N/A	-	-	0.04	Intensive geriatric rehabilitation ward
Huusko et al 2000	Median difference in hospital stay (days) Mini Mental State 24-30 subgroup	In hospital	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	N/A	-	-	>.05	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 0-11 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	0.83	0.70	N/A	NS
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 0-11 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	% risk difference	10.53	0.21	N/A	NS
Huusko et al 2000	In hospital: Mini Mental State Examination scores 0-11 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	0.95	0.91	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 0-11 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	0.95	0.96	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	Independently living: Mini Mental State Examination scores 12-17 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	3.75	0.05	N/A	Intensive geriatric rehabilitation ward
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 12-17 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	1.00	1.00	N/A	NS
Huusko et al 2000	In hospital: Mini Mental State Examination scores 12-17 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	0.25	0.01	N/A	Standard postoperative rehabilitation
Huusko et al 2000	Diceased: Mini Mental State Examination scores 12-17 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	1.50	0.71	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 18-23 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	1.37	0.01	N/A	Intensive geriatric rehabilitation ward
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 18-23 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	% risk difference	-4.76	0.14	N/A	NS
Huusko et al 2000	in hospital: Mini Mental State Examination scores 18-23 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	0.24	0.05	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	Diceased: Mini Mental State Examination scores 18-23 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	0.60	0.67	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 24-30 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	1.02	0.85	N/A	NS
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 24-30 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	% risk difference	-1.79	0.31	N/A	NS
Huusko et al 2000	in hospital: Mini Mental State Examination scores 24-30 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	0.98	0.96	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 24-30 subgroup	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	1.37	0.82	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 0-11 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	1.11	0.86	N/A	NS
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 0-11 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	% risk difference	26.32	0.04	N/A	

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	in hospital: Mini Mental State Examination scores 0-11 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	0.32	0.16	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 0-11 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	28	Risk ratio	0.79	0.70	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 12-17 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	1.88	0.15	N/A	NS
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 12-17 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	0.25	0.24	N/A	NS
Huusko et al 2000	In hospital: Mini Mental State Examination scores 12-17 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	0.50	0.26	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 12-17 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	36	Risk ratio	1.00	1.00	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 18-23 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	1.01	0.92	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 18-23 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	0.80	0.80	N/A	NS
Huusko et al 2000	In hospital: Mini Mental State Examination scores 18-23 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	1.20	0.85	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 18-23 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	77	Risk ratio	0.96	0.95	N/A	NS
Huusko et al 2000	Independently living: Mini Mental State Examination scores 24-30 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	0.99	0.90	N/A	NS
Huusko et al 2000	Living in nursing home: Mini Mental State Examination scores 24-30 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	1.37	0.82	N/A	NS
Huusko et al 2000	In hospital: Mini Mental State Examination scores 24-30 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	% risk difference	4.88	0.09	N/A	NS
Huusko et al 2000	Diceased: Mini Mental State Examination scores 24-30 subgroup	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	97	Risk ratio	0.68	0.51	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Huusko et al 2000	Mortality rate	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	220	Risk ratio	0.98	0.95	N/A	NS
Huusko et al 2000	Complication rate	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	220	Risk ratio	1.07	0.60	N/A	NS
Huusko et al 2002	Median difference in activities of daily living score (higher is better)	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	220	N/A	-	-	0.5	NS
Huusko et al 2002	Median difference in instrumental activities of daily living score (higher is better)	3 months	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	220	N/A	-	-	0.05	Intensive geriatric rehabilitation ward
Huusko et al 2002	Median difference in activities of daily living score (higher is better)	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	193	N/A	-	-	0.5	NS
Huusko et al 2002	Median difference in instrumental activities of daily living score (higher is better)	1 year	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	193	N/A	-	-	0.6	NS
Huusko et al 2002	hospital stay (days)	in hospital	Intensive geriatric rehabilitation ward	Standard postoperative rehabilitation	220	Mean difference	-8.00	0.06	N/A	NS
Krichbaum et al 2007	Functional Status Index: pain	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.25	0.09	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Krichbaum et al 2007	Functional Status Index: pain	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.13	0.35	N/A	NS
Krichbaum et al 2007	Functional Status Index: pain	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.07	0.35	N/A	NS
Krichbaum et al 2007	Functional Status Index: pain	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.09	0.39	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing activities	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.18	0.32	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing activities	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.23	0.22	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing activities	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.08	0.42	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing activities	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.04	0.73	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing amount of assistance needed	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.05	0.89	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing amount of assistance needed	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.16	0.63	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Krichbaum et al 2007	Functional Status Index: difficulty performing amount of assistance needed	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.21	0.53	N/A	NS
Krichbaum et al 2007	Functional Status Index: difficulty performing amount of assistance needed	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.23	0.51	N/A	NS
Krichbaum et al 2007	Functional Status Index: mobility	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.06	0.83	N/A	NS
Krichbaum et al 2007	Functional Status Index: mobility	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.06	0.83	N/A	NS
Krichbaum et al 2007	Functional Status Index: mobility	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.01	0.96	N/A	NS
Krichbaum et al 2007	Functional Status Index: mobility	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.18	0.30	N/A	NS
Krichbaum et al 2007	Functional Status Index: personal care	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.18	0.32	N/A	NS
Krichbaum et al 2007	Functional Status Index: personal care	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.30	0.11	N/A	NS
Krichbaum et al 2007	Functional Status Index: personal care	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.15	0.22	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Krichbaum et al 2007	Functional Status Index: personal care	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.19	0.33	N/A	NS
Krichbaum et al 2007	Functional Status Index: home chores	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.44	0.46	N/A	NS
Krichbaum et al 2007	Functional Status Index: home chores	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.14	0.57	N/A	NS
Krichbaum et al 2007	Functional Status Index: home chores	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.23	0.30	N/A	NS
Krichbaum et al 2007	Functional Status Index: home chores	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	0.04	0.82	N/A	NS
Krichbaum et al 2007	Functional Status Index: social activity	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.08	0.78	N/A	NS
Krichbaum et al 2007	Functional Status Index: social activity	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.06	0.81	N/A	NS
Krichbaum et al 2007	Functional Status Index: social activity	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.12	0.60	N/A	NS
Krichbaum et al 2007	Functional Status Index: social activity	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.15	0.52	N/A	NS
Krichbaum et al 2007	Geriatric Depression Scale	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	0.80	0.34	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Krichbaum et al 2007	Geriatric Depression Scale	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-1.10	0.19	N/A	NS
Krichbaum et al 2007	Geriatric Depression Scale	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.30	0.72	N/A	NS
Krichbaum et al 2007	Geriatric Depression Scale	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.50	0.56	N/A	NS
Krichbaum et al 2007	Global Health	1 month	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.10	0.68	N/A	NS
Krichbaum et al 2007	Global Health	3 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.10	0.72	N/A	NS
Krichbaum et al 2007	Global Health	6 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-3.50	0.00	N/A	usual care
Krichbaum (2007)	Global Health	12 months	gerontologically advanced practice nurse	usual care	23	Mean difference	-0.10	0.78	N/A	NS
Marcantonio, E. et al 2001	Hospital days of delirium per episode (Mean ± SD)	in hospital	proactive geriatric care	usual care	126	Mean difference	-0.20	0.60	N/A	NS
Marcantonio, E. et al 2001	Hospital length of stay (median _ lOR)	in hospital	proactive geriatric care	usual care	126	Mean difference	0.00	1.00	N/A	NS
Marcantonio, E. et al 2001	Delirium: cumulative incidence during acute hospitalization	in hospital	proactive geriatric care	usual care	126	Risk ratio	0.65	0.05	N/A	proactive geriatric care

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Marcantonio, E. et al 2001	Severe delirium: cumulative incidence during acute hospitalization	in hospital	proactive geriatric care	usual care	126	Risk ratio	0.40	0.03	N/A	proactive geriatric care
Marcantonio, E. et al 2001	Discharged to institutional setting (nursing home, rehab hospital)	on discharge	proactive geriatric care	usual care	126	Risk ratio	1.05	0.41	N/A	NS
Marcantonio, E. et al 2001	Delirium at hospital discharge	in hospital	proactive geriatric care	usual care	126	Risk ratio	0.69	0.37	N/A	NS
Shyu, Y. et al 2008	Self-care ability	1 month	Interdisciplinary intervention program	usual care	162	Mean difference	8.32	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Self-care ability	3 months	Interdisciplinary intervention program	usual care	162	Mean difference	8.89	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Self-care ability	6 months	Interdisciplinary intervention program	usual care	162	Mean difference	7.76	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Self-care ability	12 months	Interdisciplinary intervention program	usual care	162	Mean difference	6.17	0.07	N/A	NS
Shyu, Y. et al 2008	depressive symptoms	1 month	Interdisciplinary intervention program	usual care	162	Mean difference	-1.12	0.06	N/A	NS
Shyu, Y. et al 2008	depressive symptoms	3 months	Interdisciplinary intervention program	usual care	162	Mean difference	-1.36	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	depressive symptoms	6 months	Interdisciplinary intervention program	usual care	162	Mean difference	-1.25	0.03	N/A	Interdisciplinary intervention program

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2008	depressive symptoms	12 months	Interdisciplinary intervention program	usual care	162	Mean difference	-1.45	0.02	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Hospital Readmission	1 month	Interdisciplinary intervention program	usual care	162	Risk ratio	0.82	0.76	N/A	NS
Shyu, Y. et al 2008	Hospital Readmission	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.82	0.66	N/A	NS
Shyu, Y. et al 2008	Hospital Readmission	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.17	0.63	N/A	NS
Shyu, Y. et al 2008	Hospital Readmission	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.19	0.44	N/A	NS
Shyu, Y. et al 2008	Emergency Room Visit	1 month	Interdisciplinary intervention program	usual care	162	Risk ratio	0.38	0.15	N/A	NS
Shyu, Y. et al 2008	Emergency Room Visit	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.28	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Emergency Room Visit	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.48	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Emergency Room Visit	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.54	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Institutionalization	1 month	Interdisciplinary intervention program	usual care	162	Risk ratio	2.05	0.40	N/A	NS
Shyu, Y. et al 2008	Institutionalization	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.71	0.45	N/A	NS
Shyu, Y. et al 2008	Institutionalization	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.79	0.34	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2008	Institutionalization	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.64	0.37	N/A	NS
Shyu, Y. et al 2008	Recovery of Walking ability	1 month	Interdisciplinary intervention program	usual care	162	Risk ratio	1.57	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Recovery of Walking ability	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.54	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Recovery of Walking ability	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.44	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Recovery of Walking ability	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.28	0.03	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Mortality	1 month	Interdisciplinary intervention program	usual care	162	% risk difference	0.00	1.00	N/A	NS
Shyu, Y. et al 2008	Mortality	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	1.03	0.98	N/A	NS
Shyu, Y. et al 2008	Mortality	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.77	0.61	N/A	NS
Shyu, Y. et al 2008	Mortality	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.89	0.73	N/A	NS
Shyu, Y. et al 2008	Occurrence of Falls	1 month	Interdisciplinary intervention program	usual care	162	Risk ratio	0.56	0.23	N/A	NS
Shyu, Y. et al 2008	Occurrence of Falls	3 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.62	0.09	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2008	Occurrence of Falls	6 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.58	0.01	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2008	Occurrence of Falls	12 months	Interdisciplinary intervention program	usual care	162	Risk ratio	0.66	0.00	N/A	Interdisciplinary intervention program
Shyu, Y. et al 2010	Geriatric Depression Scale	12 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Mean difference	-1.50	0.01	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2010	Geriatric Depression Scale	18 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Mean difference	-1.20	0.02	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2010	Geriatric Depression Scale	24 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Mean difference	-1.20	0.03	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2010	recovery to prefracture walking ability	12 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.16	0.26	N/A	NS
Shyu, Y. et al 2010	recovery to prefracture walking ability	18 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.78	0.00	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2010	recovery to prefracture walking ability	24 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.54	0.02	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2010	walking independently	12 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.26	0.12	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2010	walking independently	18 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.84	0.00	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2010	walking independently	24 months	geriatric consultation services, a continuous rehab program, discharge-planning services	usual care	162	Risk ratio	1.71	0.01	N/A	geriatric consultation services, a continuous rehab program, discharge-planning services
Shyu, Y. et al 2013	Chinese Barthel Index: Self Care Ability	12 months	comprehensive care	usual care	58	N/A	-	-	<.01	comprehensive care
Shyu, Y. et al 2013	Risk of Depression	12 months	comprehensive care	usual care	0	N/A	-	-	<.01	comprehensive care
Shyu, Y. et al 2013	Malnutrition	12 months	comprehensive care	usual care	0	N/A	-	-	>.05	NS
Shyu, Y. et al 2013	Risk of Depression	12 months	comprehensive care	Interdisciplinary Care	0	N/A	-	-	<.05	comprehensive care
Shyu, Y. et al 2013	Malnutrition	12 months	comprehensive care	Interdisciplinary Care	0	N/A	-	-	<.05	comprehensive care
Shyu, Y. et al 2013	Self-Care Ability	12 months	comprehensive care	usual care	198	Risk ratio	1.29	0.07	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Shyu, Y. et al 2013	Risk of Depression	12 months	comprehensive care	usual care	198	Risk ratio	0.04	0.00	N/A	comprehensive care
Shyu, Y. et al 2013	Malnutrition	12 months	comprehensive care	usual care	198	Risk ratio	0.74	0.25	N/A	NS
Shyu, Y. et al 2013	Risk of Depression	12 months	comprehensive care	Interdisciplinary Care	200	Risk ratio	0.04	0.00	N/A	comprehensive care
Stenvall et al 2007	fall incidence rate ratio	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	0.006	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	fall incident rate ratio among people with dementia	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	64	N/A	-	-	0.006	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	post-op delirium	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	0.003	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	number of delirious days	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	<.001	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	urinary tract infections	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	<.01	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	sleep disturbances	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	<.01	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	nutritional problems	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	0.038	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	decubitus ulcers	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	N/A	-	-	0.01	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	Katz Activities of Daily Living-regained independence in ADL	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	195	N/A	-	-	0.036	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	Katz Activities of Daily Living-regained independence in ADL	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	184	N/A	-	-	0.078	NS
Stenvall et al 2007	Katz Activities of Daily Living-regained independence in ADL	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	160	N/A	-	-	0.004	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	hospital stay (days)	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Mean difference	0.00	1.00	N/A	NS
Stenvall et al 2007	Number of fallers	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	0.44	0.01	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	Number of fallers with injuries due to falls	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	0.19	0.01	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	Number of fallers with fractures due to falls	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	% risk difference	-4.12	0.03	N/A	

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	Number of fallers among people with dementia (n=28/36)	in hospital	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	64	Risk ratio	0.12	0.03	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	Living independently	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.14	0.36	N/A	NS
Stenvall et al 2007	Living independently	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.12	0.44	N/A	NS
Stenvall et al 2007	Living independently	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.24	0.20	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent walking ability	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.08	0.61	N/A	NS
Stenvall et al 2007	independent walking ability	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.08	0.55	N/A	NS
Stenvall et al 2007	independent walking ability	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.16	0.29	N/A	NS
Stenvall et al 2007	independent walking without walking aid indoors	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	% risk difference	3.92	0.03	N/A	

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent walking without walking aid indoors	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.55	0.08	N/A	NS
Stenvall et al 2007	independent walking without walking aid indoors	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.51	0.07	N/A	NS
Stenvall et al 2007	independent in personal and primary activities of daily life	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.43	0.16	N/A	NS
Stenvall et al 2007	independent in personal and primary activities of daily life	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.45	0.10	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent in personal and primary activities of daily life	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.85	0.02	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	independent in bathing	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.60	0.09	N/A	NS
Stenvall et al 2007	independent in bathing	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.65	0.05	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors
Stenvall et al 2007	independent in bathing	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.85	0.02	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent in dressing	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.41	0.11	N/A	NS
Stenvall et al 2007	independent in dressing	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.08	0.67	N/A	NS
Stenvall et al 2007	independent in dressing	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.20	0.31	N/A	NS
Stenvall et al 2007	independent in toiletnig	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	0.99	0.94	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent in toiletnig	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.15	0.30	N/A	NS
Stenvall et al 2007	independent in toiletnig	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.23	0.14	N/A	NS
Stenvall et al 2007	independent in transfer	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.02	0.85	N/A	NS
Stenvall et al 2007	independent in transfer	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.12	0.38	N/A	NS

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent in transfer	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.22	0.14	N/A	NS
Stenvall et al 2007	independent in continence	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.13	0.37	N/A	NS
Stenvall et al 2007	independent in continence	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.10	0.46	N/A	NS
Stenvall et al 2007	independent in continence	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.37	0.03	N/A	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors

Table 112. Results for Advanced Imaging: Interdisciplinary Care Programs

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study reported p-value	Favors
Stenvall et al 2007	independent in feeding	discharge	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.08	0.31	N/A	NS
Stenvall et al 2007	independent in feeding	4 months	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.09	0.31	N/A	NS
Stenvall et al 2007	independent in feeding	1 year	post-op geriatric assessment and rehabilitation, including prevention, detection, and treatment of fall risk factors	Conventional care in orthopaedic ward	199	Risk ratio	1.19	0.08	N/A	NS

POSTOPERATIVE MULTIMODAL ANALGESIA

Strong evidence supports multimodal pain management after hip fracture surgery.

Strength of Recommendation: Strong ★★★★

RATIONALE

Five high strength (Mouzopoulos et al [14], Matot et al [16], Lamb et al [142], Kang et al [143], Gorodetskyi et al [144]) and five moderate strength (Bech et al [145], Foss et al [146], Ogilvie-Harris et al [147], Spansberg et al [148], Tuncer et al [149]) studies support this recommendation. Neurostimulation, local anesthetics, regional anesthetics, epidural anesthetics, relaxation, combination techniques, and pain protocols have been shown to reduce pain as well as improve satisfaction, improve function, reduce complications, reduce nausea and vomiting, reduce delirium, decrease cardiovascular events, and reduce opiate utilization. There are a large variety of techniques that result in modest but significant positive improvements in many clinical and patient-centered domains with minimal significant adverse outcomes noted. While no particular technique is recommended, using an array of pain management modalities is appropriate.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Potential risks include medication risks and those associated with the particular procedures or techniques.

FUTURE RESEARCH

Further study is necessary to define which modalities offer the most benefit at the lowest cost and risk. Further study is necessary to determine which combinations offer the most synergy. Additional study is necessary to determine if any particular modality improves functional and system outcomes as well as pain and satisfaction.

RESULTS

QUALITY AND APPLICABILITY

Table 113. Quality Table of Treatment Studies for Advanced Imaging8

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Bech et al 2011	Nausea: VRS	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Bech et al 2011	Verbal Ranking Scale (VRS) at hip flexion	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Bech et al 2011	Verbal Ranking Scale (VRS) at rest	●	○	●	○	●	○	●	Moderate	●	○	●	○	Moderate	Moderate
Foss et al 2005	Limited mobility (dizziness walking)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (exhaustion in hip flexion)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (hip flexion)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (motor block in hip flexion)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (motor block in	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
	walking)														
Foss et al 2005	Limited mobility (pain in hip flexion)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (pain in walking)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (POCD in hip flexion)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (POCD in walking)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Limited mobility (PONV walking)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Walking (able to perform function with assistance)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Walking (performs function independently)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Foss et al 2005	Walking (unable to perform function)	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Gorodetskyi et al 2007	VAS Mean aggregate score	●	●	●	●	●	○	○	Moderate	●	○	●	●	Moderate	Moderate

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Kang et al 2013	Complications: Delirium	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Complications: Nausea	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Complications: Vomiting	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Hospital Stay Length (days)	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	ICU Admission	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Mortality	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Postoperative walking activity (Koval)	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Kang et al 2013	Satisfaction Score	●	●	●	●	●	●	○	High	●	○	●	○	Moderate	High
Lamb et al 2002	15.25-m walking speed (m/s)	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Lamb et al 2002	3.05-m walking speed (m/s)	●	●	●	●	●	●	●	High	●	○	●	●	Moderate	High
Lamb et al 2002	LEP injured (W/kg)	●	●	●	●	●	○	●	High	○	○	○	○	Low	Moderate

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Lamb et al 2002	LEP uninjured (W/kg)	●	●	●	●	●	○	●	High	○	○	○	○	Low	Moderate
Lamb et al 2002	Pain (max score, 6)	●	●	●	●	●	○	●	High	○	○	●	○	Moderate	High
Lamb et al 2002	Ratio of power (injured/uninjured)	●	●	●	●	●	○	●	High	○	○	○	○	Low	Moderate
Lamb et al 2002	Recovery of Indoor Walking	●	●	●	●	●	○	●	High	○	○	○	○	Low	Moderate
Lamb et al 2002	Tandem stand	●	●	●	●	●	○	●	High	○	○	○	○	Low	Moderate
Matot et al 2003	Cardiac events	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Matot et al 2003	Mortality	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Mouzopoulos et al 2009	Duration of Delirium (days)	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mouzopoulos et al 2009	Incidence of Delirium	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mouzopoulos et al 2009	Severity of Delirium (DRSR-98)	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High
Mouzopoulos et al 2009	VAS Pain Score	●	○	●	●	●	●	●	High	○	○	●	○	Moderate	High

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Ogilvie-Harris et al 1993	Complications	●	○	●	○	●	○	●	Moderate	●	○	●	●	Moderate	Moderate
Spansberg et al 1996	Pain	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Spansberg et al 1996	Use of morphine	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Complications: Nausea	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Complications: Pruritus	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Complications: Rescue Antiemetic	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Complications: Vomiting	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Patient Satisfaction: Excellent	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Patient Satisfaction: Good	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Patient Satisfaction: Moderate	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate
Tuncer et al 2003	Patient Satisfaction: Poor	●	○	●	○	●	●	○	Moderate	●	○	●	●	Moderate	Moderate

FINDINGS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Limited Mobility (Pain in supine to sitting transfer)	1 day	Epidural Analgesia	Placebo	60	N/A	-	-	0.016	Favors Placebo
Foss et al 2005	Limited Mobility (Pain in supine to sitting transfer)	2 day	Epidural Analgesia	Placebo	60	N/A	-	-	0.001	Favors Placebo
Foss et al 2005	Limited Mobility (Pain in standing to sitting transfer	1 day	Epidural Analgesia	Placebo	60	N/A	-	-	0.004	Favors Placebo
Foss et al 2005	Limited Mobility (Pain in standing to sitting transfer	2 day	Epidural Analgesia	Placebo	60	N/A	-	-	0.007	Favors Placebo
Foss et al 2005	Limited Mobility (PONV standing to sitting transfer)	1 day	Epidural Analgesia	Placebo	60	N/A	-	-	0.009	Favors Epidural Analgesia
Foss et al 2005	Total Duration of Hospital Stay (Preoperative and Postoperative)	Immediate	Epidural Analgesia	Placebo	60	Mean difference	-2.00	0.56	N/A	NS
Foss et al 2005	Hip Flexion (unable to perform function)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.32	0.31	N/A	NS
Foss et al 2005	Hip Flexion (unable to perform function)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	1.93	0.58	N/A	NS
Foss et al 2005	Hip Flexion (unable to perform function)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	1.93	0.58	N/A	NS
Foss et al 2005	Hip Flexion (unable to perform function)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Hip Flexion (able to perform with assistance)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.68	0.34	N/A	NS
Foss et al 2005	Hip Flexion (able to perform with assistance)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.58	0.21	N/A	NS
Foss et al 2005	Hip Flexion (able to perform with assistance)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.94	N/A	NS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Hip Flexion (able to perform with assistance)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.95	N/A	NS
Foss et al 2005	Hip Flexion (performs function independently)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.38	0.15	N/A	NS
Foss et al 2005	Hip Flexion (performs function independently)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	1.21	0.35	N/A	NS
Foss et al 2005	Hip Flexion (performs function independently)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.83	N/A	NS
Foss et al 2005	Hip Flexion (performs function independently)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	1.06	0.70	N/A	NS
Foss et al 2005	Supine to sitting transfer (unable to perform function)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Supine to sitting transfer (unable to perform function)	2 day	Epidural Analgesia	Placebo	60	% risk difference	14.29	0.03	N/A	Favors Placebo
Foss et al 2005	Supine to sitting transfer (unable to perform function)	3 day	Epidural Analgesia	Placebo	60	risk ratio	0.48	0.54	N/A	NS
Foss et al 2005	Supine to sitting transfer (unable to perform function)	4 day	Epidural Analgesia	Placebo	60	% risk difference	3.57	0.28	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.64	0.15	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.45	0.03	N/A	Favors Placebo

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.91	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.83	0.70	N/A	NS
Foss et al 2005	Supine to sitting transfer (performs function independently)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.49	0.15	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	1.37	0.24	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	1.10	0.69	N/A	NS
Foss et al 2005	Supine to sitting transfer (able to perform function with assistance)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	1.07	0.70	N/A	NS
Foss et al 2005	Standing to sitting transfer (unable to perform function)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.45	0.53	N/A	NS
Foss et al 2005	Standing to sitting transfer (unable to perform function)	2 day	Epidural Analgesia	Placebo	60	% risk difference	21.43	0.01	N/A	Favors Placebo
Foss et al 2005	Standing to sitting transfer (unable to perform function)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	1.29	0.73	N/A	NS
Foss et al 2005	Standing to sitting transfer (unable to perform function)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	1.93	0.58	N/A	NS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Standing to sitting transfer (able to perform function with assistance)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.79	0.34	N/A	NS
Foss et al 2005	Standing to sitting transfer (able to perform function with assistance)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.60	0.09	N/A	NS
Foss et al 2005	Standing to sitting transfer (able to perform function with assistance)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	1.10	0.83	N/A	NS
Foss et al 2005	Standing to sitting transfer (able to perform function with assistance)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	1.35	0.56	N/A	NS
Foss et al 2005	Standing to sitting transfer (performs function independently)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.13	0.81	N/A	NS
Foss et al 2005	Standing to sitting transfer (performs function independently)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	1.05	0.87	N/A	NS
Foss et al 2005	Standing to sitting transfer (performs function independently)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.91	0.66	N/A	NS
Foss et al 2005	Standing to sitting transfer (performs function independently)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.92	0.61	N/A	NS
Foss et al 2005	Walking (unable to perform function)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.69	0.36	N/A	NS
Foss et al 2005	Walking (unable to perform function)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	2.25	0.20	N/A	NS
Foss et al 2005	Walking (unable to perform function)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	1.35	0.56	N/A	NS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Walking (unable to perform function)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	4.82	0.14	N/A	NS
Foss et al 2005	Walking (able to perform function with assistance)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.81	0.31	N/A	NS
Foss et al 2005	Walking (able to perform function with assistance)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.77	0.35	N/A	NS
Foss et al 2005	Walking (able to perform function with assistance)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.94	N/A	NS
Foss et al 2005	Walking (able to perform function with assistance)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.94	N/A	NS
Foss et al 2005	Walking (performs function independently)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.96	N/A	NS
Foss et al 2005	Walking (performs function independently)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.93	N/A	NS
Foss et al 2005	Walking (performs function independently)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.90	0.68	N/A	NS
Foss et al 2005	Walking (performs function independently)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.86	0.47	N/A	NS
Foss et al 2005	Limited Mobility (Pain in Hip Flexion)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.19	0.02	N/A	Favors Placebo
Foss et al 2005	Limited Mobility (Pain in Hip Flexion)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.14	0.06	N/A	NS
Foss et al 2005	Limited Mobility (Pain in Hip Flexion)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.36	0.10	N/A	NS
Foss et al 2005	Limited Mobility (Pain in Hip Flexion)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.24	0.19	N/A	NS
Foss et al 2005	Limited Mobility (Pain in Walking)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.11	0.00	N/A	Favors Placebo

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Limited Mobility (Pain in Walking)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.16	0.01	N/A	Favors Placebo
Foss et al 2005	Limited Mobility (Pain in Walking)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.77	0.67	N/A	NS
Foss et al 2005	Limited Mobility (Pain in Walking)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	0.16	0.08	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Hip Flexion)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Hip Flexion)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.48	0.54	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Hip Flexion)	3 day	Epidural Analgesia	Placebo	60	% risk difference	10.71	0.06	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Hip Flexion)	4 day	Epidural Analgesia	Placebo	60	% risk difference	0.00	1.00	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Walking)	1 day	Epidural Analgesia	Placebo	60	% risk difference	7.14	0.12	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Walking)	2 day	Epidural Analgesia	Placebo	60	% risk difference	0.00	1.00	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Walking)	3 day	Epidural Analgesia	Placebo	60	% risk difference	7.14	0.12	N/A	NS
Foss et al 2005	Limited Mobility (Motor Block in Walking)	4 day	Epidural Analgesia	Placebo	60	% risk difference	0.00	1.00	N/A	NS
Foss et al 2005	Limited Mobility (PONV Walking)	1 day	Epidural Analgesia	Placebo	60	% risk difference	21.43	0.01	N/A	Favors Epidural Analgesia
Foss et al 2005	Limited Mobility (PONV Walking)	2 day	Epidural Analgesia	Placebo	60	% risk difference	3.57	0.28	N/A	NS
Foss et al 2005	Limited Mobility (PONV Walking)	3 day	Epidural Analgesia	Placebo	60	% risk difference	3.57	0.28	N/A	NS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Limited Mobility (PONV Walking)	4 day	Epidural Analgesia	Placebo	60	% risk difference	-3.70	0.27	N/A	NS
Foss et al 2005	Limited Mobility (Dizziness Walking)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	4.82	0.14	N/A	NS
Foss et al 2005	Limited Mobility (Dizziness Walking)	2 day	Epidural Analgesia	Placebo	60	% risk difference	14.29	0.03	N/A	Favors Epidural Analgesia
Foss et al 2005	Limited Mobility (Dizziness Walking)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Limited Mobility (Dizziness Walking)	4 day	Epidural Analgesia	Placebo	60	% risk difference	7.14	0.12	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Hip Flexion)	1 day	Epidural Analgesia	Placebo	60	% risk difference	3.57	0.28	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Hip Flexion)	2 day	Epidural Analgesia	Placebo	60	% risk difference	7.14	0.12	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Hip Flexion)	3 day	Epidural Analgesia	Placebo	60	% risk difference	3.57	0.28	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Hip Flexion)	4 day	Epidural Analgesia	Placebo	60	% risk difference	0.00	1.00	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Walking)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Walking)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.97	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Walking)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.98	N/A	NS
Foss et al 2005	Limited Mobility (POCD in Walking)	4 day	Epidural Analgesia	Placebo	60	% risk difference	0.00	1.00	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Hip Flexion)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.93	0.42	N/A	NS

Table 114. Epidural Analgesia Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Foss et al 2005	Limited Mobility (Exhaustion in Hip Flexion)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	1.93	0.42	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Hip Flexion)	3 day	Epidural Analgesia	Placebo	60	% risk difference	7.14	0.12	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Hip Flexion)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	2.41	0.27	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Walking)	1 day	Epidural Analgesia	Placebo	60	Risk ratio	1.69	0.36	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Walking)	2 day	Epidural Analgesia	Placebo	60	Risk ratio	2.41	0.09	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Walking)	3 day	Epidural Analgesia	Placebo	60	Risk ratio	0.96	0.95	N/A	NS
Foss et al 2005	Limited Mobility (Exhaustion in Walking)	4 day	Epidural Analgesia	Placebo	60	Risk ratio	9.64	0.03	N/A	Favors Epidural Analgesia
Matot et al 2003	Cardiac Events	Preop	Epidural Group	Control	68	% risk difference	-20.59	0.00	N/A	Favors Epidural
Matot et al 2003	Cardiac Events	Postop	Epidural Group	Control	68	Risk ratio	0.50	0.40	N/A	NS
Matot et al 2003	Pre-op death	Preop	Epidural Group	Control	68	% risk difference	-11.8	0.00	N/A	Favors Epidural

Table 115. Intensive Standardized Protocol for Medical and Nursing Treatment Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Ogilvie-Harriset al 1993	Complications	6 month	Intensive standardized protocol for medical and nursing treatment	Control	106	Risk ratio	1.55	0.10	N/A	NS

Table 116. Nerve Block Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Mouzopoulos et al. 2009	Severity of Delirium (DRSR-98)	Postop	FICB Prophylaxis Group	Placebo	219	Mean difference	-4.27	0.00	N/A	Favors FICB
Mouzopoulos et al. 2009	Duration of Delirium (days)	Postop	FICB Prophylaxis Group	Placebo	219	Mean difference	-5.75	0.00	N/A	Favors FICB
Mouzopoulos et al. 2009	VAS Pain Score	Preop	FICB Prophylaxis Group	Placebo	219	Mean difference	-6.80	-	0.59	NS
Mouzopoulos et al. 2009	VAS Pain Score	Postop	FICB Prophylaxis Group	Placebo	219	Mean difference	-8.00	-	0.34	NS
Mouzopoulos et al. 2009	Incidence of Delirium	Postop	FICB Prophylaxis Group	Placebo	219	Risk ratio	0.45	0.02	N/A	Favors FICB
Tuncer et al 2003	Complications: Nausea	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	Risk ratio	0.57	0.30	N/A	NS
Tuncer et al 2003	Complications: Vomiting	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	% risk difference	-25.00	0.01	N/A	Favors Treatment
Tuncer et al 2003	Complications: Pruritus	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	% risk difference	-25.00	0.01	N/A	Favors Treatment
Tuncer et al 2003	Complications: Rescue Antiemetic	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	% risk difference	-25.00	0.01	N/A	Favors Treatment
Tuncer et al 2003	Patient Satisfaction: Excellent	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	Risk ratio	3.67	0.02	N/A	Favors Treatment
Tuncer et al 2003	Patient Satisfaction: Good	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	Risk ratio	1.33	0.51	N/A	NS
Tuncer et al 2003	Patient Satisfaction: Moderate	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	Risk ratio	0.11	0.03	N/A	Favors Treatment
Tuncer et al 2003	Patient Satisfaction: Poor	48 hours	femoral nerve patient-controlled analgesia	Intravenous patient-controlled analgesia	40	% risk difference	0.00	1.00	N/A	NS

Table 117. Analgesic and Intraoperative Periarticular Injections Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Kang et al 2013	Postoperative walking activity (Koval)	Discharge	analgesic and intraoperative periarticular injections	Control	82	Mean difference	0.00	-	p>.05	NS
Kang et al 2013	Hospital Stay Length (days)	Discharge	analgesic and intraoperative periarticular injections	Control	82	Mean difference	-0.10	-	p>.05	NS
Kang et al 2013	Satisfaction Score	Discharge	analgesic and intraoperative periarticular injections	Control	82	Mean difference	1.10	-	0.016	Favors Treatment
Kang et al 2013	Complications: Nausea	Discharge	analgesic and perioperative cocktail	Control	82	Risk ratio	0.79	0.62	N/A	NS
Kang et al 2013	Complications: Vomiting	Discharge	analgesic and perioperative cocktail	Control	82	Risk ratio	0.68	0.60	N/A	NS
Kang et al 2013	Complications: Delirium	Discharge	analgesic and perioperative cocktail	Control	82	Risk ratio	0.91	0.83	N/A	NS
Kang et al 2013	Mortality	Discharge	analgesic and perioperative cocktail	Control	82	Risk ratio	0.91	0.94	N/A	NS
Kang et al 2013	ICU Admission	Discharge	analgesic and perioperative cocktail	Control	82	Risk ratio	1.36	0.73	N/A	NS

Table 118. Local Anesthetic Versus Placebo

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Bech et al 2011	Verbal Ranking Scale (VRS) at rest	Day 1	Bolus installation of ropivacaine	Placebo	27	Mean difference	0.50	-	p>.05	NS
Bech et al 2011	Verbal Ranking Scale (VRS) at rest	Day 2	Bolus installation of ropivacaine	Placebo	27	Mean difference	0.50	-	p>.05	NS
Bech et al 2011	Verbal Ranking Scale (VRS) at hip flexion	Day 1	Bolus installation of ropivacaine	Placebo	27	Mean difference	0.25	-	p>.05	NS
Bech et al 2011	Verbal Ranking Scale (VRS) at hip flexion	Day 2	Bolus installation of ropivacaine	Placebo	28	Mean difference	0.75	-	p<.01	Favors Intervention
Bech et al 2011	Nausea: VRS	Day 1	Bolus installation of ropivacaine	Placebo	27	Mean difference	0.00	-	p>.05	NS
Bech et al 2011	Nausea: VRS	Day 2	Bolus installation of ropivacaine	Placebo	27	Mean difference	0.00	-	p>.05	NS
Bech et al 2011	Nausea: VRS	Day 3	Bolus installation of ropivacaine	Placebo	26	Mean difference	0.00	-	p>.05	NS
Spansberg et al 1996	VAS Pain Score	16 hours	Bupivacaine	Salene (Control)	23	N/A	-	-	p>.05	NS
Spansberg et al 1996	Use of morphine	16 hours	Bupivacaine	Salene (Control)	23	N/A	-	-	p>.05	NS

Table 119. Neuromuscular Stimulation Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lamb et al 2002	3.05-m walking speed (m/s)	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	-0.03	0.50	N/A	NS
Lamb et al 2002	3.05-m walking speed (m/s)	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.01	0.92	N/A	NS
Lamb et al 2002	3.05-m walking speed (m/s)	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.11	0.38	N/A	NS
Lamb et al 2002	3.05-m walking speed (m/s)	Difference week 7- week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.02	0.81	N/A	NS
Lamb et al 2002	3.05-m walking speed (m/s)	Difference week 13- week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.12	0.03	N/A	Favors PNMS
Lamb et al 2002	15.25-m walking speed (m/s)	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	-0.02	0.64	N/A	NS
Lamb et al 2002	15.25-m walking speed (m/s)	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.00	1.00	N/A	NS
Lamb et al 2002	15.25-m walking speed (m/s)	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.11	0.36	N/A	NS
Lamb et al 2002	15.25-m walking speed (m/s)	Difference week 7- week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.05	0.59	N/A	NS

Table 119. Neuromuscular Stimulation Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lamb et al 2002	15.25-m walking speed (m/s)	Difference week 13- week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.11	0.01	N/A	Favors PNMS
Lamb et al 2002	LEP injured (W/kg)	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.04	0.61	N/A	NS
Lamb et al 2002	LEP injured (W/kg)	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.17	0.23	N/A	NS
Lamb et al 2002	LEP injured (W/kg)	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.20	0.20	N/A	NS
Lamb et al 2002	LEP injured (W/kg)	Difference week 7- week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.12	0.31	N/A	NS
Lamb et al 2002	LEP injured (W/kg)	Difference week 13- week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.04	0.62	N/A	NS
Lamb et al 2002	LEP uninjured (W/kg)	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.07	0.67	N/A	NS
Lamb et al 2002	LEP uninjured (W/kg)	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	-0.01	0.95	N/A	NS
Lamb et al 2002	LEP uninjured (W/kg)	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.04	0.84	N/A	NS
Lamb et al 2002	LEP uninjured (W/kg)	Difference week 7- week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	-0.09	0.59	N/A	NS

Table 119. Neuromuscular Stimulation Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lamb et al 2002	LEP uninjured (W/kg)	Difference week 13- week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.06	0.48	N/A	NS
Lamb et al 2002	Ratio of power (injured/uninjured)	6 weeks	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	N/A	-	-	0.05	Favors PNMS
Lamb et al 2002	Pain (max score, 6)	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	-0.34	0.44	N/A	NS
Lamb et al 2002	Pain (max score, 6)	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.00	1.00	N/A	NS
Lamb et al 2002	Pain (max score, 6)	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.25	0.31	N/A	NS
Lamb et al 2002	Pain (max score, 6)	Difference week 7- week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.34	0.50	N/A	NS
Lamb et al 2002	Pain (max score, 6)	Difference week 13- week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Mean difference	0.25	0.50	N/A	NS
Gorodetskyi et al, 2007	VAS Mean aggregate score	day 10	Non-invasive interactive neurostimulation device	Sham Device	60	Mean difference	-4.30	-	p<.001	Favors NIN
Lamb et al 2002	Recovery of Indoor Walking	7 weeks	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Risk ratio	3.50	0.07	N/A	NS
Lamb et al 2002	Recovery of Indoor Walking	13 weeks	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Risk ratio	3.00	0.04	N/A	Favors PNMS

Table 119. Neuromuscular Stimulation Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lamb et al 2002	Tandem stand	Week 1	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	% risk difference	-25.00	0.05	N/A	Favors Placebo
Lamb et al 2002	Tandem stand	Week 7	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Risk ratio	2.67	0.07	N/A	NS
Lamb et al 2002	Tandem stand	Week 13	Patterned Neuromuscular Stimulation (PNMS)	Placebo Stimulation	24	Risk ratio	1.14	0.67	N/A	NS

CALCIUM AND VITAMIN D AND SCREENING

Calcium and Vitamin D: Moderate evidence supports use of supplemental vitamin D and calcium in patients following hip fracture surgery.

Strength of Recommendation: Moderate 

Screening: Limited evidence supports preoperative assessment of serum levels of albumin and creatinine for risk assessment of hip fracture patients.

Strength of Recommendation: Limited 

CALCIUM AND VITAMIN D

Moderate evidence supports use of supplemental vitamin D and calcium in patients following hip fracture surgery.

Strength of Recommendation: Moderate 

RATIONALE

Four moderate strength studies (Bischoff-Ferrari et al [150], Prince et al[151], Harwood et al[152], and Chapuy et al[153]) show benefits of either supplemental calcium, vitamin D or both to reduce fall risk and prevent fractures in the elderly. There is a high prevalence of vitamin D deficiency among hip fracture patients (Bischoff-Ferrari et al[150]) and hip fracture patients have a 5-10x increased risk of a second hip fracture and other fragility fractures (Harwood et al[152]). In a moderate strength double-blinded study in elderly women with hip fractures (Bischoff-Ferrari et al), 98% of patients were found to be vitamin D deficient (<30 ng/ml) and hospital readmission rates were decreased by 39% in patients treated with daily supplementation of 2000 IU versus 800 IU vitamin D. In a moderate strength randomized clinical trial in 3,270 elderly women, Chapuy et al[153] showed that supplemental calcium and 800 IU vitamin D reduced the risk of hip fractures by 43% and non-spine fractures by 32% over 18 months. Another moderate strength 5 year double-blind placebo-controlled study (Prince et al[151]) showed a reduction in fractures in the elderly population with supplemental calcium carbonate (1200mg/d), but the results were limited due to poor long term compliance. A randomized controlled trial of hip fracture patients (Harwood et al[152]) showed vitamin D supplementation either orally or by injection increased bone mineral density and reduced the incidence of falls, with calcium co-supplementation having a positive effect.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

Calcium and vitamin D supplements are generally safe with few side effects. Some studies show that supplemental calcium in adults aged 65 or older is associated with an increased risk of constipation or nephrolithiasis.

FUTURE RESEARCH

Further placebo controlled randomized clinical trials controlling for non-compliance are needed to clarify benefits and risks of calcium and vitamin D supplementation in patients 65 and older, as well as to identify target levels to achieve optimal benefits as there appears to be a dose dependent relationship in outcomes. Measurement of the serum

calcium, albumin, 25-hydoxyvitamin D, and creatinine levels may reveal secondary causes of osteoporosis (e.g. hyperparathyroidism, malignancy, vitamin D deficiency or chronic kidney disease) and could guide use of calcium, vitamin D, or nutritional supplements which may improve outcomes.

SCREENING

Limited evidence supports preoperative assessment of serum levels of albumin and creatinine for risk assessment of hip fracture patients.

Strength of Recommendation: Limited ★★☆☆

RATIONALE

There was one moderate strength (Mosfeldt et al[156]) and four low strength prognostic studies assessing the effect of albumin levels on patient outcomes after hip fracture surgery (Burness et al[154], Forminga et al[155], Ozturk et al[157] and Lieberman et al[158]). Low albumin levels had a statistically significant positive correlation with mortality in three studies (Burness et al[154], Mosfeldt et al[156], Ozturk et al[157]). Lieberman et al[5] found that a 1 g/DL increase in serum albumin at discharge was associated with an 8.4% improvement on the Functional Independence Measure after rehabilitation was complete. Finally, Forminga et al[155] found that low albumin levels were associated with a higher risk of nosocomial infection and pressure ulcers.

Three low strength prognostic studies assessed the effect of patient creatinine levels on outcomes after hip fracture surgery (Talsnes et al [159], Bjorkelund et al [160], Mosfeldt et al[156]). Talsnes et al [159] found elevated creatinine levels on the 1st post-op day significantly increased the odds of mortality, but pre-op levels and day 4 post-op levels were not significant predictors of death. Finally Bjorkelund et al[160] did not find creatinine levels of >100 g/L to be significantly associated with post-op confusion, in-hospital complications or length of hospital stay beyond 10 days.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no risks associated with this recomendation.

FUTURE RESEARCH

Further studies are needed to evaluate the importance of pre-op assessment to risk stratify and optimize elderly patients with hip fractures. Measurement of the serum calcium, albumin, 25-hydoxyvitamin D, and creatinine levels may reveal secondary causes of osteoporosis (e.g. hyperparathyroidism, malignancy, vitamin D deficiency or chronic kidney disease) and could guide use of calcium, vitamin D, or nutritional supplements which may improve outcomes.

RESULTS

QUALITY AND APPLICABILITY

Table 120. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Bischoff-FerrariH.A. et al. 2010	Hospital admission due to fall related injury	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-FerrariH.A. et al. 2010	Hospital admission due to infection	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-FerrariH.A. et al. 2010	Hospital admission for fall related hip fracture	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-FerrariH.A. et al. 2010	Mortality	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-FerrariH.A. et al. 2010	Overall relative rate difference in falls per patient year	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Bischoff-FerrariH.A. et al. 2010	Refracture	●	○	●	○	○	●	●	Moderate	○	○	●	●	Moderate	Moderate
Chapuy MC. 1992	Hip fracture	●	○	○	●	○	○	○	Low	●	○	○	●	Moderate	Low

Table 120. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Chapuy et al 1992	Non vertebral fracture	●	○	○	●	○	○	○	Low	●	○	○	●	Moderate	Low
Harwood et al 2004	Falls w/ no new fracture	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Harwood et al 2004	Falls w/fracture	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Harwood et al 2004	Hypovitaminosis D	●	●	○	○	●	○	○	Low	○	○	●	○	Moderate	Moderate
Harwood et al 2004	Mobility-No Aid	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Harwood et al 2004	Mortality	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Harwood et al 2004	No Falls	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Harwood et al 2004	total falls	●	●	○	○	●	●	○	Moderate	○	○	●	○	Moderate	Moderate
Law M. et al 2006	Falls	●	○	○	●	○	○	○	Low	●	○	○	●	Moderate	Low
Law M. et al 2006	Hip Fractures	●	○	○	●	○	○	○	Low	●	○	○	●	Moderate	Low

Table 120. Quality Table of Treatment Studies for Advanced Imaging

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	Quality	Participants	Intervention Expertise	Compliance & Adherence	Analysis	Applicability	Strength of Evidence
Prince R. et al 2006	Reduction in Overall Fracture Rates	●	○	●	●	●	○	●	Moderate	●	○	○	●	Moderate	Moderate
Prince R. et al 2006	Constipation	●	○	●	●	●	○	●	Moderate	●	○	○	●	Moderate	Moderate
Prince R. et al 2006	Ischemic heart disease	●	○	●	●	●	○	●	Moderate	●	○	○	●	Moderate	Moderate

Table 121 Quality Table of Prognostic Studies for Advanced Imaging

●: Domain free of flaws

○: Domain flaws present

Study	Prospective	Power	Analysis	Model	Investigator Bias	*Quality*	Patients	Analysis	Outcomes	*Applicability*	
Bjorkelund et al 2009	○	●	○	●	●	Low	●	○	●	Moderate	Low
Burness et al 1996	●	○	○	○	●	Low	●	○	●	Moderate	Low
Formiga et al 2005	●	●	○	○	●	Low	○	○	●	Moderate	Low
Lieberman et al 2006	●	●	○	○	●	Low	○	○	●	Moderate	Low
Mosfeldt 2012	●	●	○	○	●	Low	●	●	●	High	Moderate
Ozturk et al 2009	●	●	○	○	●	Low	○	○	●	Moderate	Low
Talsnes et al 2012	●	●	○	○	●	Low	○	○	●	Moderate	Low

FINDINGS

Table 122. Calcium Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Harwood, R. et al 2004	Hypovitaminosis D	1 year	Injected Vitamin D + Oral Calcium	Injected vitamin D	45	Risk ratio	1.00	1.00	N/A	NS
Harwood, R. et al 2004	Mortality	1 year	Injected Vitamin D + Oral Calcium	Injected vitamin D	57	Risk ratio	2.01	0.08	N/A	NS
Harwood, R. et al 2004	Falls w/fracture	1 year	Injected Vitamin D + Oral Calcium	Injected vitamin D	55	% risk difference	12.00	0.04	N/A	Favors Vit D
Harwood, R. et al 2004	total falls	1 year	Injected Vitamin D + Oral Calcium	Injected vitamin D	55	Risk ratio	3.60	0.10	N/A	NS
Harwood, R. et al 2004	Mobility-No Aid	3 months	Injected Vitamin D + Oral Calcium	Injected vitamin D	69	Risk ratio	1.03	0.96	N/A	NS
Harwood, R. et al 2004	Hypovitaminosis D	1 year	Oral Vitamin D + Oral Calcium	Injected vitamin D	45	Risk ratio	0.38	0.23	N/A	NS
Harwood, R. et al 2004	Mortality	1 year	Oral Vitamin D + Oral Calcium	Injected vitamin D	57	Risk ratio	0.88	0.81	N/A	NS
Harwood, R. et al 2004	Falls w/fracture	1 year	Oral Vitamin D + Oral Calcium	Injected vitamin D	55	% risk difference	10.34	0.052	N/A	NS
Harwood, R. et al 2004	total falls	1 year	Oral Vitamin D + Oral Calcium	Injected vitamin D	55	Risk ratio	3.62	0.09	N/A	NS
Harwood, R. et al 2004	Mobility-No Aid	3 months	Oral Vitamin D + Oral Calcium	Injected vitamin D	69	Risk ratio	1.70	0.36	N/A	NS
Harwood, R. et al 2004	Hypovitaminosis D	1 year	Oral Vitamin D + Oral Calcium	No Treatment	58	Risk ratio	0.12	0.00	N/A	Favors oral vitamin d and Calcium
Harwood, R. et al 2004	Mortality	1 year	Oral Vitamin D + Oral Calcium	No Treatment	67	Risk ratio	1.39	0.55	N/A	NS

Table 122. Calcium Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Harwood, R. et al 2004	Falls w/fracture	1 year	Oral Vitamin D + Oral Calcium	No Treatment	64	Risk ratio	0.72	0.64	N/A	NS
Harwood, R. et al 2004	total falls	1 year	Oral Vitamin D + Oral Calcium	No Treatment	64	Risk ratio	0.65	0.28	N/A	NS
Harwood, R. et al 2004	Mobility-No Aid	3 months	Oral Vitamin D + Oral Calcium	No Treatment	70	Risk ratio	0.83	0.68	N/A	NS
Prince, R. et al 2006	Reduction in Overall Fracture Rates	5 years	Calcium – Per-protocol analysis	Placebo - Patients compliant with medication regimen	830	Risk ratio	0.66	0.03	N/A	Favors calcium
Prince, R. et al 2006	Reduction in Overall Fracture Rates	5 years	Calcium – Intent to Treat analysis analysis	Placebo - Patients compliant with medication regimen	1430	Risk ratio	0.88	0.59	N/A	NS
Prince, R. et al 2006	Constipation	5 years	Calcium – Intent to Treat analysis analysis	Placebo - Patients compliant with medication regimen	1430	Risk ratio	1.47	-	<.05	Placebo
Prince, R. et al 2006	Ischemic Heart Disease	5 years	Calcium – Intent to Treat analysis analysis	Placebo - Patients compliant with medication regimen	1430	Risk ratio	1.12	-	>.05	NS
Chapuy, M. et al 1992	Hip Fracture Rates	18 months	Vitamin D3-Calcium-Per protocol	Placebo	1765	Risk ratio	0.57	0.04	N/A	Favors Vitamin D3-Calcium
Chapuy, M. et al 1992	Hip Fracture Rates	18 months	Vitamin D3-Calcium_Intent to Treat Analysis	Placebo	2790	Risk ratio	0.74	0.03	N/A	Favors Vitamin D3-Calcium
Chapuy, M. et al 1992	Non-vertebral fractures	18 months	Vitamin D3-Calcium-Per protocol	Placebo	1765	Risk ratio	0.69	0.04	N/A	Favors Vitamin D3-Calcium
Chapuy, M. et al 1992	Non-vertebral fractures	18 months	Vitamin D3-Calcium_Intent to Treat Analysis	Placebo	2790	Risk ratio	0.75	0.004	N/A	Favors Vitamin D3-Calcium

Table 123. Vitamin D Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Harwood, R. et al 2004	Hypovitaminosis D	1 year	Injected vitamin D	No treatment	57	Risk ratio	0.32	0.01	N/A	Favors Vit D
Harwood, R. et al 2004	Mortality	1 year	Injected vitamin D	No treatment	68	Risk ratio	1.58	0.39	N/A	NS
Harwood, R. et al 2004	Falls w/fracture	1 year	Injected vitamin D	No treatment	65	% risk difference	-14.29	0.02	N/A	Favors Vit D
Harwood, R. et al 2004	total falls	1 year	Injected vitamin D	No treatment	65	Risk ratio	0.18	0.02	N/A	Favors Vit D
Harwood, R. et al 2004	Mobility-No Aid	3 months	Injected vitamin D	No treatment	69	Risk ratio	0.49	0.20	N/A	NS
Law, M. et al 2006	Hip Fractures	Median 10 months	Vitamin D (1,100 IU) daily	No vitamin D	3717	Risk ratio	1.33	0.34	N/A	NS
Law, M. et al 2006	Falls	Median 10 months	Vitamin D (1,100 IU) daily	No vitamin D	3717	Risk ratio	1.03	0.50	N/A	NS

Table 124. Vitamin D High Versus Low Dosage

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Bischoff-Ferrari,H.A. et al 2010	Overall relative rate difference in falls per patient year	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	N/A	-	-	>.05	NS
Bischoff-Ferrari,H.A. et al 2010	Hospital admission due to fall related injury	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	Risk ratio	0.39	0.03	N/A	Cholecalciferol 2000 IU/d
Bischoff-Ferrari,H.A. et al 2010	Hospital admission for fall related hip fracture	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	Risk ratio	0.51	0.32	N/A	NS
Bischoff-Ferrari,H.A. et al 2010	Hospital admission due to infection	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	Risk ratio	0.51	0.57	N/A	NS
Bischoff-Ferrari,H.A. et al 2010	Mortality	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	Risk ratio	1.01	0.98	N/A	NS
Bischoff-Ferrari,H.A. et al 2010	Refracture	1 year	Cholecalciferol 2000 IU/d	Cholecalciferol 800 IU/d	173	Risk ratio	0.47	0.08	N/A	NS

Table 125. Results For Prognostic Studies Of Albumin

Study	AAOS ID	Outcome	Duration	Biomarker	N	Statistic type	Statistical result (NR=not reported)	p value (*=stastically significant)	Conclusion
Burness et al 1996	7101	albumin levels in alive compared to dead patients	1 year	Pre-op Albumin	39	bivariate mean difference g/L	4.8	0.004*	Albumin was significantly lower in deceased patients
Forminga et al 2005	4944	in hospital mortality	varying	Albumin within 3 days after surgery	73	unclear	NR	0.6	albumin not a significant predictor of mortality

Table 125. Results For Prognostic Studies Of Albumin

Study	AAOS ID	Outcome	Duration	Biomarker	N	Statistic type	Statistical result (NR=not reported)	p value (*=stastically significant)	Conclusion
Mosfeldt 2012	20103	mortality	3 months	albumin <34 g/L on admission	792	logistic regression odds ratio	3.08	0.009*	albumin levels under threshold increase mortality odds by 208%
Ozturk et al 2009	462	mortality	1 year	albumin <3.5 g/dl day of admission	74	bivariate risk ratio	5.23	0.02*	Mortality risk is significantly higher in patients with albumin levels below threshold
Burness et al 1996	7101	deterioration in walking ability	1 year	Pre-op Albumin	39	bivariate mean difference not reported	NR	0.12	Albumin was not significantly higher in patients whose walking deteriorated
Lieberman et al 2006	4879	Percent improvement on Functional Indendence Measure(final FIM/(126-base FIM) after rehabilitation	1 year	Albumin at discharge (g/dl)	943	stepwise multiple regression coefficient	8.418	<.001*	increased albumin is significantly associated with higher functional improvement
Ozturk et al 2009	462	mobility: Parkland and Palmer score	1 year	albumin <3.5 g/dl day of admission	74	multivariate analysis, but not clear what kind	NR	>.05	albumin was not a significnat predictor of mobility
Formiga et al 2005	4944	nosocomial infection	varying	Albumin within 3 days after surgery	73	unclear	NR	0.008*	albumin significantly predicts nosocomial infection
Formiga et al 2005	4944	pressure ulcers	varying	Albumin within 3 days after surgery	73	unclear	NR	0.008*	albumin significantly predicts pressure ulcers

Table 126. Results For Prognostic Studies Of Creatinine

Study	AAOS ID	Outcome	Duration	Biomarker	N	Statistic type	Statistical result (NR=not reported)	p value (*=stastically significant)	Conclusion
Talsnes et al 2012	19939	mortality	3 months	Pre-op creatinine	302	logistic regression odds ratio controling for age sex and comorbidity	1.009	0.058	Not statistically significant
Talsnes et al 2012	19939	mortality	3 months	creatinine post-op day 1	302	logistic regression odds ratio controling for age sex and comorbidity	1.011	0.028*	1 day post op creatinine level significantly predict mortality
Talsnes et al 2012	19939	mortality	3 months	creatinine post op day4	302	logistic regression odds ratio controling for age sex and comorbidity	1.001	0.615	Not statistically significant
Bjorkelund et al 2009	3948	mortality	4 months	creatinine >100 g/L	428	logistic regression Odds Ratio not reported due to non significance in stepwise model	NR	>.05	creatinine >100 g/L did not significantly predict mortality
Mosfeldt 2012	20103	mortality	3 months	creatinine (>90 in women >105 mmol/L in men)	792	logistic regression odds ratio	2.84	<.001*	creatinine levels over threshold increase mortality odds by 184%
Bjorkelund et al 2009	3948	post-op confusion	varying	creatinine >100 g/L	428	logistic regression Odds Ratio not reported due to non significance in stepwise model	NR	>.05	creatinine >100 g/L did not significantly predict post-op confusion
Bjorkelund et al 2009	3948	in hospital complication	varying	creatinine >100 g/L	428	logistic regression Odds Ratio not reported due to non significance in stepwise model	NR	>.05	creatinine >100 g/L did not significantly predict in hospital complication
Bjorkelund et al 2009	3948	length of stay >10 days	10 days	creatinine >100 g/L	428	logistic regression Odds Ratio not reported due to non significance in stepwise model	NR	>.05	creatinine >100 g/L did not significantly predict length of stay >10 days

OSTEOPOROSIS EVALUATION AND TREATMENT

Moderate evidence supports that patients be evaluated and treated for osteoporosis after sustaining a hip fracture.

Strength of Recommendation: Moderate 

RATIONALE

There were two moderate strength studies (Lyles et al[161] and Majumdar et al[162]) and one low strength studies (Gardner et al[163]) that support this recommendation. Lyles et al[161] studied the effectiveness of zoledronic acid versus placebo combined with pre-treatment vitamin D repletion and found that the treatment group exhibited statistically significant reductions in mortality rates, rates of any new fractures, rates of new non-vertebral fractures, or the rates of new vertebral fractures.All participants who had very low 25-hydroxyvitamin D levels or no blood level available received 50,000 to 125,000 units of vitamin D_2 or D_3 (orally or intramuscularly) 14 days before the treatment intervention. All participants then received supplemental calcium and vitamin D daily. Majumdar et al[162] was upgraded from a low strength study to a moderate strength study due to a large effect size. Majumdar, et al studied the effectiveness of an osteoporosis case manager for post-discharge hip fracture care. In this study, those patients who received the intervention had increased chance of osteoporosis evaluation by bone mineral density testing and osteoporosis-specific treatment with bisphosphonates. The Gardner et al[163]study found no significant differences in mortality or osteoporosis addressed with bone density scan and/or bisphosphonate therapy between the group who received a discussion regarding osteoporosis risks post-surgery and the group who received a fall prevention pamphlet. Hip fractures are a sign (symptom) of osteoporosis, but most patients with hip fractures are not currently evaluated and treated for their underlying osteoporosis.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

A hip fracture is a sign of osteoporosis, but most patients with hip fractures are not currently evaluated and treated for their underlying osteoporosis. Patients who have fractured a hip are at high risk for subsequent fracture and increased mortality. There are very effective osteoporosis therapies that lower the risk of fractures. There are potential benefits for identification of secondary causes of osteoporosis with no known harm associated with this osteoporosis evaluation. There is the potential for “atypical femur fractures” that may be associated with prolonged bisphosphonate therapy. All medications including osteoporosis therapies have potential harms.

FUTURE RESEARCH

Cost-effectiveness research on use of a fracture liaison service in open health care systems would be helpful for evaluation and treatment of osteoporosis and to test whether a fracture liaison service reduces the risk of hip fracture readmission rates after a hip fracture. Further investigations of the long term patient specific outcomes of bisphosphonate therapies are also appropriate, including assessment of alternative osteoporosis treatments. In addition, the relative roles of the orthopaedic surgeon and the

patient's primary care provider in evaluating and treating low bone mass after hip fracture, and how these compare to the use of a fracture liaison service, should be studied.

RESULTS

QUALITY AND APPLICABILITY

Table 127. Quality Table of Treatment Studies for Preoperative Regional Analgesia

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Gardner et al 2005	Death	●	○	○	○	●	●	●	Moderate	○	○	○	○	Low	Low
Gardner et al 2005	Osteoporosis addressed with scan and/or biophosphonate therapy	●	○	○	○	●	●	●	Moderate	○	○	○	○	Low	Low
Lyles et al 2007	Any adverse event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Any atrial fibrillation event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Any fracture	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Any Pyrexia • event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Any serious adverse event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Arthralgia	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Lyles et al 2007	Calculated creatinine clearance <30 ml/min	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Death	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Death from cardiovascular causes	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Discontinuation of follow-up owing to adverse event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Fatal stroke	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Headache	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Hip fracture	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Increase in serum creatinine >0.5 mg/dl	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Influenza-like symptoms	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Myalgia	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
Lyles et al 2007	Myocardial infarction	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Non vertebral fracture	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Pyrexia • After first infusion	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Pyrexia • After second infusion	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Pyrexia • After third infusion	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Serious adverse atrial fibrillation event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Serious adverse stroke event	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Lyles et al 2007	Vertebral fracture	●	●	●	○	○	●	○	Moderate	○	○	●	●	Moderate	Moderate
Majumdar et al 2007	Additional Fractures	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	Admission to Hospital	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	BMD testing received within 6 months of	●	○	○	○	●	○	○	Low	○	○	●	●	Moderate	Low

Domain free of flaws: ●

Domain flaws present: ○

Study	Outcome	Hypothesis	Group Assignment	Blinding	Group Comparability	Treatment Integrity	Measurement	Investigator Bias	*Quality*	Participants	Intervention Expertise	Compliance & Adherence	Analysis	*Applicability*	*Strength of Evidence*
	fracture														
Majumdar et al 2007	Death	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	General health status: mental component	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	General health status: physical component	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	Guideline-concordant appropriate care received within 6 months of fracture	●	○	○	○	●	○	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	Independent ambulation	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	No hip pain	●	○	○	○	●	●	○	Low	○	○	●	●	Moderate	Low
Majumdar et al 2007	Osteoporosis Therapy received within 6 months of fracture	●	○	○	○	●	○	○	Low	○	○	●	●	Moderate	Low

FINDINGS

Table 128. Discharge Planning Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Gardner et al 2005	Death	6-months	Discussion regarding osteoporosis association, questions provided for primary care physician, 6 week telephone reminder	Fall prevention pamphlet (control)	80	Risk ratio	1.00	1.00	N/A	NS
Gardner et al 2005	Osteoporosis addressed with scan and/or biophosphonate therapy	6-months	Discussion regarding osteoporosis association, questions provided for primary care physician, 6 week telephone reminder	Fall prevention pamphlet (control)	80	Risk ratio	2.14	0.05	N/A	NS
Majumdar et al 2007	Osteoporosis Therapy received within 6 months of fracture	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	2.33	0.00	N/A	Favors Intervention
Majumdar et al 2007	BMD testing received within 6 months of fracture	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	2.75	0.001	N/A	Favors Intervention
Majumdar et al 2007	Guideline-concordant appropriate care received within 6 months of fracture	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	2.85	0.001	N/A	Favors Intervention
Majumdar et al 2007	Additional Fractures	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	1.00	1.00	N/A	NS
Majumdar et al 2007	Admission to Hospital	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	1.36	0.41	N/A	NS
Majumdar et al 2007	Death	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	1.50	0.65	N/A	NS
Majumdar et al 2007	General health status: physical component	6 months	Osteoporosis Case Manager	Usual Care	220	Mean difference	1.00	0.45	N/A	NS

Table 128. Discharge Planning Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Majumdar et al 2007	General health status: mental component	6 months	Osteoporosis Case Manager	Usual Care	220	Mean difference	-0.80	0.58	N/A	NS
Majumdar et al 2007	Independent ambulation	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	0.84	0.33	N/A	NS
Majumdar et al 2007	No hip pain	6 months	Osteoporosis Case Manager	Usual Care	220	Risk ratio	1.09	0.39	N/A	NS

Table 129. Zolderonic Acid Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lyles et al 2007	Any fracture	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.66	0.00	N/A	Favors treatment
Lyles et al 2007	Non vertebral fracture	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.74	0.03	N/A	Favors treatment
Lyles et al 2007	Hip fracture	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.70	0.18	N/A	NS
Lyles et al 2007	Vertebral fracture	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.54	0.02	N/A	Favors treatment
Lyles et al 2007	Death	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.72	0.01	N/A	Favors treatment
Lyles et al 2007	Any adverse event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.02	0.33	N/A	NS
Lyles et al 2007	Any serious adverse event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.93	0.17	N/A	NS

Table 129. Zolderonic Acid Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lyles et al 2007	Discontinuation of follow-up owing to adverse event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.17	0.62	N/A	NS
Lyles et al 2007	Increase in serum creatinine >0.5 mg/dl	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	1786	Risk ratio	1.12	0.56	N/A	NS
Lyles et al 2007	Calculated creatinine clearance <30 ml/min	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	1773	Risk ratio	1.12	0.49	N/A	NS
Lyles et al 2007	Myalgia	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	3.68	0.00	N/A	Favors placebo
Lyles et al 2007	Influenza-like symptoms	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	2.01	0.32	N/A	NS
Lyles et al 2007	Headache	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.78	0.16	N/A	NS
Lyles et al 2007	Arthralgia	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.44	0.17	N/A	NS
Lyles et al 2007	Any Pyrexia • event	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	8.13	0.00	N/A	Favors placebo
Lyles et al 2007	Pyrexia • After first infusion	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	10.31	0.00	N/A	Favors placebo
Lyles et al 2007	Pyrexia • After second infusion	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.50	0.65	N/A	NS
Lyles et al 2007	Pyrexia • After third infusion	3 days	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	% risk difference	0.28	0.06	N/A	NS
Lyles et al 2007	Any atrial fibrillation event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.08	0.78	N/A	NS
Lyles et al 2007	Serious adverse atrial fibrillation event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.86	0.70	N/A	NS

Table 129. Zolderonic Acid Versus Control

Study	Outcome	Duration	Group 1	Group 2	N	Statistic	Result	p	Study p value	Favors
Lyles et al 2007	Serious adverse stroke event	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.21	0.37	N/A	NS
Lyles et al 2007	Fatal stroke	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	1.50	0.44	N/A	NS
Lyles et al 2007	Myocardial infarction	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.77	0.47	N/A	NS
Lyles et al 2007	Death from cardiovascular causes	36 months	Zolderonic acid +3 day course of acetaminophen	Placebo	2111	Risk ratio	0.69	0.09	N/A	NS

V. APPENDIXES

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The following participants contributed to the development of the preliminary recommendations during the introductory meeting, but did not participate in the final meeting where the evidence was reviewed and the final recommendations were developed:

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APPENDIX II
AAOS BODIES THAT APPROVED THIS CLINICAL PRACTICE GUIDELINE

Committee on Evidence Based Quality and Value

The committee on Evidence Based Quality and Value (EBQV) consists of twenty AAOS members who implement evidence-based quality initiatives such as clinical practice guidelines (CPGs) and appropriate use criteria (AUCs). They also oversee the dissemination of related educational materials and promote the utilization of orthopaedic value products by the Academy's leadership and its members.

Council on Research and Quality

The Council on Research and Quality promotes ethically and scientifically sound clinical and translational research to sustain patient care in musculoskeletal disorders. The Council also serves as the primary resource for educating its members, the public, and public policy makers regarding evidenced-based medical practice, orthopaedic devices and biologics, regulatory pathways and standards development, patient safety, occupational health, technology assessment, and other related important errors.

The Council is comprised of the chairs of the committees on Biological Implants, Biomedical Engineering, Occupational Health and Workers' Compensation, Patient Safety, Research Development, U.S. Bone and Joint Decade, and chair and Appropriate Use Criteria and Clinical Practice Guideline section leaders of the Evidence Based Quality and Value committee. Also on the Council are the second vice-president, three members at large, and representatives of the Diversity Advisory Board, Women's Health Issues Advisory Board, Board of Specialty Societies (BOS), Board of Councilors (BOC), Communications Cabinet, Orthopaedic Research Society (ORS), Orthopedic Research and Education Foundation (OREF).

Board of Directors

The 17 member Board of Directors manage the affairs of the AAOS, set policy, and oversee the Strategic Plan.

APPENDIX III
DETERMINING CRITICAL OUTCOMES

The first task of the work group is to identify the critical outcomes for the guideline. Members are asked to construct a preliminary list of important outcomes prior to attending the introductory meeting. They participate in three Delphi rounds, completing the "Critical Outcomes Form" shown below.

CRITICAL OUTCOMES FORM

DETERMINING OUTCOMES

The first task as a guideline work group member is to determine outcomes. List the variables you think are relevant and rank them in order of importance. Appropriate outcomes are patient-centered and consider the benefits and potential harm of the treatments being measured.

Criticality

Some outcomes are more important than others. The *most* important ones are considered critical. Critical outcomes are vital for determining whether or not you should offer a treatment or diagnostic test to a patient. Without knowing what the essential outcomes are and how the treatment or test influences them, efficacy cannot be determined.

Patient-Oriented Outcomes

In general, good practice and good evidence-based medicine give priority to the outcomes that patients care about. Patient-oriented outcomes:

- Help the patient live longer or better
- Are typically something the patient experiences
- Are often the patient's diagnostic or treatment goal(s)
- Do not require extrapolation or interpolation to determine their importance to the patient

Examples of patient-oriented outcomes are:

- Survival/mortality
- Pain relief
- Fracture prevention
- Functional status
- Quality of life

Surrogate Outcomes

Patient-oriented outcomes contrast surrogate ones in that the latter:

- Substitute measures for patient-oriented outcomes
- Are typically not experienced by the patient
- Are typically not the patient's goals for treatment
- Require extrapolation or interpolation to determine their relationship to (or effect on) patient-oriented outcomes

Examples of surrogate outcomes are:

- Blood cholesterol (a surrogate for survival)
- Bone mineral density (a surrogate for fractures)
- All imaging results (often surrogates for pain or functional status but they can also be surrogates for other patient-oriented outcomes)

Benefit Versus Harm
Potential benefit to patients is based on the patient-oriented outcomes that they desire and potential harm can be thought of as patient-oriented outcomes unwanted to them. For example, avoiding harm (e.g. fractures or death) is considered a benefit.

For Consideration
Not taking the time to develop appropriate critical outcomes has been known to detrimentally affect the strength of the final recommendations, and on occasion prevent being able to make a recommendation for a treatment or diagnostic test of clinical importance.

Rating Outcomes
In addition to identifying patient outcomes, work group members rated the importance of each one using a scale of 1 to 9. The rating categories are shown in the table below:

Rating	*Importance*
9	
8	**Critical**
7	
6	
5	**Important**
4	
3	
2	**Not Important**
1	

Work group members were advised to note that:

1. **Unless you are interested in measures of diagnostic test performance (i.e., sensitivity and specificity), surrogate Outcomes may not be rated as "Critical" (7-9).**

2. **If all Outcomes are rated as critically important, then it will not be possible to prioritize the ones that are more likely to generate a comprehensive list of initial recommendations.**

Final Determinations
To determine which outcomes to include and designate as critical, three rounds of the Delphi method were used.

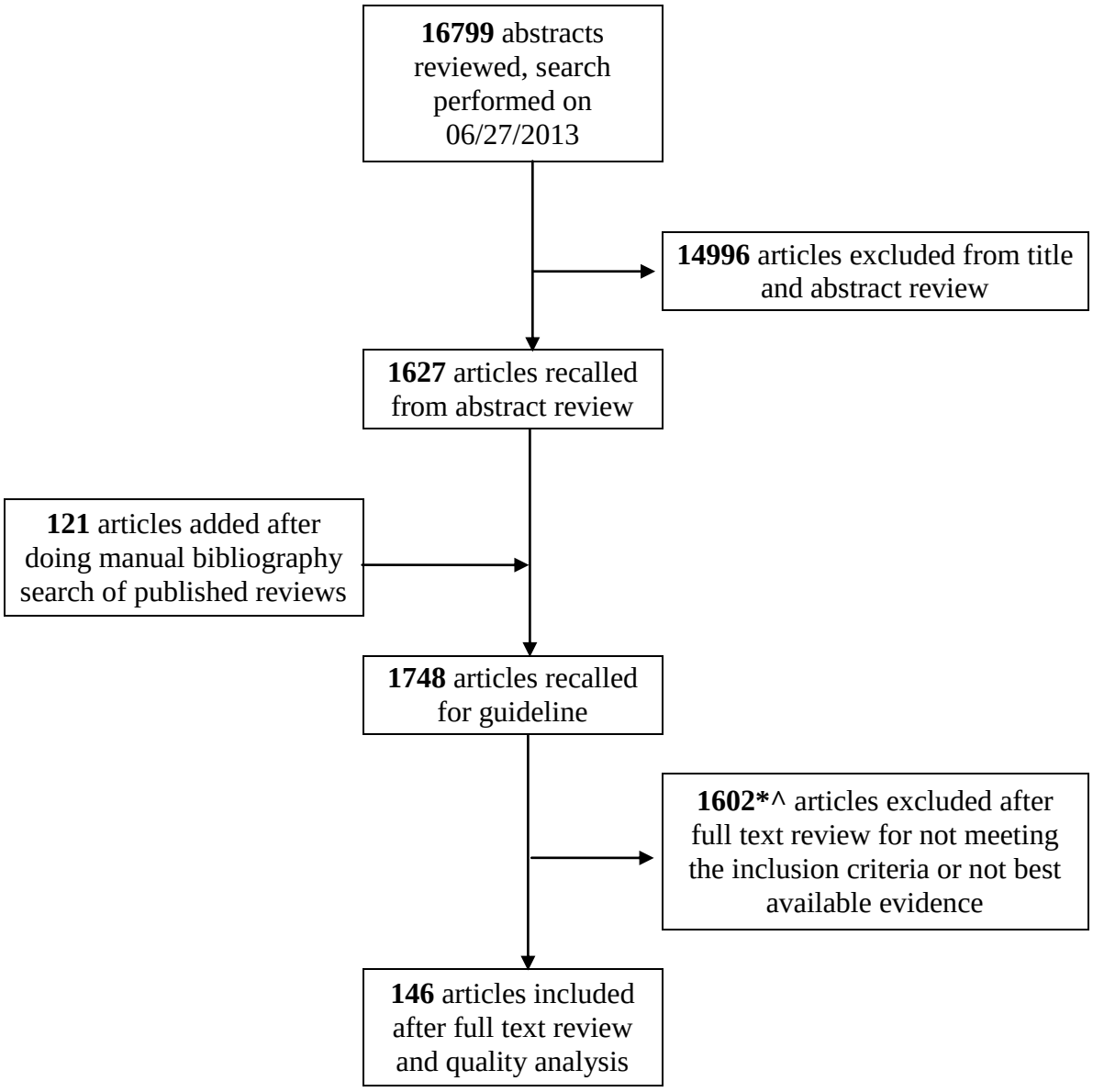
The form below was used by the work group.

Please list up to 10 Outcomes that you think this guideline should address, and rate them in order of importance on a scale from 1-9. Do not consult with other members of the work group during this step.

Outcome Number	Outcome	Rating
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

This form was circulated <u>three times.</u>

APPENDIX IV
STUDY ATTRITION FLOWCHART



(^Includes recalled articles that the librarian was unable to retrieve and articles not in English)

APPENDIX V
LITERATURE SEARCH STRATEGIES

#1
Hip Fractures[mesh] OR Femoral Neck Fractures[mesh] OR (Hip Joint[mesh] OR Hip Injuries[mesh] OR Hip[mesh] AND fracture*[tiab]) OR ("hip fracture"[tiab] OR "hip fractures"[tiab]) OR (Joint Capsule/injuries[mesh] AND (hip[tiab] OR hips[tiab]))

#2
fracture*[tiab] AND ("femoral neck"[tiab] OR "low energy"[tiab] OR basicervical[tiab] OR midcervical[tiab] OR subcapital[tiab] OR trochanter*[tiab] OR subtrochanter*[tiab] OR peritrochanter*[tiab] OR intertrochanter*[tiab])

#3
Aged[mesh] OR elderly[tiab]

#4
Fractures, Spontaneous[Majr] OR Periprosthetic Fractures[Majr]

#5
(animal[mh] NOT human[mh]) OR cadaver[mh] OR cadaver*[titl] OR ((comment[pt] OR editorial[pt] OR letter[pt] OR "historical article"[pt]) NOT "clinical trial"[pt]) OR addresses[pt] OR news[pt] OR "newspaper article"[pt] OR pmcbook OR "case report"[titl]

#6
("2012/12/03"[Date - Publication] : "2013/04/23"[Date - Publication]) AND English[la]

#7
(#1 OR #2) AND #3

#8
#7 NOT (#4 OR #5)

#9
#8 AND #6

Sorted by study type

#10
Medline[tw] OR systematic review[tiab] OR Meta-analysis[pt]

#11
"Clinical Trial"[pt] OR (clinical[tiab] AND trial[tiab]) OR random*[tw] OR "Therapeutic use"[sh]

#12
#9 AND #10

#13
#9 AND #11 NOT #10

#14
#9 NOT (#11 OR #10)

Study type	Search line	Results	De-duplicated	RefIDs
Systematic Reviews	12	4	3	22040-22042
Clinical Trials	13	24	19	22043-22062
Other Studies	14	79	69	22063-22136

APPENDIX VI
EVALUATION OF QUALITY

Quality questions are asked for every outcome reported in a study. They vary according to the rigor of a study's research design. Different questions are asked depending on if a study uses a controlled design with a no-treatment comparison group, is a crossover or historically controlled study, or case series. A total of 20 questions are asked for each type of research design and are described below:

Quality Questions and Domains for Four Designs of Studies of Interventions

Domain	Question:	Parallel, Contemporary Controls	Crossover Trials	Historical Controls	Case Series
Group Assignment	Stochastic	Yes	Yes	No	No
Group Assignment	Quasi-random Assignment	No	No	No	*NA
Group Assignment	Matched Groups	No	No	Yes	No
Group Assignment	Consecutive Enrollment	NA	NA	NA	Yes
Prospective	Prospective	Yes	Yes	Yes	Yes
Blinding	Blinded Patients	Yes	Yes	No	No
Blinding	Blinded Assessors	Yes	Yes	No	No
Blinding	Blinding Verified	Yes	Yes	No	No
Group Comparability	Allocation Concealment	Yes	Yes	No	No
Group Comparability	>80% Follow-up	Yes	Yes	No	Yes
Group Comparability	<20% Completion Difference	Yes	Yes	No	No
Group Comparability	Similar Baseline Outcome Values	Yes	NA	Yes	No
Group Comparability	Comparable Pt. Characteristics	Yes	NA	Yes	No
Group Comparability	Same Control Group Results	NA	Yes	NA	NA
Group Comparability	Same Experimental Group Results	NA	Yes	NA	NA
Treatment Integrity	Same Centers	Yes	Yes	Yes	No
Treatment Integrity	Same Treatment Duration in and across All Groups	Yes	Yes	Yes	No
Treatment Integrity	Same Concomitant Treatment to All Groups (controlled studies only)	Yes	Yes	Yes	NA
Treatment Integrity	No Confounding Treatment (case series only)	NA	NA	NA	Yes
Measurement	Same Instruments	Yes	Yes	Yes	Yes
Measurement	Valid Instrument	Yes	Yes	Yes	Yes
Bias	Article & Abstract Agree	Yes	Yes	Yes	Yes
Bias	All Outcomes Reported	Yes	Yes	Yes	Yes
Bias	A Priori Analysis	Yes	Yes	Yes	Yes

Domain	Question:	Parallel, Contemporary Controls	Crossover Trials	Historical Controls	Case Series
Statistical Power	Statistically Significant	High	High	High	High
Statistical Power	Number of patients in analysis	See below for further information			

*"NA" means "not asked."

The statistical power domain is assessed differently from the other domains. We characterize this domain as free from flaws if any one of the following is true:

- The results of a statistical test on the outcome of interest are statistically significant (statistical significance is indicative of adequate statistical power).
- The results of a statistical test of the outcome of interest are not statistically significant (or it is unclear whether the results are statistically significant), and the study is either an uncontrolled study in which data from 34 or more patients are included in the statistical analysis of the outcome of interest OR a controlled study in which data from 128 or more patients are included in the analysis of the outcome of interest.
- The study's results for the outcome of interest are used in a meta-analysis. We make this assumption because one reason for performing a meta-analysis is to compensate for the low statistical power of individual studies. Implicit in this assumption is a second assumption; that the power of the meta-analysis will be sufficient to detect an effect as statistically significant.

We term the power domain as flawed if all of the following are true:

- The results of a statistical test on the outcome of interest are either not statistically significant or it is unclear whether the results of statistical test on the outcome of interest are statistically significant.
- The study is an uncontrolled study in which data from fewer than 15 patients are included in the analysis of the outcome of interest OR the study is a controlled study in which data from fewer than 52 patients were included in the analysis of the outcome of interest.
- The results on the outcome of interest will not be used in a meta-analysis.

The numbers used to determine whether a study is of sufficient power are based on Cohen's[134] definitions of small, medium, and large effects. To compute the number of patients needed for an uncontrolled study using a pretest/posttest design, we consider a two-tailed paired samples t-test. We then determine whether or not sample size is sufficient to detect a large effect (defined as a standardized mean difference of ≥ 0.8) with alpha = 0.05 significance level and power = 80%. If a study does not have the ability to detect even a large effect as statistically significant, we characterize it as underpowered and the domain flawed.

To compute the number of patients needed for a controlled study, we consider a two-tailed independent samples t-test with equal size groups, and then determine if sample size is adequate for detecting a large effect, again with alpha = 0.05 and power = 80%. Similar to the above, we term a study as underpowered and the domain flawed if it does not enroll enough patients to detect a large effect size. It is viewed as adequately powered if it enrolls enough patients to detect a small effect.

Quality Domains for Incidence and Prevalence studies

#	**Domain**	**Relationship Between Quality and Domain Scores for Incident and Prevalence Studies**
1	Outcome: Whether the study is measuring the incidence/prevalence of a clinically meaningful event.	0 Flawed Domains = High Quality Study 1 Flawed Domain = Moderate Quality Study 2 Flawed Domains = Low Quality Study ≥ 3 Flawed Domains = Very Low Quality Study
2	Measurement: Whether the study measured the disease/disorder/condition in a way that would lead to accurate estimates of incidence or prevalence.	
3	Participant: Whether those who were studied were representative of the population of interest.	
4	Investigator Bias: Whether author biases could have prejudiced the results.	

Quality Domains for Screening & Diagnosis studies

#	**Domain**	**Relationship Between Quality and Domain Scores for Screening and Diagnosis Studies**
1	Participants: Whether the spectrum of disease among the participants enrolled in the study is the same as the spectrum of disease seen in actual clinical practice	0 Flawed Domains = High Quality Study 1 Flawed Domain = Moderate Quality Study 2 Flawed Domains = Low Quality Study ≥ 3 Flawed Domains = Very Low Quality Study
2	Reference Test: Whether the reference test , often a "gold standard" and the way it was employed in the study ensures correct and unbiased categorization of patients as having or not having disease	
3	Index Test: Whether interpretation of the results of the test under study, often called the "index test", was unbiased	
4	Study Design: Whether the design of the study allowed for unbiased interpretation of test results	
5	Information: Whether the same clinical data were available when test results were interpreted as would be available when the test is used in practice	
6	Reporting: Whether the patients, tests, and study protocol were described well enough to permit its replication	

Quality Domains for Prognostic studies

	Domain	Relationship Between Quality and Domain Scores for Prognosis Studies
1	Prospective: With prospective studies, a variable is specified as a potential prognostic variable a priori. This is not possible with retrospective studies.	0 Flawed Domains = High Quality Study 1 Flawed Domain = Moderate Quality Study 2 Flawed Domains = Low Quality Study ≥ 3 Flawed Domains = Very Low Quality Study
2	Power: Whether the study had sufficient statistical power to detect a prognostic variable as statistically significant.	
3	Analysis: Whether the statistical analyses used to determine that a variable was rigorous to provide sound results.	
4	Model: Whether the final statistical model used to evaluate a prognostic accounted for enough variance to be statistically significant.	
5	Bias: Whether there was evidence of investigator bias.	

Quality Domains for Treatment studies

#	Domains	Relationship Between Quality and Domain Scores for Treatment Studies
1	The study addressed a hypothesis	0 Flawed Domains = High Quality Study 1 – 2 Flawed Domain = Moderate Quality Study 3 – 4 Flawed Domains = Low Quality Study ≥ 5 Flawed Domains = Very Low Quality Study
2	The assignment of patients to groups was unbiased	
3	There was sufficient blinding to mitigate against a placebo effect	
4	The patient groups were comparable at the beginning of the study	
5	The treatment was delivered in such a way that any observed effects could reasonably be attributed to that treatment	
6	Whether the instruments used to measure outcomes were valid	
7	Whether there was evidence of investigator bias	

APPLICABILITY

We determine the applicability of a study using the PRECIS instrument.[135] This instrument consists of 10 questions. The domains that each question applies to are shown in the table below.

Applicability Questions and the Domains for Studies of Interventions

Question	Domain
All Types of Patients Enrolled	Participants
Flexible Instructions to Practitioners	Interventions and Expertise
Full Range of Expt'l Practitioners	Interventions and Expertise
Usual Practice Control	Interventions and Expertise

Full Range of Control Practitioners	Interventions and Expertise
No Formal Follow-up	Interventions and Expertise
Usual and Meaningful Outcome	Interventions and Expertise
Compliance Not Measured	Compliance and Adherence
No Measure of Practitioner Adherence	Compliance and Adherence
All Patients in Analysis	Analysis

Applicability Domains for Incident and Prevalence studies

Domain	**Relationship Between Applicability and Domain Scores for Incidence and Prevalence Studies**
Participants (i.e. whether the participants in the study were like those seen in the population of interest)	0 Flawed Domains = High Quality Study 1 – 2 Flawed Domain = Moderate Quality Study ≥ 3 Flawed Domains = Low Quality Study
Analysis (i.e., whether participants were appropriately included and excluded from the analysis)	
Outcome (i.e., whether the incidence/prevalence estimates being made were of a clinically meaningful outcome)	

Applicability Questions and Domains for Screening and Diagnostic Studies

Domain	**Relationship Between Applicability and Domain Scores for Screening and Diagnosis Studies**
Participants: whether the patients in the study are like those seen in actual clinical practice	0 Flawed Domains = High Quality Study 1 – 3 Flawed Domain = Moderate Quality Study ≥ 4 Flawed Domains = Low Quality Study
Index Test: whether the test under study could be used in actual clinical practice and whether it was administered in a way that reflects its use in actual practice	
Directness: whether the study demonstrated that patient health is affected by use of the diagnostic test under study	
Analysis: whether the data analysis reported in the study was based on a large enough percentage of enrolled patients to ensure that the analysis was not conducted on "unique" or "unusual" patients	

Applicability Domains for Prognostic studies

	Domain	Relationship Between Applicability and Domain Scores for Prognostic Studies
1	Patients: Whether the patients in the study and in the analysis were like those seen in actual clinical practice.	0 Flawed Domains = High Quality Study 1 – 2 Flawed Domain = Moderate Quality Study ≥ 3 Flawed Domains = Low Quality Study
2	Analysis: Whether the analysis was not conducted in a way that was likely to describe variation among patients that might be unique to the dataset the authors used.	
3	Outcome: Whether the prognostic was a predictor of a clinically meaningful outcome.	

Applicability Domains for Treatment studies

	Domain	Relationship Between Applicability and Domain Scores for Treatment Studies
1	Patients: whether the patients in the study are like those seen in actual clinical practice	0 Flawed Domains = High Quality Study 1 – 3 Flawed Domain = Moderate Quality Study ≥ 4 Flawed Domains = Low Quality Study
2	Interventions and Expertise: whether the treatments are delivered as they would be in actual clinical practice and whether the clinicians providing then are like those in actual clinical practice	
3	Compliance and Adherence (i.e., whether the steps taken in the study to ensure patient compliance and adherence to treatment regimens would make the compliance/adherence in the study different from that seen in actual clinical practice)	
4	Analysis: whether the data analysis reported in the study was based on a large enough percentage of enrolled patients to ensure that the analysis was not conducted on "unique" or "unusual" patients.	

Criteria to upgrade the Quality of a research article

Research articles may be adjusted upwards if the research is of high applicability or if providing the intervention decreases the potential for catastrophic harm, such as loss of life or limb. The EBQV expanded the above criteria based on the G.R.A.D.E. methodology, so that it now includes the following:

- The study has a large (>2) or very large (>5) magnitude of treatment effect: used for non-retrospective observational studies;

- All plausible confounding factors would reduce a demonstrated effect or suggest a spurious effect when results show no effect;
- Consideration of the dose-response effect.

Reference: *GRADE handbook for grading quality of evidence and strength of recommendation.* The GRADE Working Group; 2009.

APPENDIX VII
OPINION BASED RECOMMENDATIONS

A guideline can contain recommendations for which there is no evidence. Work groups might make the decision to issue opinion-based recommendations. Although expert opinion is a form of evidence, it is also important to avoid liberal use in a guideline since research shows that expert opinion can be incorrect.

Opinion-based recommendations are developed only in instances where not establishing a recommendation would lead to catastrophic consequences for a patient (e.g. loss of life or limb). To ensure that an opinion-based recommendation is absolutely necessary, the AAOS has adopted rules to guide the content of the rationales that are based on those outlined by the U.S. Preventive Services Task Force (USPSTF).[166] Specifically, rationales based on expert opinion must:

- Not contain references to or citations from articles not included in the systematic review.

- Not contain the AAOS guideline language "the practitioner should/should not", "the practitioner could/could not" or "The practitioner might/might not."

- Contain an explanation of the potential preventable burden of disease. This involves considering both the incidence and/or prevalence of the disease, disorder, or condition and the associated burden of suffering. To paraphrase the USPSTF, when evidence is insufficient, provision of a treatment (or diagnostic) for a serious condition might be viewed more favorably than provision of a treatment (or diagnostic) for a condition that does not cause as much suffering. The AAOS understands that evaluating the "burden of suffering" is subjective and involves judgment. This evaluation should be informed by patient values and concerns. It is not appropriate for a guideline to recommend widespread use of a technology backed by little data and for which there is limited experience. Such technologies are addressed in the AAOS' Technology Overviews.

- Address potential harms.

- Address apparent discrepancies in the logic of different recommendations. If there are no relevant data for several recommendations and the work group chooses to issue an opinion-based recommendation in some cases but not in other cases, the rationales must explain why.

- Consider current practice. The USPSTF specifically states that clinicians justifiably fear not providing a service that is practiced on a widespread basis will lead to litigation.[166] Not providing a service that is not widely available or commonly used has less serious consequences than not providing a treatment accepted by the medical profession that patients expect. The patient's "expectation of treatment" must be tempered by the treating physician's guidance about the reasonable outcomes that the patient can expect.

- Justify when applicable why a more costly device, drug, or procedure is being recommended.

Work group members write the rationales for opinion based recommendations on the first day of the final work group meeting. When the work group reconvenes on the second day, members approve the rationales. If the work group cannot adopt a rationale after three votes, the rationale and the opinion-based recommendation will be withdrawn, and a "recommendation" stating that the group can neither recommend for or against the recommendation in question will appear in the guideline.

Sometimes work group members change their views. At any time during the discussion of the rationales, any member of the work group can make a motion to withdraw a recommendation. The guideline will state that the work group can neither recommend for or against the recommendation in question.

APPENDIX VIII
STRUCTURED PEER REVIEW FORM

Peer reviewers are asked to read and review the draft of the clinical practice guideline with a particular focus on their area of expertise. Their responses to the answers below are used to assess the validity, clarity, and accuracy of the interpretation of the evidence.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The overall objective(s) of the guideline is (are) specifically described.	○	○	○	○	○
2. The health question(s) covered by the guideline is (are) specifically described.	○	○	○	○	○
3. The guideline's target audience is clearly described.	○	○	○	○	○
4. The guideline development group includes individuals from all the relevant professional groups.	○	○	○	○	○
5. There is an explicit link between the recommendations and the supporting evidence.	○	○	○	○	○
6. Given the nature of the topic and the data, all clinically important outcomes are considered.	○	○	○	○	○
7. The patients to whom this guideline is meant to apply are specifically described.	○	○	○	○	○
8. The criteria used to select articles for inclusion are appropriate.	○	○	○	○	○
9. The reasons why some studies were excluded are clearly described.	○	○	○	○	○
10. All important studies that met the article inclusion criteria are included.	○	○	○	○	○
11. The validity of the studies is appropriately appraised.	○	○	○	○	○
12. The methods are described in such a way as to be reproducible.	○	○	○	○	○
13. The statistical methods are appropriate to the material and the objectives of this guideline.	○	○	○	○	○
14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.	○	○	○	○	○
15. Health benefits, side effects, and risks are adequately addressed.	○	○	○	○	○
16. The writing style is appropriate for health care professionals.	○	○	○	○	○
17. The grades assigned to each recommendation are appropriate.	○	○	○	○	○

Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline.

Would you recommend these guidelines for use in clinical practice?*

- Strongly Recommend
- Recommend
- Would Not Recommend
- Unsure

Additional Comments:

To view an exampleof the structured peer review form, please select the following link: Structured Peer Review Form

APPENDIX IX
PARTICIPATING PEER REVIEW ORGANIZATIONS

Peer review of the guideline is completed by interested external organizations. The AAOS solicits reviewers for each guideline. They consist of experts in the topic area and represent professional societies other than AAOS. Review organizations are nominated by the work group at the introductory meeting. For this guideline, thirty-one organizations were invited to review the full guideline. Nine societies participated in the review of the guideline on hip fractures in the elderly and have given consent to be listed below:

Orthopedic Trauma Association
American Academy of Pain Medicine
American Academy of Hospice and Palliative Medicine
American Medical Women's Association
American Association of Hip and Knee Surgeons
American Geriatrics Society
American College of Emergency Physicians (ACEP)
American Osteopathic Academy of Orthopedics

Peer review comments will be available on aaos.org.

Participation in the AAOS guideline peer review process does not constitute an endorsement nor does it imply that the reviewer supports this document.

APPENDIX X
INTERPRETING THE FOREST PLOTS

We use descriptive diagrams known as forest plots to present data from studies comparing the differences in outcomes between two treatment groups when a meta-analysis has been performed (combining results of multiple studies into a single estimate of overall effect). The overall effect is shown at the bottom of the graph as a diamond to illustrate the confidence intervals. The standardized mean difference or odds ratio are measures used to depict differences in outcomes between treatment groups. The horizontal line running through each point represents the 95% confidence interval for that point estimate. The solid vertical line represents “no effect” and is where the standardized mean difference = 0 or odds ratio = 1.

APPENDIX XI
CONFLICT OF INTEREST

Prior to the development of this guideline, work group members disclose conflicts of interest. They disclose COIs in writing to the American Academy of Orthopaedic Surgeons via a private on-line reporting database and also verbally at the recommendation approval meeting.

Disclosure Items: (n) = Respondent answered 'No' to all items indicating no conflicts. 1 = Royalties from a company or supplier; 2 = Speakers bureau/paid presentations for a company or supplier; 3A = Paid employee for a company or supplier; 3B = Paid consultant for a company or supplier; 3C = Unpaid consultant for a company or supplier; 4 = Stock or stock options in a company or supplier; 5 = Research support from a company or supplier as a PI; 6 = Other financial or material support from a company or supplier; 7 = Royalties, financial or material support from publishers; 8 = Medical/Orthopaedic publications editorial/governing board; 9 = Board member/committee appointments for a society.

William Timothy Brox, MD, Workgroup Chair: 9 (American Orthopaedic Association; American Orthopaedic Association); Submitted on: 06/02/2014

Karl C Roberts, MD, Workgroup Vice-Chair: 8 (Journal of Arthroplasty); Submitted on: 05/31/2014

Alan M Adelman, MD: (n); Submitted on: 02/18/2013

Robert A Adler: 3B (Amgen); 7 (Springer); 8 (Current Osteoporosis Reports; Endocrine Research; Journal of Bone and Mineral Research; Journal of Clinical Densitometry; Journal of Clinical Endocrinology and Metabolism; Osteoporosis International); 9 (American Dental Association; American Society for Bone and Mineral Research; American Society for Bone and Mineral Research; American Society for Bone and Mineral Research); Submitted on: 08/06/2014

Thiru Annaswamy, MD: 8 (American Journal of Physical Medicine & Rehabilitation); 9 (American Academy of PM&R; Association of Academic Physiatrists; North American Spine Society); Submitted on: 08/05/2014

Pauline A Camacho, MD: 5 (Amgen Co); Submitted on: 08/06/2014

Eitan Dickman, MD: 9 (Society for Academic Emergency Medicine Emergency Ultrasound Academy BOD); Submitted on: 10/21/2013

Catherine G Hawthorne, MD: 9 (AAOS; AAOS Education and Advocacy Committeees; Orthopaedic Rehabilitation Association); Submitted on: 08/05/2014

James M Jackman, DO: (n); Submitted on: 08/05/2014

Meryl S Leboff, MD: 4 (Amgen Co); 8 (Journal of Clinical Densitometry); 9 (American Society for Bone and Mineral Research; National Osteoporosis Foundation); Submitted on: 10/24/2013

William B Macaulay, MD: 2 (Merck); 3B (Johnson & Johnson; OrthAlign); 4 (OrthAlign); 5 (Pfizer; Wright Medical Technology, Inc.); 8 (Arthritis and Rheumatism; Clinical Orthopaedics and Related Research; Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons; American Association of Hip and Knee Surgeons); Submitted on: 04/02/2014

Daniel Ari Mendelson, MD, MS, FACP, AGSF: 8 (Geriatric Orthopaedic Surgery and Rehabilitation/Sage); 9 (American Geriatrics Society); Submitted on: 04/22/2013

Steven A Olson, MD: 5 (Synthes); 9 (Orthopaedic Trauma Association; Southeastern Fracture Consortium); Submitted on: 04/01/2014

Joshua C Patt, MD: 2 (DePuy, A Johnson & Johnson Company); Submitted on: 06/02/2014

Sudeep Taksali, MD: 9 (AAOS); Submitted on: 08/05/2014

Kimberly J Templeton, MD: 9 (USBJI); Submitted on: 04/06/2014

Creighton Collins Tubb, MD: 9 (AAOS); Submitted on: 07/20/2014

John J Wixted, MD: 3B (DePuy, A Johnson & Johnson Company); 5 (Merck); Submitted on: 02/04/2014

Douglas G Wright, MD: (n); Submitted on: 02/04/2014

David Jevsevar, MD, MBA: (n); Submitted on: 04/19/2014

Kevin John Bozic, MD, MBA: 9 (AAOS; American Association of Hip and Knee Surgeons; American Orthopaedic Association; California Joint Replacement Registry Project; California Orthopaedic Association; Orthopaedic Research and Education Foundation); Submitted on: 04/01/2014

William Shaffer: (n); Submitted on: 04/13/2014

Deborah Cummins, PhD: (n); Submitted on: 05/22/2014

Jayson Murray, MA: (n); Submitted on: 06/02/2014

Patrick Donnelly: (n); Submitted on: 04/01/2014

Anne Woznica: (n); Submitted on: 04/01/2014

Yasseline Martinez: (n); Submitted on: 07/31/2014

Kaitlyn Sevarino: (n); Submitted on: 07/22/2014

Peter Shores: (n); Submitted on: 07/31/2014

APPENDIX XII
BIBLIOGRAPHIES
INTRODUCTION AND METHODS

M1. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and Mortality of Hip Fractures in the United States. JAMA. 2009;302(14):1573-9. doi: 10.1001/jama.2009.1462.

M2. Becker DJ, Kilgore ML, Morrisey MA. The societal burden of osteoporosis. Current rheumatology reports. 2010;12(3):186-91. doi: 10.1007/s11926-010-0097-y. PubMed PMID: 20425518.

M3. Hall SE, Williams JA, Senior JA, Goldswain PR, Criddle RA. Hip fracture outcomes: quality of life and functional status in older adults living in the community. Australian and New Zealand journal of medicine. 2000;30(3):327-32. Epub 2000/07/29. PubMed PMID: 10914749.

M4. Randell AG, Nguyen TV, Bhalerao N, Silverman SL, Sambrook PN, Eisman JA. Deterioration in quality of life following hip fracture: a prospective study. Osteoporos Int. 2000;11(5):460-6. Epub 2000/07/27. PubMed PMID: 10912850.

M5. Scaglione M, Fabbri L, Di Rollo F, Bianchi MG, Dell'omo D, Guido G. The second hip fracture in osteoporotic patients: not only an orthopaedic matter. Clinical cases in mineral and bone metabolism : the official journal of the Italian Society of Osteoporosis, Mineral Metabolism, and Skeletal Diseases. 2013;10(2):124-8. Epub 2013/10/18. PubMed PMID: 24133530; PubMed Central PMCID: PMCPmc3797000.

M6. Faucett SC, Genuario JW, Tosteson ANA, Koval KJ. Is Prophylactic Fixation a Cost-Effective Method to Prevent a Future Contralateral Fragility Hip Fracture? Journal of Orthopaedic Trauma. 2010;24(2):65-74 10.1097/BOT.0b013e3181b01dce

M7. Miyamoto RG, Kaplan KM, Levine BR, Egol KA, Zuckerman JD. Surgical Management of Hip Fractures: An Evidence-based Review of the Literature. I: Femoral Neck Fractures. J Am Acad Orthop Surg. Oct 2008, 16(10):596-607.
8. Osnes EK, Lofthus CM, Meyer HE, Falch JA, Nordsletten L, Cappelen I, Kristiansen IS. Consequences of hip fracture on Activities of Daily Life and Residential Needs. Osteoporos Int. 2004 Jul;15(7):567-74.

M8. Osnes EK, Lofthus CM, Meyer HE, Falch JA, Nordsletten L, Cappelen I, Kristiansen IS. Consequences of hip fracture on Activities of Daily Life and Residential Needs. Osteoporos Int. 2004 Jul;15(7):567-74.

M9. Hannan EL, Magaziner J, Wang JJ, et al. Mortality and locomotion 6 months after hospitalization for hip fracture: risk factors and risk-adjusted hospital outcomes. JAMA 2001;285:2736-42.

M10. Hirsh J., Guyatt G. “Clinical experts or methodologists to write clinical guidelines? www.thelancet.com 2009, Vol 374.

M11. GRADE handbook for grading quality of evidence and strength of recommendation. Schunemann H, Brozek JL, Oxman AD, editors. [Version 3.2]. 2009. The GRADE Working Group 1-1-2011.

M12. Treadwell JR, Tregear SJ, Reston JT, Turkelson CM. A system for rating the stability and strength of medical evidence. BMC Med Res Methodol 2006;6:5

M13. Higgins J, Altman D. Assessing risk of bias in included studies. In: Higgins J, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions. John Wiley & Sons; 2008. 187-241.

M14. Thorpe KE, Zwarenstein M, Oxman AD, Treweek S, Furberg CD, Altman DG, et al. A pragmatic-explanatory continuum indicator summary (PRECIS): a tool to help trial designers. J Clin Epidemiol. 2009;62(5):464–475.

M15. Whiting P, Rutjes A, Reitsma J, Bossuyt P, Kleijnen J. The development of QUADAS: a tool for the quality assessment of studies of diagnostic accuracy included in systematic reviews. *Biomed Central Medical Research Methodology* 2003, 3:25.

M16. Rucker G, Schwarzer G, Carpenter J, Olkin I. Why add anything to nothing? The arcsine difference as a measure of treatment effect in meta-analysis with zero cells. *Statistics in Medicine* 2009, 28: 721-738.

M17. DerSimonian R, Laird N. Meta-Analysis in Clinical Trials. Controlled Clinical 2791 Trials 1986, 7:177-188.

INCLUDED STUDIES

(1) Chana R, Noorani A, Ashwood N, Chatterji U, Healy J, Baird P. The role of MRI in the diagnosis of proximal femoral fractures in the elderly. Injury 2006;37(2):185-189. PM:16249001

(2) Haramati N, Staron RB, Barax C, Feldman F. Magnetic resonance imaging of occult fractures of the proximal femur. Skeletal Radiol 1994;23(1):19-22. PM:8160031

(3) Kirby MW, Spritzer C. Radiographic detection of hip and pelvic fractures in the emergency department. AJR Am J Roentgenol 2010;194(4):1054-1060. PM:20308510

(4) Lim KB, Eng AK, Chng SM, Tan AG, Thoo FL, Low CO. Limited magnetic resonance imaging (MRI) and the occult hip fracture. Ann Acad Med Singapore 2002;31(5):607-610. PM:12395646

(5) Pandey R, McNally E, Ali A, Bulstrode C. The role of MRI in the diagnosis of occult hip fractures. Injury 1998;29(1):61-63. PM:9659484

(6) Lee KH, Kim HM, Kim YS et al. Isolated fractures of the greater trochanter with occult intertrochanteric extension. Arch Orthop Trauma Surg 2010;130(10):1275-1280. PM:20499242

(7) Rizzo PF, Gould ES, Lyden JP, Asnis SE. Diagnosis of occult fractures about the hip. Magnetic resonance imaging compared with bone-scanning. J Bone Joint Surg Am 1993;75(3):395-401. PM:8444918

(8) Iwata T, Nozawa S, Dohjima T et al. The value of T1-weighted coronal MRI scans in diagnosing occult fracture of the hip. J Bone Joint Surg Br 2012;94(7):969-973. PM:22733955

(9) Quinn SF, McCarthy JL. Prospective evaluation of patients with suspected hip fracture and indeterminate radiographs: use of T1-weighted MR images. Radiology 1993;187(2):469-471. PM:8475292

(10) Fletcher AK, Rigby AS, Heyes FL. Three-in-one femoral nerve block as analgesia for fractured neck of femur in the emergency department: a randomized, controlled trial. Ann Emerg Med 2003;41(2):227-233. PM:12548273

(11) Foss NB, Kristensen BB, Bundgaard M et al. Fascia iliaca compartment blockade for acute pain control in hip fracture patients: a randomized, placebo-controlled trial. Anesthesiology 2007;106(4):773-778. PM:17413915

(12) Haddad FS, Williams RL. Femoral nerve block in extracapsular femoral neck fractures. J Bone Joint Surg Br 1995;77(6):922-923. PM:7593107

(13) Monzon DG, Vazquez J, Jauregui JR, Iserson KV. Pain treatment in post-traumatic hip fracture in the elderly: regional block vs. systemic non-steroidal analgesics. Int J Emerg Med 2010;3(4):321-325. PM:21373300

(14) Mouzopoulos G, Vasiliadis G, Lasanianos N, Nikolaras G, Morakis E, Kaminaris M. Fascia iliaca block prophylaxis for hip fracture patients at risk for delirium: a randomized placebo-controlled study. J Orthop Traumatol 2009;10(3):127-133. PM:19690943

(15) Yun MJ, Kim YH, Han MK, Kim JH, Hwang JW, Do SH. Analgesia before a spinal block for femoral neck fracture: fascia iliaca compartment block. Acta Anaesthesiol Scand 2009;53(10):1282-1287. PM:19650803

(16) Matot I, Oppenheim-Eden A, Ratrot R et al. Preoperative cardiac events in elderly patients with hip fracture randomized to epidural or conventional analgesia. Anesthesiology 2003;98(1):156-163. PM:12502992

(17) Anderson GH, Harper WM, Connolly CD, Badham J, Goodrich N, Gregg PJ. Preoperative skin traction for fractures of the proximal femur. A randomised prospective trial. J Bone Joint Surg Br 1993;75(5):794-796. PM:8376442

(18) Finsen V, Borset M, Buvik GE, Hauke I. Preoperative traction in patients with hip fractures. Injury 1992;23(4):242-244. PM:1618564

(19) Needoff M, Radford P, Langstaff R. Preoperative traction for hip fractures in the elderly: a clinical trial. Injury 1993;24(5):317-318. PM:8349341

(20) Resch S, BjÃ¤rnetoft. Preoperative skin traction or pillow nursing in hip fractures: a prospective, randomized study in 123 patients. 2005. http://www.nzgg.org.nz/search?search=acute+management;http://dx.doi.org/10.1080/096382805 00055800; http://www.ncbi.nlm.nih.gov/pubmed/16278188; http://www.ingentaconnect.com/content/apl/tids

(21) Rosen JE, Chen FS, Hiebert. Efficacy of preoperative skin traction in hip fracture patients: a prospective, randomized study. 2001. http://www.nzgg.org.nz/search?search=acute+management;http://dx.doi.org/10.1080/110381203 10004475; http://informahealthcare.com/loi/occ

(22) Saygi B, Ozkan K, Eceviz E, Tetik C, Sen C. Skin traction and placebo effect in the preoperative pain control of patients with collum and intertrochanteric femur fractures. Bull NYU Hosp Jt Dis 2010;68(1):15-17. PM:20345356

(23) Yip DK, Chan CF, Chiu PK, Wong JW, Kong JK. Why are we still using pre-operative skin traction for hip fractures? Int Orthop 2002;26(6):361-364. PM:12466869

(24) Resch S, Thorngren KG. Preoperative traction for hip fracture: a randomized comparison between skin and skeletal traction in 78 patients. Acta Orthop Scand 1998;69(3):277-279. PM:9703402

(25) Elliott J, Beringer T, Kee F, Marsh D, Willis C, Stevenson M. Predicting survival after treatment for fracture of the proximal femur and the effect of delays to surgery. J Clin Epidemiol 2003;56(8):788-795. PM:12954472

(26) Fox HJ, Pooler J, Prothero D, Bannister GC. Factors affecting the outcome after proximal femoral fractures. Injury 1994;25(5):297-300. PM:8034346

(27) McGuire KJ, Bernstein J, Polsky D, Silber JH. The 2004 Marshall Urist award: delays until surgery after hip fracture increases mortality. Clin Orthop Relat Res 2004;(428):294-301. PM:15534555

(28) Moran CG, Wenn RT, Sikand M, Taylor AM. Early mortality after hip fracture: is delay before surgery important? J Bone Joint Surg Am 2005;87(3):483-489. PM:15741611

(29) Novack V, Jotkowitz A, Etzion O, Porath A. Does delay in surgery after hip fracture lead to worse outcomes? A multicenter survey. Int J Qual Health Care 2007;19(3):170-176. PM:17309897

(30) Orosz GM, Magaziner J, Hannan EL et al. Association of timing of surgery for hip fracture and patient outcomes. JAMA 2004;291(14):1738-1743. PM:15082701

(31) Parker MJ, Pryor GA. The timing of surgery for proximal femoral fractures. J Bone Joint Surg Br 1992;74(2):203-205. PM:1544952

(32) Radcliff TA, Henderson WG, Stoner TJ, Khuri SF, Dohm M, Hutt E. Patient risk factors, operative care, and outcomes among older community-dwelling male veterans with hip fracture. J Bone Joint Surg Am 2008;90(1):34-42. PM:18171955

(33) Siegmeth AW, Gurusamy K, Parker MJ. Delay to surgery prolongs hospital stay in patients with fractures of the proximal femur. J Bone Joint Surg Br 2005;87(8):1123-1126. PM:16049251

(34) Chechik O, Amar E, Khashan M, Kadar A, Rosenblatt Y, Maman E. In support of early surgery for hip fractures sustained by elderly patients taking clopidogrel: a retrospective study. Drugs Aging 2012;29(1):63-68. PM:22191724

(35) Maheshwari R, Acharya M, Monda M, Pandey R. Factors influencing mortality in patients on antiplatelet agents presenting with proximal femoral fractures. J Orthop Surg (Hong Kong) 2011;19(3):314-316. PM:22184161

(36) Manning BJ, O'Brien N, Aravindan S, Cahill RA, McGreal G, Redmond HP. The effect of aspirin on blood loss and transfusion requirements in patients with femoral neck fractures. Injury 2004;35(2):121-124. PM:14736467

(37) Thaler HW, Frisee F, Korninger C. Platelet aggregation inhibitors, platelet function testing, and blood loss in hip fracture surgery. J Trauma 2010;69(5):1217-1220. PM:21068622

(38) Hossain FS, Rambani R, Ribee H, Koch L. Is discontinuation of clopidogrel necessary for intracapsular hip fracture surgery? Analysis of 102 hemiarthroplasties. J Orthop Traumatol 2013. PM:23563577

(39) Casati A, Aldegheri G, Vinciguerra E, Marsan A, Fraschini G, Torri G. Randomized comparison between sevoflurane anaesthesia and unilateral spinal anaesthesia in elderly patients undergoing orthopaedic surgery. Eur J Anaesthesiol 2003;20(8):640-646. PM:12932066

(40) Davis FM, Laurenson VG. Spinal anaesthesia or general anaesthesia for emergency hip surgery in elderly patients. Anaesth Intensive Care 1981;9(4):352-358. PM:6797318

(41) de V, V, Picart F, Le JR, Legrand A, Savry C, Morin V. Combined lumbar and sacral plexus block compared with plain bupivacaine spinal anesthesia for hip fractures in the elderly. Reg Anesth Pain Med 2000;25(2):158-162. PM:10746528

(42) Honkonen K, Tarkkanen L, Julkunen H. Femoral neck fracture during and after surgery, with special reference to the type of anaesthesia used. Acta Med Scand 1971;189(3):173-178. PM:5090201

(43) Koval KJ, Aharonoff GB, Rosenberg AD, Bernstein RL, Zuckerman JD. Functional outcome after hip fracture. Effect of general versus regional anesthesia. Clin Orthop Relat Res 1998;(348):37-41. PM:9553531

(44) Koval KJ, Aharonoff GB, Rosenberg AD, Schmigelski C, Bernstein RL, Zuckerman JD. Hip fracture in the elderly: the effect of anesthetic technique. Orthopedics 1999;22(1):31-34. PM:9925195

(45) McKenzie PJ, Wishart HY, Smith G. Long-term outcome after repair of fractured neck of femur. Comparison of subarachnoid and general anaesthesia. Br J Anaesth 1984;56(6):581-585. PM:6721969

(46) Sutcliffe AJ, Parker M. Mortality after spinal and general anaesthesia for surgical fixation of hip fractures. Anaesthesia 1994;49(3):237-240. PM:8147519

(47) Valentin N, Lomholt B, Jensen JS, Hejgaard N, Kreiner S. Spinal or general anaesthesia for surgery of the fractured hip? A prospective study of mortality in 578 patients. Br J Anaesth 1986;58(3):284-291. PM:3947489

(48) Cserhati P, Kazar G, Manninger J, Fekete K, Frenyo S. Non-operative or operative treatment for undisplaced femoral neck fractures: a comparative study of 122 non-operative and 125 operatively treated cases. Injury 1996;27(8):583-588. PM:8994566

(49) Davison JN, Calder SJ, Anderson GH et al. Treatment for displaced intracapsular fracture of the proximal femur. A prospective, randomised trial in patients aged 65 to 79 years. The Journal of bone and joint surgery British volume 2001;83):206-212.

(50) Keating JF, Grant A, Masson M, Scott NW, Forbes JF. Displaced intracapsular hip fractures in fit, older people: a randomised comparison of reduction and fixation, bipolar hemiarthroplasty and total hip arthroplasty. Health Technol Assess 2005;9(41):iii-x, 1. PM:16202351

(51) Johansson T, Jacobsson SA, Ivarsson I, Knutsson A, Wahlstrom O. Internal fixation versus total hip arthroplasty in the treatment of displaced femoral neck fractures: a prospective randomized study of 100 hips. Acta Orthop Scand 2000;71(6):597-602. PM:11145387

(52) Bray TJ, Smith-Hoefer E, Hooper A, Timmerman L. The displaced femoral neck fracture. Internal fixation versus bipolar endoprosthesis. Results of a prospective, randomized comparison. Clin Orthop Relat Res 1988;(230):127-140. PM:3365885

(53) Frihagen F, Nordsletten L, Madsen JE. Hemiarthroplasty or internal fixation for intracapsular displaced femoral neck fractures: randomised controlled trial. BMJ 2007;335(7632):1251-1254. PM:18056740

(54) Sikorski JM, Barrington R. Internal fixation versus hemiarthroplasty for the displaced subcapital fracture of the femur. A prospective randomised study. J Bone Joint Surg Br 1981;63-B(3):357-361. PM:7263746

(55) Ravikumar KJ, Marsh G. Internal fixation versus hemiarthroplasty versus total hip arthroplasty for displaced subcapital fractures of femur--13 year results of a prospective randomised study. Injury 2000;31(10):793-797. PM:11154750

(56) Rogmark C, Carlsson A, Johnell O, Sernbo I. A prospective randomised trial of internal fixation versus arthroplasty for displaced fractures of the neck of the femur. Functional outcome for 450 patients at two years. J Bone Joint Surg Br 2002;84(2):183-188. PM:11922358

(57) Tidermark J, Ponzer S, Svensson O, Soderqvist A, Tornkvist H. Internal fixation compared with total hip replacement for displaced femoral neck fractures in the elderly. A randomised, controlled trial. J Bone Joint Surg Br 2003;85(3):380-388. PM:12729114

(58) Chammout GK, Mukka SS, Carlsson T, Neander GF, Helge Stark AW, Skoldenberg OG. Total Hip Replacement Versus Open Reduction and Internal Fixation of Displaced Femoral Neck Fractures: A Randomized Long-Term Follow-up Study. J Bone Joint Surg Am 2012. PM:23014835

(59) Bachrach-Lindstrom M, Johansson T, Unosson M, Ek AC, Wahlstrom O. Nutritional status and functional capacity after femoral neck fractures: a prospective randomized one-year follow-up study. Aging (Milano) 2000;12(5):366-374. PM:11126523

(60) Calder SJ, Anderson GH, Harper WM, Jagger C, Gregg PJ. A subjective health indicator for follow-up. A randomised trial after treatment of displaced intracapsular hip fractures. J Bone Joint Surg Br 1995;77(3):494-496. PM:7744944

(61) El-Abed K, McGuinness A, Brunner J, Dallovedova P, O'Connor P, Kennedy JG. Comparison of outcomes following uncemented hemiarthroplasty and dynamic hip screw in the treatment of displaced subcapital hip fractures in patients aged greater than 70 years. Acta Orthop Belg 2005;71(1):48-54. PM:15792207

(62) Johansson T, Risto O, Knutsson A, Wahlstrom O. Heterotopic ossification following internal fixation or arthroplasty for displaced femoral neck fractures: a prospective randomized study. Int Orthop 2001;25(4):223-225. PM:11561495

(63) Johansson T, Bachrach-Lindstrom M, Aspenberg P, Jonsson D, Wahlstrom O. The total costs of a displaced femoral neck fracture: comparison of internal fixation and total hip replacement. A randomised study of 146 hips. Int Orthop 2006;30(1):1-6. PM:16374651

(64) Jonsson B, Sernbo I, Carlsson A, Fredin H, Johnell O. Social function after cervical hip fracture. A comparison of hook-pins and total hip replacement in 47 patients. Acta Orthop Scand 1996;67(5):431-434.

(65) Mouzopoulos G, Stamatakos M, Arabatzi H et al. The four-year functional result after a displaced subcapital hip fracture treated with three different surgical options. Int Orthop 2008;32(3):367-373. PM:17431621

(66) Neander G, Adolphson P, von SK, Dahlborn M, Dalen N. Bone and muscle mass after femoral neck fracture. A controlled quantitative computed tomography study of osteosynthesis versus primary total hip arthroplasty. Arch Orthop Trauma Surg 1997;116(8):470-474. PM:9352040

(67) Parker MJ. Internal fixation or arthroplasty for displaced subcapital fractures in the elderly? Injury 1992;23(8):521-524. PM:1286902

(68) Parker MJ, Khan RJ, Crawford J, Pryor GA. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly. A randomised trial of 455 patients. J Bone Joint Surg Br 2002;84(8):1150-1155. PM:12463661

(69) Parker MJ, Pryor G, Gurusamy K. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures: a long-term follow-up of a randomised trial. Injury 2010;41(4):370-373. PM:19879576

(70) Roden M, Schon M, Fredin H. Treatment of displaced femoral neck fractures: a randomized minimum 5-year follow-up study of screws and bipolar hemiprostheses in 100 patients. Acta Orthop Scand 2003;74(1):42-44. PM:12635791

(71) Skinner P, Riley D, Ellery J, Beaumont A, Coumine R, Shafighian B. Displaced subcapital fractures of the femur: a prospective randomized comparison of internal fixation, hemiarthroplasty and total hip replacement. Injury 1989;20(5):291-293. PM:2693355

(72) van Dortmont LM, Douw CM, van Breukelen AM et al. Cannulated screws versus hemiarthroplasty for displaced intracapsular femoral neck fractures in demented patients. Ann Chir Gynaecol 2000;89(2):132-137. PM:10905680

(73) Waaler Bjornelv GM, Frihagen F, Madsen JE, Nordsletten L, Aas E. Hemiarthroplasty compared to internal fixation with percutaneous cannulated screws as treatment of displaced femoral neck fractures in the elderly: cost-utility analysis performed alongside a randomized, controlled trial. Osteoporos Int 2012;23(6):1711-1719. PM:21997224

(74) Raia FJ, Chapman CB, Herrera MF, Schweppe MW, Michelsen CB, Rosenwasser MP. Unipolar or bipolar hemiarthroplasty for femoral neck fractures in the elderly? Clin Orthop Relat Res 2003;(414):259-265. PM:12966301

(75) Cornell CN, Levine D, O'Doherty J, Lyden J. Unipolar versus bipolar hemiarthroplasty for the treatment of femoral neck fractures in the elderly. Clin Orthop Relat Res 1998;(348):67-71. PM:9553535

(76) Jeffcote B, Li MG, Barnet-Moorcroft A, Wood D, Nivbrant B. Roentgen stereophotogrammetric analysis and clinical assessment of unipolar versus bipolar hemiarthroplasty for subcapital femur fracture: a randomized prospective study. ANZ J Surg 2010;80(4):242-246. PM:20575949

(77) Calder SJ, Anderson GH, Jagger C, Harper WM, Gregg PJ. Unipolar or bipolar prosthesis for displaced intracapsular hip fracture in octogenarians: a randomised prospective study. J Bone Joint Surg Br 1996;78(3):391-394. PM:8636172

(78) Hedbeck CJ, Blomfeldt R, Lapidus G, Tornkvist H, Ponzer S, Tidermark J. Unipolar hemiarthroplasty versus bipolar hemiarthroplasty in the most elderly patients with displaced femoral neck fractures: a randomised, controlled trial. Int Orthop 2011. PM:21301830

(79) Kenzora JE, Magaziner J, Hudson J et al. Outcome after hemiarthroplasty for femoral neck fractures in the elderly. Clin Orthop Relat Res 1998;(348):51-58. PM:9553533

(80) Blomfeldt R, Tornkvist H, Ponzer S, Soderqvist A, Tidermark J. Internal fixation versus hemiarthroplasty for displaced fractures of the femoral neck in elderly patients with severe cognitive impairment. J Bone Joint Surg Br 2005;87(4):523-529. PM:15795204

(81) Hedbeck CJ, Enocson A, Lapidus G et al. Comparison of bipolar hemiarthroplasty with total hip arthroplasty for displaced femoral neck fractures: a concise four-year follow-up of a randomized trial. J Bone Joint Surg Am 2011;93(5):445-450. PM:21368076

(82) Macaulay W, Nellans KW, Iorio R, Garvin KL, Healy WL, Rosenwasser MP. Total hip arthroplasty is less painful at 12 months compared with hemiarthroplasty in treatment of displaced femoral neck fracture. HSS J 2008;4(1):48-54. PM:18751862

(83) van den Bekerom MP, Hilverdink EF, Sierevelt IN et al. A comparison of hemiarthroplasty with total hip replacement for displaced intracapsular fracture of the femoral neck: a randomised controlled multicentre trial in patients aged 70 years and over. J Bone Joint Surg Br 2010;92(10):1422-1428. PM:20884982

(84) Deangelis JP, Ademi A, Staff I, Lewis CG. Cemented versus uncemented hemiarthroplasty for displaced femoral neck fractures: a prospective randomized trial with early follow-up. J Orthop Trauma 2012;26(3):135-140. PM:22198652

(85) Figved W, Opland V, Frihagen F, Jervidalo T, Madsen JE, Nordsletten L. Cemented versus uncemented hemiarthroplasty for displaced femoral neck fractures. Clin Orthop Relat Res 2009;467(9):2426-2435. PM:19130162

(86) Taylor F, Wright M, Zhu M. Hemiarthroplasty of the Hip with and without Cement: A Randomized Clinical Trial. J Bone Joint Surg Am 2012;999(2):577-583. PM:23064652

(87) Santini S, Rebeccato A, Bolgan I, Turi G. Hip fractures in elderly patients treated with bipolar hemiarthroplasty: Comparison between cemented and cementless implants. Journal of Orthopaedics and Traumatology 2005;6(2):80-87.

(88) Lennox IA, McLauchlan J. Comparing the mortality and morbidity of cemented and uncemented hemiarthroplasties. Injury 1993;24(3):185-186. PM:8509191

(89) Parker MI, Pryor G, Gurusamy K. Cemented versus uncemented hemiarthroplasty for intracapsular hip fractures: A randomised controlled trial in 400 patients. J Bone Joint Surg Br 2010;92(1):116-122. PM:20044689

(90) Sonne HS, Walter S, Jensen JS. Moore hemi-arthroplasty with an without bone cement in femoral neck fractures. A clinical controlled trial. Acta Orthop Scand 1982;53(6):953-956.

(91) Singh GK, Deshmukh RG. Uncemented Austin-Moore and cemented Thompson unipolar hemiarthroplasty for displaced fracture neck of femur--comparison of complications and patient satisfaction. Injury 2006;37(2):169-174. PM:16413024

(92) Bieber R, Brem M, Singler K, Moellers M, Sieber C, Bail HJ. Dorsal versus transgluteal approach for hip hemiarthroplasty: an analysis of early complications in seven hundred and four consecutive cases. Int Orthop 2012;36(11):2219-2223. PM:22872411

(93) Skoldenberg O, Ekman A, Salemyr M, Boden H. Reduced dislocation rate after hip arthroplasty for femoral neck fractures when changing from posterolateral to anterolateral approach. Acta Orthop 2010;81(5):583-587. PM:20860452

(94) Ahrengart L, Tornkvist H, Fornander P et al. A randomized study of the compression hip screw and Gamma nail in 426 fractures. Clin Orthop Relat Res 2002;(401):209-222. PM:12151898

(95) Utrilla AL, Reig JS, Munoz FM, Tufanisco CB. Trochanteric gamma nail and compression hip screw for trochanteric fractures: a randomized, prospective, comparative study in 210 elderly patients with a new design of the gamma nail. J Orthop Trauma 2005;19(4):229-233. PM:15795570

(96) Varela-Egocheaga JR, Iglesias-Colao R, Suarez-Suarez MA, Fernandez-Villan M, Gonzalez-Sastre V, Murcia-Mazon A. Minimally invasive osteosynthesis in stable trochanteric fractures: a comparative study between Gotfried percutaneous compression plate and Gamma 3 intramedullary nail. Arch Orthop Trauma Surg 2009;129(10):1401-1407. PM:19672606

(97) Sadowski C, Lubbeke A, Saudan M, Riand N, Stern R, Hoffmeyer P. Treatment of reverse oblique and transverse intertrochanteric fractures with use of an intramedullary nail or a 95 degrees screw-plate: a prospective, randomized study. J Bone Joint Surg Am 2002;84-A(3):372-381. PM:11886906

(98) Zhang S, Zhang K, Jia Y, Yu B, Feng W. InterTan nail versus proximal femoral nail antirotation-asia in the treatment of unstable trochanteric fractures. Orthopedics 2013;36(3):e288-e294.

(99) Schipper IB, Steyerberg EW, Castelein RM et al. Treatment of unstable trochanteric fractures. Randomised comparison of the gamma nail and the proximal femoral nail. J Bone Joint Surg Br 2004;86(1):86-94. PM:14765872

(100) Miedel R, Ponzer S, Tornkvist H, Soderqvist A, Tidermark J. The standard Gamma nail or the Medoff sliding plate for unstable trochanteric and subtrochanteric fractures. A randomised, controlled trial. J Bone Joint Surg Br 2005;87(1):68-75. PM:15686240

(101) Hardy DC, Descamps PY, Krallis P et al. Use of an intramedullary hip-screw compared with a compression hip-screw with a plate for intertrochanteric femoral fractures. A prospective, randomized study of one hundred patients. J Bone Joint Surg Am 1998;80(5):618-630. PM:9611022

(102) Adams CI, Robinson CM, Court-Brown CM, McQueen MM. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. J Orthop Trauma 2001;15(6):394-400. PM:11514765

(103) Knobe M, Drescher W, Heussen N, Sellei RM, Pape HC. Is helical blade nailing superior to locked minimally invasive plating in unstable pertrochanteric fractures? Clin Orthop Relat Res 2012;470(8):2302-2312. PM:22311725

(104) Papasimos S, Koutsojannis CM, Panagopoulos A, Megas P, Lambiris E. A randomised comparison of AMBI, TGN and PFN for treatment of unstable trochanteric fractures. Arch Orthop Trauma Surg 2005;125(7):462-468. PM:16059696

(105) Leung KS, So WS, Shen WY, Hui PW. Gamma nails and dynamic hip screws for peritrochanteric fractures. A randomised prospective study in elderly patients. J Bone Joint Surg Br 1992;74(3):345-351. PM:1587874

(106) Verettas DA, Ifantidis P, Chatzipapas CN et al. Systematic effects of surgical treatment of hip fractures: gliding screw-plating vs intramedullary nailing. Injury 2010;41(3):279-284. PM:20176167

(107) Prevention of pulmonary embolism and deep vein thrombosis with low dose aspirin: Pulmonary Embolism Prevention (PEP) trial. Lancet 2000;355(9212):1295-1302. PM:10776741

(108) Chotanaphuti T, Jareonarpornwatana A, Laoruengthana A. The mortality rate after thromboembolism prophylaxis in the hip fracture surgery. J Med Assoc Thai 2009;92 Suppl 6):S115-S119. PM:20120672

(109) Sasaki S, Miyakoshi N, Matsuura H, Saitoh H, Kudoh D, Shimada Y. Prospective randomized controlled trial on the effect of fondaparinux sodium for prevention of venous thromboembolism after hip fracture surgery. J Orthop Sci 2009;14(5):491-496. PM:19802659

(110) Sasaki S, Miyakoshi N, Matsuura H et al. Prospective study on the efficacies of fondaparinux and enoxaparin in preventing venous thromboembolism after hip fracture surgery. J Orthop Sci 2011;16(1):64-70.

(111) Checketts RG, Bradley JG. Low-dose heparin in femoral neck fractures. Injury 1974;6(1):42-44. PM:4418947

(112) Jorgensen PS, Knudsen JB, Broeng L et al. The thromboprophylactic effect of a low-molecular-weight heparin (Fragmin) in hip fracture surgery. A placebo-controlled study. Clin Orthop Relat Res 1992;(278):95-100. PM:1314147

(113) Hinman RS, Crossley KM. Patellofemoral joint osteoarthritis: an important subgroup of knee osteoarthritis. Rheumatology (Oxford) 2007;46(7):1057-1062. PM:17500072

(114) Kew J, Lee YL, Davey IC, Ho SY, Fung KC, Metreweli C. Deep vein thrombosis in elderly Hong Kong Chinese with hip fractures detected with compression ultrasound and Doppler imaging: incidence and effect of low molecular weight heparin. Arch Orthop Trauma Surg 1999;119(3-4):156-158. PM:10392509

(115) Eskeland G, Solheim K, Skjorten F. Anticoagulant prophylaxis, thromboembolism and mortality in elderly patients with hip fractures. Acta Chir Scand 1966;131):16-29.

(116) Carson JL, Terrin ML, Noveck H et al. Liberal or restrictive transfusion in high-risk patients after hip surgery. N Engl J Med 2011;365(26):2453-2462. PM:22168590

(117) Carson JL, Terrin ML, Barton FB et al. A pilot randomized trial comparing symptomatic vs. hemoglobin-level-driven red blood cell transfusions following hip fracture. Transfusion (Paris) 1998;38(6):522-529. PM:9661685

(118) Ziden L, Kreuter M, Frandin K. Long-term effects of home rehabilitation after hip fracture - 1-year follow-up of functioning, balance confidence, and health-related quality of life in elderly people. Disabil Rehabil 2010;32(1):18-32. PM:19925273

(119) Crotty M, Whitehead CH, Gray S, Finucane PM. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomized controlled trial. Clin Rehabil 2002;16(4):406-413. PM:12061475

(120) Binder EF, Brown M, Sinacore DR, Steger-May K, Yarasheski KE, Schechtman KB. Effects of extended outpatient rehabilitation after hip fracture: a randomized controlled trial. JAMA 2004;292(7):837-846. PM:15315998

(121) Hagsten B, Svensson O, Gardulf A. Early individualized postoperative occupational therapy training in 100 patients improves ADL after hip fracture: a randomized trial. Acta Orthop Scand 2004;75(2):177-183. PM:15180233

(122) Hagsten B, Svensson O, Gardulf A. Health-related quality of life and self-reported ability concerning ADL and IADL after hip fracture: a randomized trial. Acta Orthop 2006;77(1):114-119. PM:16534710

(123) Tsauo JY, Leu WS, Chen YT, Yang RS. Effects on function and quality of life of postoperative home-based physical therapy for patients with hip fracture. Arch Phys Med Rehabil 2005;86(10):1953-1957. PM:16213237

(124) Bischoff-Ferrari HA, Dawson-Hughes. Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. 2010.
http://www.nzgg.org.nz/search?search=acute+management;http://dx.doi.org/10.1001/archinternm ed.2010.67;
http://www.ncbi.nlm.nih.gov/pubmed/20458090; http://archinte.ama- assn.org/contents-by-date.0.dtl

(125) Ziden L, Frandin K, Kreuter M. Home rehabilitation after hip fracture. A randomized controlled study on balance confidence, physical function and everyday activities. Clin Rehabil 2008;22(12):1019-1033. PM:19052241

(126) Mangione KK, Craik RL, Palombaro KM, Tomlinson SS, Hofmann MT. Home-based leg-strengthening exercise improves function 1 year after hip fracture: a randomized controlled study. J Am Geriatr Soc 2010;58(10):1911-1917. PM:20929467

(127) Sylliaas H, Brovold T, Wyller TB, Bergland A. Progressive strength training in older patients after hip fracture: a randomised controlled trial. Age Ageing 2011;40(2):221-227. PM:21247887

(128) Allegrante JP, Peterson MG, Cornell CN, MacKenzie CR, Robbins. Methodological challenges of multiplecomponent intervention: lessons learned from a randomized controlled trial of functional recovery following hip fracture. 2007.
http://www.nzgg.org.nz/search?search=acute+management;http://www.ncbi.nlm.nih.gov/pubmed /22842835;
http://www.kurtis.it/aging/en/previous.cfm

(129) Ryan T, Enderby P, Rigby AS. A randomized controlled trial to evaluate intensity of community-based rehabilitation provision following stroke or hip fracture in old age. Clin Rehabil 2006;20(2):123-131. PM:16541932

(130) Duncan DG, Beck SJ, Hood K, Johansen A. Using dietetic assistants to improve the outcome of hip fracture: a randomised controlled trial of nutritional support in an acute trauma ward. Age Ageing 2006;35(2):148-153. PM:16354710

(131) Eneroth M, Olsson UB, Thorngren KG. Nutritional supplementation decreases hip fracture-related complications. Clin Orthop Relat Res 2006;451):212-217. PM:16770284

(132) Espaulella J, Guyer H, Diaz-Escriu F, Mellado-Navas JA, Castells M, Pladevall M. Nutritional supplementation of elderly hip fracture patients. A randomized, double-blind, placebo-controlled trial. Age Ageing 2000;29(5):425-431. PM:11108415

(133) Berggren M, Stenvall M, Olofsson B, Gustafson Y. Evaluation of a fall-prevention program in older people after femoral neck fracture: a one-year follow-up. Osteoporos Int 2008;19(6):801-809. PM:18030411

(134) Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: a randomized trial. J Am Geriatr Soc 2001;49(5):516-522. PM:11380742

(135) Huusko TM, Karppi P, Avikainen V, Kautiainen H, Sulkava R. Intensive geriatric rehabilitation of hip fracture patients: a randomized, controlled trial. Acta Orthop Scand 2002;73(4):425-431. PM:12358116

(136) 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):1107-1111. PM:11061730

(137) Krichbaum K. GAPN postacute care coordination improves hip fracture outcomes. West J Nurs Res 2007;29(5):523-544. PM:17526868

(138) Shyu YI, Liang J, Wu CC et al. Interdisciplinary intervention for hip fracture in older Taiwanese: benefits last for 1 year. J Gerontol A Biol Sci Med Sci 2008;63(1):92-97. PM:18245766

(139) Shyu YI, Liang J, Wu CC et al. Two-year effects of interdisciplinary intervention for hip fracture in older Taiwanese. J Am Geriatr Soc 2010;58(6):1081-1089. PM:20722845

(140) Shyu YI, Liang J, Tseng MY et al. Comprehensive Care Improves Health Outcomes Among Elderly Taiwanese Patients With Hip Fracture. J Gerontol A Biol Sci Med Sci 2012. PM:22960477

(141) Stenvall M, Olofsson B, Lundstrom M et al. A multidisciplinary, multifactorial intervention program reduces postoperative falls and injuries after femoral neck fracture. Osteoporos Int 2007;18(2):167-175. PM:17061151

(142) Lamb SE, Oldham JA, Morse RE, Evans JG. Neuromuscular stimulation of the quadriceps muscle after hip fracture: a randomized controlled trial. Arch Phys Med Rehabil 2002;83(8):1087-1092. PM:12161829

(143) Kang H, Ha YC, Kim JY, Woo YC, Lee JS, Jang EC. Effectiveness of multimodal pain management after bipolar hemiarthroplasty for hip fracture: a randomized, controlled study. J Bone Joint Surg Am 2013;95(4):291-296. PM:23302898

(144) Gorodetskyi IG, Gorodnichenko AI, Tursin PS, Reshetnyak VK, Uskov ON. Non-invasive interactive neurostimulation in the post-operative recovery of patients with a trochanteric fracture of the femur. A randomised, controlled trial. J Bone Joint Surg Br 2007;89(11):1488-1494. PM:17998187

(145) Bech RD, Lauritsen J, Ovesen O, Emmeluth C, Lindholm P, Overgaard S. Local anaesthetic wound infiltration after internal fixation of femoral neck fractures: a randomized, double-blind clinical trial in 33 patients. Hip Int 2011;21(2):251-259. PM:21484739

(146) Foss NB, Kristensen MT, Kristensen BB, Jensen PS, Kehlet H. Effect of postoperative epidural analgesia on rehabilitation and pain after hip fracture surgery: a randomized, double-blind, placebo-controlled trial. Anesthesiology 2005;102(6):1197-1204. PM:15915033

(147) Ogilvie-Harris DJ, Botsford DJ, Hawker RW. Elderly patients with hip fractures: improved outcome with the use of care maps with high-quality medical and nursing protocols. J Orthop Trauma 1993;7(5):428-437. PM:8229379

(148) Spansberg NL, Anker-Moller E, Dahl JB, Schultz P, Christensen EF. The value of continuous blockade of the lumbar plexus as an adjunct to acetylsalicyclic acid for pain relief after surgery for femoral neck fractures. Eur J Anaesthesiol 1996;13(4):410-412. PM:8842667

(149) Tuncer S, Sert OA, Yosunkaya A, Mutlu M, Celik J, Okesli S. Patient-controlled femoral nerve analgesia versus patient-controlled intravenous analgesia for postoperative analgesia after trochanteric fracture repair. Acute Pain 2003;4(3-4):105-108.

(150) Bischoff-Ferrari HA, Dawson-Hughes B, Platz A et al. Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. Arch Intern Med 2010;170(9):813-820. PM:20458090

(151) Prince RL, Devine A, Dhaliwal SS, Dick IM. Effects of calcium supplementation on clinical fracture and bone structure: results of a 5-year, double-blind, placebo-controlled trial in elderly women. Arch Intern Med 2006;166(8):869-875. PM:16636212

(152) Harwood RH, Sahota O, Gaynor K, Masud T, Hosking DJ. A randomised, controlled comparison of different calcium and vitamin D supplementation regimens in elderly women after hip fracture: The Nottingham Neck of Femur (NONOF) Study. Age Ageing 2004;33(1):45-51. PM:14695863

(153) Chapuy MC, Arlot ME, Duboeuf F et al. Vitamin D3 and calcium to prevent hip fractures in the elderly women. N Engl J Med 1992;327(23):1637-1642. PM:1331788

(154) Burness R, Horne G, Purdie G. Albumin levels and mortality in patients with hip fractures. N Z Med J 1996;109(1016):56-57. PM:8598940

(155) Formiga F, Chivite D, Mascaro J, Ramon JM, Pujol R. No correlation between mini-nutritional assessment (short form) scale and clinical outcomes in 73 elderly patients admitted for hip fracture. Aging Clin Exp Res 2005;17(4):343-346. PM:16285202

(156) Mosfeldt M, Pedersen OB, Riis T et al. Value of routine blood tests for prediction of mortality risk in hip fracture patients. Acta Orthop 2012;83(1):31-35. PM:22248167

(157) Ozturk A, Ozkan Y, Akgoz S, Yalcin N, Aykut S, Ozdemir MR. The effect of blood albumin and total lymphocyte count on short-term results in elderly patients with hip fractures. Ulus Travma Acil Cerrahi Derg 2009;15(6):546-552. PM:20037871

(158) Lieberman D, Friger M, Lieberman D. Inpatient rehabilitation outcome after hip fracture surgery in elderly patients: a prospective cohort study of 946 patients. Arch Phys Med Rehabil 2006;87(2):167-171. PM:16442967

(159) Talsnes O, Hjelmstedt F, Dahl OE, Pripp AH, Reikeras O. Biochemical lung, liver and kidney markers and early death among elderly following hip fracture. Arch Orthop Trauma Surg 2012;132(12):1753-1758. PM:22996053

(160) Bjorkelund KB, Hommel A, Thorngren KG, Lundberg D, Larsson S. Factors at admission associated with 4 months outcome in elderly patients with hip fracture. AANA J 2009;77(1):49-58. PM:19263829

(161) Lyles KW, Colon-Emeric CS, Magaziner JS et al. Zoledronic acid and clinical fractures and mortality after hip fracture. N Engl J Med 2007;357(18):1799-1809. PM:17878149

(162) Majumdar SR, Beaupre LA, Harley CH et al. Use of a case manager to improve osteoporosis treatment after hip fracture: results of a randomized controlled trial. Arch Intern Med 2007;167(19):2110-2115. PM:17954806

(163) Gardner MJ, Brophy RH, Demetrakopoulos D et al. Interventions to improve osteoporosis treatment following hip fracture: A prospective, randomized trial. Journal of Bone and Joint Surgery - Series A 2005;87(1):3-7.

(164) Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Lawrence Erlbaum Associates, 1998.

(165) Thorpe KE, Zwarenstein M, Oxman AD et al. A pragmatic-explanatory continuum indicator summary (PRECIS): a tool to help trial designers. J Clin Epidemiol 2009;62(5):464-475. PM:19348971

(166) Petitti DB, Teutsch SM, Barton MB, Sawaya GF, Ockene JK, DeWitt T. Update on the methods of the U.S. Preventive Services Task Force: insufficient evidence. Ann Intern Med 2009;150(3):199-205. PM:19189910

(167) Moskovitz,P.A., Ellenberg,S.S., Feffer,H.L., Kenmore,P.I., Neviaser,R.J., Rubin,B.E., Varma,V.M. Low-dose heparin for prevention of venous thromboembolism in total hip arthroplasty and surgical repair of hip fractures. J Bone Joint Surg Am 1978/12; 8: 1065-1070

(168) Xabregas,A., Gray,L., Ham,J.M. Heparin prophylaxis of deep vein thrombosis in patients with a fractured neck of the femur. Med J Aust. 1978/6/3; 11: 620-622

(169) Morris,G.K., Mitchell,J.R. Warfarin sodium in prevention of deep venous thrombosis and pulmonary embolism in patients with fractured neck of femur. 1976/10/23; 7991: 869-872

LOWER QUALITY STUDIES THAT MET THE INCLUSION CRITERIA BUT WERE EXCLUDED FOR NOT BEST AVAILABLE EVIDENCE

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Egund,N.; Nilsson,L.T.; Wingstrand,H.; Stromqvist,B.; Pettersson,H.	1990	CT scans and lipohaemarthrosis in hip fractures	Advanced Imaging
Holder,L.E.; Schwarz,C.; Wernicke,P.G.; Michael,R.H.	1990	Radionuclide bone imaging in the early detection of fractures of the proximal femur (hip): multifactorial analysis	Advanced Imaging
Neander,G.; Adolphson,P.; von,Sivers K.; Dahlborn,M.; Dalen,N.	1997	Bone and muscle mass after femoral neck fracture. A controlled quantitative computed tomography study of osteosynthesis versus primary total hip arthroplasty	Advanced Imaging
Sankey,R.A.; Turner,J.; Lee,J.; Healy,J.; Gibbons,C.E.	2009	The use of MRI to detect occult fractures of the proximal femur: a study of 102 consecutive cases over a ten-year period	Advanced Imaging
Baker,R.P.; Squires,B.; Gargan,M.F.; Bannister,G.C.	2006	Total hip arthroplasty and hemiarthroplasty in mobile, independent patients with a displaced intracapsular fracture of the femoral neck. A randomized, controlled trial	Displaced Femoral Neck Fractures
Bracey,D.J.	1977	A comparison of internal fixation and prosthetic replacement in the treatment of displaced subcapital fractures	Displaced Femoral Neck Fractures
Frandsen,P.A.; Andersen,P.E.,Jr.	1981	Treatment of displaced fractures of the femoral neck. Smith-Petersen osteosynthesis versus sliding-nail-plate osteosynthesis	Displaced Femoral Neck Fractures

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Frandsen,P.A.; Jorgensen,F.	1977	Osteosynthesis of medial fractures of the femoral neck by sliding nail-plate fixation	Displaced Femoral Neck Fractures
Haentjens,P.; Casteleyn,P.P.; De,Boeck H.; Handelberg,F.; Opdecam,P.	1989	Treatment of unstable intertrochanteric and subtrochanteric fractures in elderly patients. Primary bipolar arthroplasty compared with internal fixation	Displaced Femoral Neck Fractures
Kos,N.; Burger,H.; Vidmar,G.	2011	Mobility and functional outcomes after femoral neck fracture surgery in elderly patients: a comparison between hemiarthroplasty and internal fixation	Displaced Femoral Neck Fractures
Meyer,S.	1981	Prosthetic replacement in hip fractures: a comparison between the Moore and Christiansen endoprostheses	Displaced Femoral Neck Fractures
Nicolaides,V.; Galanakos,S.; Mavrogenis,A.F.; Sakellariou,V.I.; Papakostas,I.; Nikolopoulos,C.E.; Papagelopoulos,P.J.	2011	Arthroplasty versus internal fixation for femoral neck fractures in the elderly	Displaced Femoral Neck Fractures
Puolakka,T.J.; Laine,H.J.; Tarvainen,T.; Aho,H.	2001	Thompson hemiarthroplasty is superior to Ullevaal screws in treating displaced femoral neck fractures in patients over 75 years. A prospective randomized study with two-year follow-up	Displaced Femoral Neck Fractures
Raine,G.E.	1973	A comparison of internal fixation and prosthetic replacement for recent displaced subcapital fractures of the neck of the femur	Displaced Femoral Neck Fractures
Stewart,H.D.	1984	Pugh's nail fixation versus Thompson's prosthesis for displaced subcapital fractures of the femur	Displaced Femoral Neck Fractures

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Lim,K.B.; Eng,A.K.; Chng,S.M.; Tan,A.G.; Thoo,F.L.; Low,C.O.	2002	Limited magnetic resonance imaging (MRI) and the occult hip fracture	Unipolar versus Bipolar
Kos,N.; Burger,H.; Vidmar,G.	2011	Mobility and functional outcomes after femoral neck fracture surgery in elderly patients: a comparison between hemiarthroplasty and internal fixation	Hemi vs. Total Hip Arthroplasty
Baker,R.P.; Squires,B.; Gargan,M.F.; Bannister,G.C.	2006	Total hip arthroplasty and hemiarthroplasty in mobile, independent patients with a displaced intracapsular fracture of the femoral neck. A randomized, controlled trial	CEMENTED FEMORAL STEMS
Dorr,L.D.; Glousman,R.; Hoy,A.L.; Vanis,R.; Chandler,R.	1986	Treatment of femoral neck fractures with total hip replacement versus cemented and noncemented hemiarthroplasty	CEMENTED FEMORAL STEMS
Hansen,L.B.; Kromann,B.; Baekgaard,N.	1986	Uncemented two-component femoral prosthesis for the hip joint. A 50-month follow-up study	CEMENTED FEMORAL STEMS
Lausten,G.S.; Vedel,P.	1982	Cementing v. not cementing the Monk endoprosthesis	CEMENTED FEMORAL STEMS
Skoldenberg,O.G.; Salemyr,M.O.; Boden,H.S.; Lundberg,A.; Ahl,T.E.; Adolphson,P.Y.	2011	A new uncemented hydroxyapatite-coated femoral component for the treatment of femoral neck fractures: two-year radiostereometric and bone densitometric evaluation in 50 hips	CEMENTED FEMORAL STEMS
Bensafi,H.; Laffosse,J.M.; Giordano,G.; Dao,C.; Chiron,P.; Puget,J.	2006	The percutaneous compression plate (PCCP) in the treatment of trochanteric hip fractures in elderly patients	STABLE INTERTROCHANTERIC FRACTURES
Brostrom,L.A.; Barrios,C.; Kronberg,M.; Stark,A.; Walheim,G.	1992	Clinical features and walking ability in the early postoperative period after treatment of trochanteric hip fractures. Results with special reference to fracture type and surgical treatment	STABLE INTERTROCHANTERIC FRACTURES

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Ekstrom,W.; Karlsson-Thur,C.; Larsson,S.; Ragnarsson,B.; Alberts,K.A.	2007	Functional outcome in treatment of unstable trochanteric and subtrochanteric fractures with the proximal femoral nail and the Medoff sliding plate	STABLE INTERTROCHANTERIC FRACTURES
Jensen,J.S.; Tondevold,E.; Sonne-Holm,S.	1980	Stable trochanteric fractures. A comparative analysis of four methods of internal fixation	STABLE INTERTROCHANTERIC FRACTURES
Park,S.R.; Kang,J.S.; Kim,H.S.; Lee,W.H.; Kim,Y.H.	1998	Treatment of intertrochanteric fracture with the Gamma AP locking nail or by a compression hip screw--a randomised prospective trial	STABLE INTERTROCHANTERIC FRACTURES
Parker,M.J.; Bowers,T.R.; Pryor,G.A.	2012	Sliding hip screw versus the Targon PF nail in the treatment of trochanteric fractures of the hip: a randomised trial of 600 fractures	STABLE INTERTROCHANTERIC FRACTURES
Patel,A.R.; Boyes,C.; Shur,V.	2007	Treatment of stable extra-capsular hip fractures with a sliding screw versus short gamma nail: A retrospective study of 102 patients	STABLE INTERTROCHANTERIC FRACTURES
Al-yassari,G.; Langstaff,R.J.; Jones,J.W.; Al-Lami,M.	2002	The AO/ASIF proximal femoral nail (PFN) for the treatment of unstable trochanteric femoral fracture	Subtrochanteric or Reverse Obliquity Fractures
Broos,P.L.; Reynders,P.	2002	The use of the unreamed AO femoral intramedullary nail with spiral blade in nonpathologic fractures of the femur: experiences with eighty consecutive cases	Subtrochanteric or Reverse Obliquity Fractures
Brostrom,L.A.; Barrios,C.; Kronberg,M.; Stark,A.; Walheim,G.	1992	Clinical features and walking ability in the early postoperative period after treatment of trochanteric hip fractures. Results with special reference to fracture type and surgical treatment	Subtrochanteric or Reverse Obliquity Fractures

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Gavaskar,A.S.; Subramanian,M.; Tummala,N.C.	2012	Results of proximal femur nail antirotation for low velocity trochanteric fractures in elderly	Subtrochanteric or Reverse Obliquity Fractures
Madsen,J.E.; Naess,L.; Aune,A.K.; Alho,A.; Ekeland,A.; Stromsoe,K.	1998	Dynamic hip screw with trochanteric stabilizing plate in the treatment of unstable proximal femoral fractures: a comparative study with the Gamma nail and compression hip screw	Subtrochanteric or Reverse Obliquity Fractures
Park,S.R.; Kang,J.S.; Kim,H.S.; Lee,W.H.; Kim,Y.H.	1998	Treatment of intertrochanteric fracture with the Gamma AP locking nail or by a compression hip screw--a randomised prospective trial	Subtrochanteric or Reverse Obliquity Fractures
Parker,M.J.; Bowers,T.R.; Pryor,G.A.	2012	Sliding hip screw versus the Targon PF nail in the treatment of trochanteric fractures of the hip: a randomised trial of 600 fractures	Subtrochanteric or Reverse Obliquity Fractures
Pu,J.S.; Liu,L.; Wang,G.L.; Fang,Y.; Yang,T.F.	2009	Results of the proximal femoral nail anti-rotation (PFNA) in elderly Chinese patients	Subtrochanteric or Reverse Obliquity Fractures
Foss,N.B.; Kristensen,B.B.; Bundgaard,M.; Bak,M.; Heiring,C.; Virkelyst,C.; Hougaard,S.; Kehlet,H.	2007	Fascia iliaca compartment blockade for acute pain control in hip fracture patients: a randomized, placebo-controlled trial	VTE PROPHYLAXIS
Adunsky,A.; Lusky,A.; Arad,M.; Heruti,R.J.	2003	A comparative study of rehabilitation outcomes of elderly hip fracture patients: the advantage of a comprehensive orthogeriatric approach	Occupational and Physical Therapy
Al-Ani,A.N.; Flodin,L.; Soderqvist,A.; Ackermann,P.; Samnegard,E.; Dalen,N.; Saaf,M.; Cederholm,T.; Hedstrom,M.	2010	Does rehabilitation matter in patients with femoral neck fracture and cognitive impairment? A prospective study of 246 patients	Occupational and Physical Therapy

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Carmeli,E.; Sheklow,S.L.; Coleman,R.	2006	A comparative study of organized class-based exercise programs versus individual home-based exercise programs for elderly patients following hip surgery	Occupational and Physical Therapy
Dai,Y.T.; Huang,G.S.; Yang,R.S.; Tsauo,J.Y.; Yang,L.H.	2001	Effectiveness of a multidisciplinary rehabilitation program in elderly patients with hip fractures	Occupational and Physical Therapy
Giangregorio,L.M.; Thabane,L.; Debeer,J.; Farrauto,L.; McCartney,N.; Adachi,J.D.; Papaioannou,A.	2009	Body weight-supported treadmill training for patients with hip fracture: a feasibility study	Occupational and Physical Therapy
Gilchrist WJ; Newman RJ; Hamblen DL; Williams BO; New Zealand Guidelines Group (	1988	Prospective randomised study of an orthopaedic geriatric inpatient service	TRANSFUSION THRESHOLD
Graham,J.	1968	Early or delayed weight-bearing after internal fixation of transcervical fracture of the femur. A clinical trial	TRANSFUSION THRESHOLD
Holmberg,S.; Agger,E.; Ersmark,H.	1989	Rehabilitation at home after hip fracture	Occupational and Physical Therapy
Jackson,J.P.; Schkade,J.K.	2001	Occupational Adaptation model versus biomechanical-rehabilitation model in the treatment of patients with hip fractures	Occupational and Physical Therapy
Karumo,I.	1977	Recovery and rehabilitation of elderly subjects with femoral neck fractures	Occupational and Physical Therapy

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Mard,M.; Vaha,J.; Heinonen,A.; Portegijs,E.; Sakari-Rantala,R.; Kallinen,M.; Alen,M.; Kiviranta,I.; Sipila,S.	2008	The effects of muscle strength and power training on mobility among older hip fracture patients	Occupational and Physical Therapy
Munin,M.C.; Putman,K.; Hsieh,C.H.; Smout,R.J.; Tian,W.; DeJong,G.; Horn,S.D.	2010	Analysis of rehabilitation activities within skilled nursing and inpatient rehabilitation facilities after hip replacement for acute hip fracture	Occupational and Physical Therapy
Shyu,Y.I.; Liang,J.; Wu,C.C.; Su,J.Y.; Cheng,H.S.; Chou,S.W.; Yang,C.T.	2005	A pilot investigation of the short-term effects of an interdisciplinary intervention program on elderly patients with hip fracture in Taiwan	Occupational and Physical Therapy
Stromberg,L.; Ohlen,G.; Nordin,C.; Lindgren,U.; Svensson,O.	1999	Postoperative mental impairment in hip fracture patients. A randomized study of reorientation measures in 223 patients	Occupational and Physical Therapy
Zuckerman,J.D.; Sakales,S.R.; Fabian,D.R.; Frankel,V.H.	1990	The challenge of geriatric hip fractures	Occupational and Physical Therapy
Ceccio CM; New Zealand Guidelines Group (	1984	Postoperative pain relief through relaxation in elderly patients with fractured hips	POSTOPERATIVE MULTIMODAL ANALGESIA
Coad,N.R.	1991	Postoperative analgesia following femoral-neck surgery--a comparison between 3 in 1 femoral nerve block and lateral cutaneous nerve block	POSTOPERATIVE MULTIMODAL ANALGESIA
Zabari,A.; Lubart,E.; Ganz,F.D.; Leibovitz,A.	2012	The effect of a pain management program on the rehabilitation of elderly patients following hip fracture surgery	POSTOPERATIVE MULTIMODAL ANALGESIA
Gallagher,J.C.; Fowler,S.E.; Detter,J.R.; Sherman,S.S.	2001	Combination treatment with estrogen and calcitriol in the prevention of age-related bone loss	Calcium and Vitamin D

Articles Excluded for Not Best Available Evidence

Authors	Year	Title	Recommendation
Law,M.; Withers,H.; Morris,J.; Anderson,F.	2006	Vitamin D supplementation and the prevention of fractures and falls: results of a randomised trial in elderly people in residential accommodation	Calcium and Vitamin D

EXCLUDED STUDIES

Studies Excluded for Not Meeting Inclusion Criteria

Authors	Year	Title	Reason for Exclusion
Abou-Setta AM; Beaupre LA; Rashiq S; Dryden DM; Hamm MP; Sadowski CA; Menon MRG; Majumdar SR; Wilson DM; Karkhaneh	2011	Comparative effectiveness of pain management interventions for hip fracture: a systematic review	Systematic Review
Abrahamsen,B.; Masud,T.; Avenell,A.; Anderson,F.; Meyer,H.E.; Cooper,C.; Smith,H.; LaCroix,A.Z.; Torgerson,D.; Johansen,A.; Jackson,R.; Rejnmark,L.; Wactawski-Wende,J.; Brixen,K.; Mosekilde,L.; Robbins,J.A.; Francis,R.M.	2010	Patient level pooled analysis of 68 500 patients from seven major vitamin D fracture trials in US and Europe	Meta-analysis
Ackroyd,C.E.	1973	Treatment of subcapital femoral fractures fixed with Moore's pins: a study of 34 cases followed-up for up to 3 years	Retrospective Case Series
Adam,P.; Philippe,R.; Ehlinger,M.; Roche,O.; Bonnomet,F.; Mole,D.; Fessy,M.H.	2012	Dual mobility cups hip arthroplasty as a treatment for displaced fracture of the femoral neck in the elderly. A prospective, systematic, multicenter study with specific focus on postoperative dislocation	Not relevant: no patients have internal fixation
Ainsworth,Jr	1971	Immediate full weight-bearing in the treatment of hip fractures	Very low strength of evidence.
Alberts,K.A.; Jaerveus,J.; Zyto,K.	1989	Nail versus screw fixation of femoral neck fractures. A 2-year radiological and clinical prospective study	Some patients had unstable fractures
Aldrete,J.A.; Davis,H.S.; Hingson,R.A.	1967	Anesthesia factors in the surgical management of hip fractures	Review
Allen,J.	2012	Rehabilitation in patients with dementia following hip fracture: a systematic review	Systematic Review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Alobaid,A.; Harvey,E.J.; Elder,G.M.; Lander,P.; Guy,P.; Reindl,R.	2004	Minimally invasive dynamic hip screw: prospective randomized trial of two techniques of insertion of a standard dynamic fixation device	Unclear if patients had stable fractures
Al-Rashid,M.; Parker,M.J.	2005	Anticoagulation management in hip fracture patients on warfarin	Anticoagulant, not antiplatelet
Arinzon,Z.; Peisakh,A.; Schrire,S.; Berner,Y.N.	2011	Delirium in long-term care setting: Indicator to severe morbidity	Very low strength
Arnold,W.D.; Lyden,J.P.; Minkoff,J.	1974	Treatment of intracapsular fractures of the femoral neck. With special reference to percutaneous Knowles pinning	Combines displaced and non-displaced
Aronoff,P.M.; Davis,P.M.,Jr.; Wickstrom,J.K.	1971	Intramedullary nail fixation as treatment of subtrochanteric fractures of the femur	Does not meet study selection criteria: mean age less than 65 years of age
Aronoff,P.M.; Davis,P.M.,Jr.; Wickstrom,J.K.	1972	Subtrochanteric fractures of the femur treated by intramedullary nail fixation	Does not meet study selection criteria: mean age less than 65 years of age
Asher,M.A.; Tippett,J.W.; Rockwood,C.A.; Zilber,S.	1976	Compression fixation of subtrochanteric fractures	Does not meet study selection criteria: mean age less than 65 years of age
Auffarth,A.; Resch,H.; Lederer,S.; Karpik,S.; Hitzl,W.; Bogner,R.; Mayer,M.; Matis,N.	2011	Does the choice of approach for hip hemiarthroplasty in geriatric patients significantly influence early postoperative outcomes? a randomized-controlled trial comparing the modified smith-petersen and hardinge approaches	Does not look at posterior approach
Avenell,A.; Gillespie,W.J.; Gillespie,L.D.; O'Connell,D.	2009	Vitamin D and vitamin D analogues for preventing fractures associated with involutional and post-menopausal osteoporosis	Systematic review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Avery,P.P.; Baker,R.P.; Walton,M.J.; Rooker,J.C.; Squires,B.; Gargan,M.F.; Bannister,G.C.	2011	Total hip replacement and hemiarthroplasty in mobile, independent patients with a displaced intracapsular fracture of the femoral neck: a seven- to ten-year follow-up report of a prospective randomised controlled trial	Only some of the patients had additional hip disease
Bachrach-Lindstrom,M.; Unosson,M.; Ek,A.C.; Arnqvist,H.J.	2001	Assessment of nutritional status using biochemical and anthropometric variables in a nutritional intervention study of women with hip fracture	Doesn't answer the reccommendation
Bagby,G.W.; Wallace,G.T.	1971	Femoral neck fractures in the elderly treated by multiple pins (Knowles)	Review (medical record review)
Bai,B.; Wang,K.Z.; Liu,W.K.; Song,J.H.; Chen,J.C.	2003	Comprehensive treatment for old patients with hip fractures	Very low quality study
Baker PA; Evans OM; Lee	1991	Treadmill gait retraining following fractured neck-of-femur	< 10 in each treatment group
Baker,P.A.; Evans,O.M.; Lee,C.	1991	Treadmill gait retraining following fractured neck-of-femur	No patient oriented outcomes
Bannister,G.C.; Gibson,A.G.; Ackroyd,C.E.; Newman,J.H.	1990	The fixation and prognosis of trochanteric fractures. A randomized prospective controlled trial	Most outcomes combine stability and instability. one outcome does not combine, but it isn't patient oriented
Barceloe,M.; Torres,O.; Mascaroe,J.; Francia,E.; Ruiz,D.	2011	Osteoporosis treatment and clinical pathway following a hip fracture in older age	Not full text article-abstract
Barker,R.; Kober,A.; Hoerauf,K.; Latzke,D.; Adel,S.; Kain,Z.N.; Wang,S.M.	2006	Out-of-hospital auricular acupressure in elder patients with hip fracture: a randomized double-blinded trial	VAS pain for all patients was not over 7. Per this guidelines criteria, and included studies must have had severe pain with patients having VAS scores of 7 or above

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Barkmann,R.; Dencks,S.; Laugier,P.; Padilla,F.; Brixen,K.; Ryg,J.; Seekamp,A.; Mahlke,L.; Bremer,A.; Heller,M.; Gluer,C.C.	2010	Femur ultrasound (FemUS)--first clinical results on hip fracture discrimination and estimation of femoral BMD	No data to perform diagnostic test performance
Barnes,B.; Dunovan,K.	1987	Functional outcomes after hip fracture	Does not answer recommendation
Barone,A.; Giusti,A.; Pizzonia,M.; Razzano,M.; Oliveri,M.; Palummeri,E.; Pioli,G.	2009	Factors associated with an immediate weight-bearing and early ambulation program for older adults after hip fracture repair	Narrative review
Barsotti,J.; Gruel,Y.; Rosset,P.; Favard,L.; Dabo,B.; Andreu,J.; Delahousse,B.; Leroy,J.	1990	Comparative double-blind study of two dosage regimens of low-molecular weight heparin in elderly patients with a fracture of the neck of the femur	Dosage study
Barton,T.M.; Gleeson,R.; Topliss,C.; Greenwood,R.; Harries,W.J.; Chesser,T.J.S.	2010	A comparison of the long gamma nail with the sliding hip screw for the treatment of AO/OTA 31-A2 fractures of the proximal part of the femur: A prospective randomized trial	Rec 24 and 25: combines results of stable and unstable patients. Rec 26 could only use as a case series because comparator is not relevant to the recommendation. was appraised as very low strength as a case series
Bastow,M.D.; Rawlings,J.; Allison,S.P.	1983	Benefits of supplementary tube feeding after fractured neck of femur: a randomised controlled trial	Does not answer reccommendation
Bauer,D.C.; Ewing,S.K.; Cauley,J.A.; Ensrud,K.E.; Cummings,S.R.; Orwoll,E.S.	2007	Quantitative ultrasound predicts hip and non-spine fracture in men: the MrOS study	Fracture risk
Baumgaertner,M.R.; Curtin,S.L.; Lindskog,D.M.	1998	Intramedullary versus extramedullary fixation for the treatment of intertrochanteric hip fractures	Comparison not considered for this guideline: sliding hip screw vs intramedullary hip screw
Beaudoin,F.L.; Nagdev,A.; Merchant,R.C.; Becker,B.M.	2010	Ultrasound-guided femoral nerve blocks in elderly patients with hip fractures	Serious Methodological Flaw: Nonconsecutive enrollment

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Beaupre,L.A.; Jones,C.A.; Saunders,L.D.; Johnston,D.W.; Buckingham,J.; Majumdar,S.R.	2005	Best practices for elderly hip fracture patients. A systematic overview of the evidence	Systematic Review
Beaver,R.H.; Bach,P.J.	1978	Zickel nail: a retrospective study of subtrochanteric fractures	Retrospective case series
Bedford,M.R.; Brewster,M.B.S.; Grimstvedt,L.O.; O'Dwyer,K.	2011	Re-evaluating the lateral hip view in the management of femoral neck fractures	No data to perform diagnostic test performance
Berg,E.E.	1989	Hemi-arthroplasty in femoral neck fractures	Case report
Bergman,G.D.; Winquist,R.A.; Mayo,K.A.; Hansen,S.T.,Jr.	1987	Subtrochanteric fracture of the femur. Fixation using the Zickel nail	Does not meet study selection criteria: mean age less than 65 years of age
Bergman,G.J.; Fan,T.; McFetridge,J.T.; Sen,S.S.	2010	Efficacy of vitamin D3 supplementation in preventing fractures in elderly women: a meta-analysis	Meta-analysis
Bergquist,E.; Bergqvist,D.; Bronge,A.; Dahlgren,S.; Lindquist,B.	1972	An evaluation of early thrombosis prophylaxis following fracture of the femoral neck. A comparison between dextran and dicoumarol	Comparison not considered for this guideline (Postop Prophylaxis)
Bergqvist,D.; Arcelus,J.I.; Felicissimo,P.	2012	Evaluation of the duration of thromboembolic prophylaxis after high-risk orthopaedic surgery: the ETHOS observational study	Not all hip fractures
Bergqvist,D.; Efsing,H.O.; Hallbook,T.; Hedlund,T.	1979	Thromboembolism after elective and post-traumatic hip surgery--a controlled prophylactic trial with dextran 70 and low-dose heparin	
Beringer,T.R.; Crawford,V.L.; Brown,J.G.	1996	Audit of surgical delay in relationship to outcome after proximal femoral fracture	Very low strength

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Bernardini,B.; Meinecke,C.; Pagani,M.; Grillo,A.; Fabbrini,S.; Zaccarini,C.; Corsini,C.; Scapellato,F.; Bonaccorso,O.	1995	Comorbidity and adverse clinical events in the rehabilitation of older adults after hip fracture	Retrospective case series (medical chart review)
Bertoft,E.S.; Lundh,I.; Ringqvist,I.	1984	Physiotherapy after fracture of the proximal end of the humerus. Comparison between two methods	Mean age < 65
Bess,R.J.; Jolly,S.A.	1997	Comparison of compression hip screw and gamma nail for treatment of peritrochanteric fractures	Fracture stability not reported
Bhatia,M.; Talawadekar,G.; Parihar,S.; Smith,A.	2010	An audit of the role of vitamin K in the reversal of International Normalised Ratio (INR) in patients undergoing surgery for hip fracture	Does not answer recommendation
Bhuller,G.S.	1982	Use of the Giliberty bipolar endoprosthesis in femoral neck fractures	Not all fractures are displaced
Bischoff-Ferrari,H.A.; Dawson-Hughes,B.; Baron,J.A.; Burckhardt,P.; Li,R.; Spiegelman,D.; Specker,B.; Orav,J.E.; Wong,J.B.; Staehelin,H.B.; O'Reilly,E.; Kiel,D.P.; Willett,W.C.	2007	Calcium intake and hip fracture risk in men and women: a meta-analysis of prospective cohort studies and randomized controlled trials	Meta-analysis
Bischoff-Ferrari,H.A.; Willett,W.C.; Orav,E.J.; Lips,P.; Meunier,P.J.; Lyons,R.A.; Flicker,L.; Wark,J.; Jackson,R.D.; Cauley,J.A.; Meyer,H.E.; Pfeifer,M.; Sanders,K.M.; Stahelin,H.B.; Theiler,R.; Dawson-Hughes,B.	2012	A pooled analysis of vitamin D dose requirements for fracture prevention	Meta-analysis
Bischoff-Ferrari,H.A.; Willett,W.C.; Wong,J.B.; Giovannucci,E.; Dietrich,T.; Dawson-Hughes,B.	2005	Fracture prevention with vitamin D supplementation: a meta-analysis of randomized controlled trials	Meta-analysis

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Bishop,J.A.; Rodriguez,E.K.	2010	Closed intramedullary nailing of the femur in the lateral decubitus position	Retrospective case series
Blanchard,J.; Meuwly,J.Y.; Leyvraz,P.F.; Miron,M.J.; Bounameaux,H.; Hoffmeyer,P.; Didier,D.; Schneider,P.A.	1999	Prevention of deep-vein thrombosis after total knee replacement. Randomised comparison between a low-molecular-weight heparin (nadroparin) and mechanical prophylaxis with a foot-pump system	Not relevant, total knee replacement
Blomfeldt,R.; Tornkvist,H.; Ponzer,S.; Soderqvist,A.; Tidermark,J.	2005	Comparison of internal fixation with total hip replacement for displaced femoral neck fractures. Randomized, controlled trial performed at four years	Study is followup to Tidermark 2003 and patient population is less than 50%
BOA Trauma Group	2012	British Orthopaedic Association Standards for Trauma (BOAST): Hip fracture in the older person	Does not investigate the efficacy of a treatment
Bochner,R.M.; Pellicci,P.M.; Lyden,J.P.	1988	Bipolar hemiarthroplasty for fracture of the femoral neck. Clinical review with special emphasis on prosthetic motion	Retrospective case series
Bogost,G.A.; Lizerbram,E.K.; Crues,J.V.,III	1995	MR imaging in evaluation of suspected hip fracture: frequency of unsuspected bone and soft-tissue injury	Insufficient data to calculate diagnostic test performance
Bohannon,R.W.; Kloter,K.S.; Cooper,J.A.	1990	Outcome of patients with hip fracture treated by physical therapy in an acute care hospital	Not relevant: tries to evaluate prognostic factors related to rehab success. does not evaluate treatment efficacy
Boldin,C.; Seibert,F.J.; Fankhauser,F.; Peicha,G.; Grechenig,W.; Szyszkowitz,R.	2003	The proximal femoral nail (PFN)--a minimal invasive treatment of unstable proximal femoral fractures: a prospective study of 55 patients with a follow-up of 15 months	Combined stability results
Bonamo,J.J.; Accettola,A.B.	1982	Treatment of intertrochanteric fractures with a sliding nail-plate	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Bong,S.C.; Lau,H.K.; Leong,J.C.; Fang,D.; Lau,M.T.	1981	The treatment of unstable intertrochanteric fractures of the hip: a prospective trial of 150 cases	
Boonen,S.; Lips,P.; Bouillon,R.; Bischoff-Ferrari,H.A.; Vanderschueren,D.; Haentjens,P.	2007	Need for additional calcium to reduce the risk of hip fracture with vitamin d supplementation: evidence from a comparative metaanalysis of randomized controlled trials	Meta-analysis
Bowman,A.J.,Jr.; Walker,M.W.; Kilfoyle,R.M.; O'Brien,P.I.; McConville,J.F.	1985	Experience with the bipolar prosthesis in hip arthroplasty. A clinical study	Not all patients had hip fracture (some had arthritis)
Braatz,J.H.; Pino,A.E.	1972	Therapy and rehabilitation for psychiatric-geriatric patients with hip fracture	< 10 in each treatment group
Brands,E.; Callanan,V.I.	1978	Continuous lumbar plexus block--analgesia for femoral neck fractures	Retrospective case series
Brandt,S.E.; Lefever,S.; Janzing,H.M.; Broos,P.L.; Pilot,P.; Houben,B.J.	2002	Percutaneous compression plating (PCCP) versus the dynamic hip screw for pertrochanteric hip fractures: preliminary results	
Bray,T.J.; Chapman,M.W.	1984	Percutaneous pinning of intracapsular hip fractures	Review
Bredahl,C.; Hindsholm,K.B.; Frandsen,P.C.	1991	Changes in body heat during hip fracture surgery: a comparison of spinal analgesia and general anaesthesia	No patient oriented outcomes
Bredahl,C.; Nyholm,B.; Hindsholm,K.B.; Mortensen,J.S.; Olesen,A.S.	1992	Mortality after hip fracture: results of operation within 12 h of admission	Does not meet study selection criteria: mean age cannot be determined
Bridle,S.H.; Patel,A.D.; Bircher,M.; Calvert,P.T.	1991	Fixation of intertrochanteric fractures of the femur. A randomised prospective comparison of the gamma nail and the dynamic hip screw	Combines stability results

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Bronge,A.; Dahlgren,S.; Lindquist,B.	1971	Prophylaxis against thrombosis in femoral neck fractures--a comparison between dextran 70 and dicumarol	Comparison not considered for this guideline: Postop Prophylaxis Intervention
Broos,P.L.; Rommens,P.M.; Geens,V.R.; Stappaerts,K.H.	1991	Pertrochanteric fractures in the elderly. Is the Belgian VDP prosthesis the best treatment for unstable fractures with severe comminution?	The Vandeputte device is not included in this guideline
Buddenberg,L.A.; Schkade,J.K.	1998	Special feature: A comparison of occupational therapy intervention approaches for older patients after hip fracture	Comparison not relevant to recommendation. if both groups are used as separate case series, evidence strength is very low.
Buecking,B.; Bliemel,C.; Struewer,J.; Eschbach,D.; Ruchholtz,S.; Muller,T.	2012	Use of the gamma3TM nail in a teaching hospital for trochanteric fractures: mechanical complications, functional outcomes, and quality of life	Combined stability results
Burcharth,F.; Hansen,O.H.; Wolf,H.; Ostergaard,A.H.	1973	Prevention of pulmonary embolism in patients with fractures of the femoral neck	Prevention of Pulmonary Embolism
Burgers,P.T.; Van Geene,A.R.; van den Bekerom,M.P.; Van Lieshout,E.M.; Blom,B.; Aleem,I.S.; Bhandari,M.; Poolman,R.W.	2012	Total hip arthroplasty versus hemiarthroplasty for displaced femoral neck fractures in the healthy elderly: a meta-analysis and systematic review of randomized trials	Meta-Analysis
Burwell,H.N.	1967	Replacement of the femoral head by a prosthesis in subcapital fractures	Retrospective case series
Butler,M.; Forte,M.; Kane,R.L.; Joglekar,S.; Duval,S.J.; Swiontkowski,M.; Wilt,T.	2009	Treatment of common hip fractures	Systematic review, bibliography screened
Butt,M.S.; Krikler,S.J.; Nafie,S.; Ali,M.S.	1995	Comparison of dynamic hip screw and gamma nail: a prospective, randomized, controlled trial	Study combines results for stable and unstable fractures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Caiaffa,V.; Vita,D.; Laforgia,R.; Sessa,G.; Varsalona,R.; Girolami,M.; Dallari,D.; Mignani,G.; Turi,G.; Micaglio,A.; Manca,M.; Sancin,A.	2007	Treatment of peritrochanteric fractures with the Endovis BA cephalomedullary nail: Multicenter study of 1091 patients	Combined stability results
Cameron,I.; Crotty,M.; Currie,C.; Finnegan,T.; Gillespie,L.; Gillespie,W.; Handoll,H.; Kurrle,S.; Madhok,R.; Murray,G.; Quinn,K.; Torgerson,D.	2000	Geriatric rehabilitation following fractures in older people: A systematic review	Systematic review, bibliography screened
Carless,Paul A.; Henry,David A.; Carson,Jeffrey L.; Hebert-Paul,P.C.; McClelland,Brian; Ker,Katharine	2010	Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion	Systematic review
Carroll,C.; Stevenson,M.; Scope,A.; Evans,P.; Buckley,S.	2011	Hemiarthroplasty and total hip arthroplasty for treating primary intracapsular fracture of the hip: a systematic review and cost-effectiveness analysis	Systematic review
Carson,J.L.; Duff,A.; Berlin,J.A.; Lawrence,V.A.; Poses,R.M.; Huber,E.C.; O'Hara,D.A.; Noveck,H.; Strom,B.L.	1998	Perioperative blood transfusion and postoperative mortality	Retrospective Cohort Study
Casaletto,J.A.; Gatt,R.	2004	Postoperative mortality related to waiting time for hip fracture surgery	Not all pateients in the control group were operated on within the 1st day
Cauley,J.A.; Parimi,N.; Ensrud,K.E.; Bauer,D.C.; Cawthon,P.M.; Cummings,S.R.; Hoffman,A.R.; Shikany,J.M.; Barrett-Connor,E.; Orwoll,E.	2010	Serum 25-hydroxyvitamin D and the risk of hip and nonspine fractures in older men	Workgroup
Ceder,L.; Ekelund,L.; Inerot,S.; Lindberg,L.; Odberg,E.; Sjolin,C.	1979	Rehabilitation after hip fracture in the elderly	Not relevant. compare rehab in patients who were institutionalized at time of fracture, versus those who lived independently

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Ceder,L.; Lindberg,L.; Odberg,E.	1980	Differentiated care of hip fracture in the elderly. Mean hospital days and results of rehabilitation	Very low strength
Ceder,L.; Lunsjo,K.; Olsson,O.; Stigsson,L.; Hauggaard,A.	1998	Different ways to treat subtrochanteric fractures with the Medoff sliding plate	Comparison not considered for this guideline, uniaxial vs biaxial Medoff Sliding Plate
Ceder,L.; Svensson,K.; Thorngren,K.G.	1980	Statistical prediction of rehabilitation in elderly patients with hip fractures	Prognostic study. does not answer recommendation
Ceder,L.; Thorngren,K.G.; Wallden,B.	1980	Prognostic indicators and early home rehabilitation in elderly patients with hip fractures	Prognostic study that doesn't answer recommendation
Center,J.R.; Bliuc,D.; Nguyen,T.V.; Eisman,J.A.	2007	Risk of subsequent fracture after low-trauma fracture in men and women	Not all patients had hip fracture (other fractures included)
Chapchal,G.J.; Slooff,T.J.; Nollen,A.D.	1973	Results of total hip replacement. A clinical follow-up study	Age <65
Charnley,J.; Cupic,Z.	1973	The nine and ten year results of the low-friction arthroplasty of the hip	Patients recieved operation for OA, RA and Ankylosing Spondylitis
Chaudhry,H.; Mundi,R.; Einhorn,T.A.; Russell,T.A.; Parvizi,J.; Bhandari,M.	2012	Variability in the approach to total hip arthroplasty in patients with displaced femoral neck fractures	Narrative Review
Chechik,O.; Thein,R.; Fichman,G.; Haim,A.; Tov,T.B.; Steinberg,E.L.	2011	The effect of clopidogrel and aspirin on blood loss in hip fracture surgery	Results do not answer recommendation
Choi,Peter; Bhandari,Mohit; Scott,Julia; Douketis,James D.	2003	Epidural analgesia for pain relief following hip or knee replacement	Systematic review
Chudyk AM; Jutai JW; Petrella RJ; Speechley	2009	Systematic review of hip fracture rehabilitation practices in the elderly	Systematic review, bibliography screened
Chudyk,A.M.; Jutai,J.W.; Petrella,R.J.; Speechley,M.	2009	Systematic review of hip fracture rehabilitation practices in the elderly	Systematic review, bibliography screened

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Clark,D.I.; Crofts,C.E.; Saleh,M.	1990	Femoral neck fracture fixation. Comparison of a sliding screw with lag screws	Cadaveric study
Cobelli,N.J.; Sadler,A.H.	1985	Ender rod versus compression screw fixation of hip fractures	Study combines results for stable and unstable fractures
Cocchiarella,A.; Yue,S.J.	1966	Rehabilitation of geriatric patients with hip fracture	Case series
Cohen,A.T.; Skinner,J.A.; Warwick,D.; Brenkel,I.	2007	The use of graduated compression stockings in association with fondaparinux in surgery of the hip. A multicentre, multinational, randomised, open-label, parallel-group comparative study	Combines results for total hip replacement and hip fracture patients
ColÃn-Emeric,C.S.; Caminis,J.; Suh,T.T.; Pieper,C.F.; Janning,C.; Magaziner,J.; Adachi,J.; Rosario,Jansen T.; Mesenbrink,P.; Horowitz,Z.D.; Lyles,K.W.; HORIZON-Recurrent,Fracture Trial	2004	The HORIZON Recurrent Fracture Trial: design of a clinical trial in the prevention of subsequent fractures after low trauma hip fracture repair	Report of RCT design, no data.
Collin,D.; Dunker,D.; Gothlin,J.H.; Geijer,M.	2011	Observer variation for radiography, computed tomography, and magnetic resonance imaging of occult hip fractures	Not relevant, retrospective observer variation study
Collinge,C.A.; Beltran,C.M.	2013	Does Modern Nail Geometry Affect Positioning in the Distal Femur of Elderly Patients with Hip Fractures? A Comparison of Otherwise Identical Intramedullary Nails with a 200cm versus 150cm Radius of Curvature	Study does not report patient oriented outcomes
Collis,D.K.; Johnston,R.C.	1972	Comparative evaluation of the results of cup arthroplasty and total hip replacement	Unclear if average age >65

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Collyer,T.C.; Reynolds,H.C.; Truyens,E.; Kilshaw,L.; Corcoran,T.	2011	Perioperative management of clopidogrel therapy: the effects on in-hospital cardiac morbidity in older patients with hip fractures	
Colwell,C.W.; Kwong,L.M.; Turpie,A.G.; Davidson,B.L.	2006	Flexibility in administration of fondaparinux for prevention of symptomatic venous thromboembolism in orthopaedic surgery	Patient undergoing elective arthroplasty were admitted
Cooper,C.; Reginster,J.Y.; Cortet,B.; Diaz-Curiel,M.; Lorenc,R.S.; Kanis,J.A.; Rizzoli,R.	2012	Long-term treatment of osteoporosis in postmenopausal women: a review from the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) and the International Osteoporosis Foundation (IOF)	Includes more than hip fractures
Covert,C.R.; Fox,G.S.	1989	Anaesthesia for hip surgery in the elderly	Narrative Review
Cranney,A.; Guyatt,G.; Krolicki,N.; Welch,V.; Griffith,L.; Adachi,J.D.; Shea,B.; Tugwell,P.; Wells,G.	2001	A meta-analysis of etidronate for the treatment of postmenopausal osteoporosis	Meta-analysis
Crilly,R.G.; Speechley,M.; Overend,T.J.; Mackenzie,R.; Simon,S.; Cremer,S.	2009	Evaluation of a care pathway in the initiation of calcium and vitamin D treatment of patients after hip fracture	Chart Review
Crotty,M.; Unroe,K.; Cameron,I.D.; Miller,M.; Ramirez,G.; Couzner,L.	2010	Rehabilitation interventions for improving physical and psychosocial functioning after hip fracture in older people	Systematic review, bibliography screened
Cuenca,J.; Garcia-Erce,J.A.; Munoz,M.; Izuel,M.; Martinez,A.A.; Herrera,A.	2004	Patients with pertrochanteric hip fracture may benefit from preoperative intravenous iron therapy: a pilot study	Case series
Cumming,R.G.; Nevitt,M.C.	1997	Calcium for prevention of osteoporotic fractures in postmenopausal women	Systematic review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Cuthbert,H.; Howat,T.W.	1976	The use of the Kuntscher Y nail in the treatment of intertrochantertc and subtrochanteric fractures of the femur	Retrospective case series
Dai,Y.T.; Huang,G.S.; Yang,R.S.; Tsauo,J.Y.; Yang,L.H.	2002	Functional recovery after hip fracture: six months' follow-up of patients in a multidisciplinary rehabilitation program	PMID 11393099 overlap in populations - can only use 1 of 2 studies
Dai,Z.; Li,Y.; Jiang,D.	2011	Meta-analysis comparing arthroplasty with internal fixation for displaced femoral neck fracture in the elderly	Meta-analysis, Bibliography Screened
Dalen,N.; Jacobsson,B.; Eriksson,P.A.	1988	A comparison of nail-plate fixation and Ender's nailing in pertrochanteric fractures	Study combines results for stable and unstable fractures
Dall'Oca,C.; Maluta,T.; Bartolozzi,P.	2011	Cement augmentation method for intertrochanteric fractures in osteoporothic elderly patients treated by intramedullary nailing: A 3-year follow-up	Abstract only
Dall'Oca,C.; Maluta,T.; Moscolo,A.; Lavini,F.; Bartolozzi,P.	2010	Cement augmentation of intertrochanteric fractures stabilised with intramedullary nailing	Not relevant, augmentation of trochanteric fractures.
D'Arrigo,C.; Carcangiu,A.; Perugia,D.; Scapellato,S.; Alonzo,R.; Frontini,S.; Ferretti,A.	2012	Intertrochanteric fractures: comparison between two different locking nails	Study combines results for stable and unstable fractures
D'Arrigo,C.; Carcangiu,A.; Perugia,D.; Speranza,A.; Alonzo,R.; De,Sanctis S.	2011	Comparison between two different intramedullary nails in the treatment of intertrochanteric fractures	Abstract-not full text article
Davie,I.T.; MacRae,W.R.; Malcolm-Smith,N.A.	1970	Anesthesia for the fractured hip: a survey of 200 cases	Very low strength of evidence
Davis,J.; Harris,M.B.; Duval,M.; D'Ambrosia,R.	1991	Pertrochanteric fractures treated with the Gamma nail: technique and report of early results	Combined stability

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Davis,T.R.; Sher,J.L.; Horsman,A.; Simpson,M.; Porter,B.B.; Checketts,R.G.	1990	Intertrochanteric femoral fractures. Mechanical failure after internal fixation	Combines stable and unstable
Davis,T.R.; Sher,J.L.; Porter,B.B.; Checketts,R.G.	1988	The timing of surgery for intertrochanteric femoral fractures	Very low quality
Dawe,E.J.; Lindisfarne,E.; Singh,T.; McFadyen,I.; Stott,P.	2013	Sernbo score predicts survival after intracapsular hip fracture in the elderly	Very low strength
Dawson,Hughes B.; Harris,S.S.; Krall,E.A.; Dallal,G.E.	1997	Effect of calcium and vitamin D supplementation on bone density in men and women 65 years of age or older	1 Not Recalled Initially. No reason given. contains more than ust hip fractures
de Grave,P.W.; Tampere,T.; Byn,P.; Van,Overschelde J.; Pattyn,C.; Verdonk,R.	2012	Intramedullary fixation of intertrochanteric hip fractures: a comparison of two implant designs. A prospective randomised clinical trial	Insufficient data for analysis
Delamarter,R.; Moreland,J.R.	1987	Treatment of acute femoral neck fractures with total hip arthroplasty	Not all fractures were displaced
Della Valle,A.G.; Ibanez,U.M.; Buttaro,M.; Rolon,A.; Piccaluga,F.	2003	Early detection of occult fractures around the hip with magnetic resonance imaging	Insufficient data to calculate diagnostic test performance
Desjardins,A.L.; Roy,A.; Paiement,G.; Newman,N.; Pedlow,F.; Desloges,D.; Turcotte,R.E.	1993	Unstable intertrochanteric fracture of the femur. A prospective randomised study comparing anatomical reduction and medial displacement osteotomy	Not considered for this guideline, medial displacement osteotomy in intertrochanteric fractures
Deutsch,A.L.; Mink,J.H.; Waxman,A.D.	1989	Occult fractures of the proximal femur: MR imaging	Insufficient data to calculate diagnostic test performance
Dezee,K.J.; Shimeall,W.T.; Douglas,K.M.; Shumway,N.M.; O'malley,P.G.	2006	Treatment of excessive anticoagulation with phytonadione (vitamin K): a meta-analysis	Meta-analysis

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Di,Fiore M.; Giacomello,A.; Vigano,E.; Zanoni,A.,Jr.	1993	The gamma nail and the compression-sliding plate in the treatment of pertrochanteric fractures: anesthesiologic aspects	Study does not report stability
Di,Monaco M.; Castiglioni,C.; Vallero,F.; Di,Monaco R.; Tappero,R.	2012	Men recover ability to function less than women do: an observational study of 1094 subjects after hip fracture	Very low quality study
Di,Monaco M.; Castiglioni,C.; Vallero,F.; Di,Monaco R.; Tappero,R.	2011	Appendicular lean mass does not mediate the significant association between vitamin D status and functional outcome in hip-fracture women	Very low quality
Di,Monaco M.; Vallero,F.; Castiglioni,C.; Di,Monaco R.; Tappero,R.	2011	Low levels of 25-hydroxyvitamin D are associated with the occurrence of concomitant upper limb fractures in older women who sustain a fall-related fracture of the hip	Cross sectional study that looks at vitamin D and tandem hip and upper limb fractures
Di,Monaco M.; Vallero,F.; De,Toma E.; Castiglioni,C.; Gardin,L.; Giordano,S.; Tappero,R.	2012	Adherence to recommendations for fall prevention significantly affects the risk of falling after hip fracture: post-hoc analyses of a quasi-randomized controlled trial	Very low quality study
Di,Monaco M.; Vallero,F.; De,Toma E.; De,Lauso L.; Tappero,R.; Cavanna,A.	2008	A single home visit by an occupational therapist reduces the risk of falling after hip fracture in elderly women: a quasi-randomized controlled trial	Very low quality study
Di,Monaco M.; Vallero,F.; Di,Monaco R.; Mautino,F.; Cavanna,A.	2005	Serum levels of 25-hydroxyvitamin D and functional recovery after hip fracture	Very low strength of evidence
Dickerson,J.W.; Soper,R.; Older,M.W.	1979	Nutrient intake in elderly women after femoral neck fracture	Insufficient data
Dirschl,D.R.; Piedrahita,L.; Henderson,R.C.	2000	Bone mineral density 6 years after a hip fracture: a prospective, longitudinal study	No patient oriented outcomes

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Dolk,T.	1989	Influence of treatment factors on the outcome after hip fractures	Doesn't answer reccommendation
Domingo,L.J.; Cecilia,D.; Herrera,A.; Resines,C.	2001	Trochanteric fractures treated with a proximal femoral nail	Combined stability results
Dominguez,S.; Liu,P.; Roberts,C.; Mandell,M.; Richman,P.B.	2005	Prevalence of traumatic hip and pelvic fractures in patients with suspected hip fracture and negative initial standard radiographs--a study of emergency department patients	Retrospective medical records review
Douketis,J.D.; Berger,P.B.; Dunn,A.S.; Jaffer,A.K.; Spyropoulos,A.C.; Becker,R.C.; Ansell,J.	2008	The perioperative management of antithrombotic therapy: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)	
Drinker,H.; Murray,W.R.	1979	The universal proximal femoral endoprosthesis. A short-term comparison with conventional hemiarthroplasty	Comparison not considered for this guideline. cannot be used as a case series sincie study is retrospective
Dujardin,F.H.; Benez,C.; Polle,G.; Alain,J.; Biga,N.; Thomine,J.M.	2001	Prospective randomized comparison between a dynamic hip screw and a mini-invasive static nail in fractures of the trochanteric area: preliminary results	Combines stable and unstable results
Dulaney-Cripe,E.; Hadaway,S.; Bauman,R.; Trame,C.; Smith,C.; Sillaman,B.; Laughlin,R.	2012	A continuous infusion fascia iliaca compartment block in hip fracture patients: a pilot study	Very Low Quality
Dunker,D.; Collin,D.; Gothlin,J.H.; Geijer,M.	2012	High clinical utility of computed tomography compared to radiography in elderly patients with occult hip fracture after low-energy trauma	Retrospective medical records review, no diagnostic data
Dunn,A.W.	1982	Total hip arthroplasty: review of long-term results in 185 cases	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Durosier,C.; Hans,D.; Krieg,M.A.; Ruffieux,C.; Cornuz,J.; Meunier,P.J.; Schott,A.M.	2007	Combining clinical factors and quantitative ultrasound improves the detection of women both at low and high risk for hip fracture	Retrospective Cohort Study
Eastell,R.; Reid,D.M.; Compston,J.; Cooper,C.; Fogelman,I.; Francis,R.M.; Hay,S.M.; Hosking,D.J.; Purdie,D.W.; Ralston,S.H.; Reeve,J.; Russell,R.G.; Stevenson,J.C.	2001	Secondary prevention of osteoporosis: when should a non-vertebral fracture be a trigger for action?	Review
Eftekhar,N.	1971	Low-friction arthroplasty: indications, contraindications, and complications	Review
Eftekhar,N.	1971	Charnley	Retrospective case series
Egkher,E.; Martinek,H.; Passl,R.	1981	Pertrochanteric fractures of the femur. A comparative study of internal fixation with angle nail-plates and flexible condylar nails	Comparison not considered for guideline-case series evidence is retrospective
Eiskjaer,S.; Gelineck,J.; Soballe,K.	1989	Fractures of the femoral neck treated with cemented bipolar hemiarthroplasty	Retrospective case series
Eiskjaer,S.; Ostgard,S.E.	1991	Risk factors influencing mortality after bipolar hemiarthroplasty in the treatment of fracture of the femoral neck	Retrospective Cohort Study
Elinge,E.; Lofgren,B.; Gagerman,E.; Nyberg,L.	2003	A group learning programme for old people with hip fracture: A randomized study	Very low quality study
Elis,J.; Chechik,O.; Maman,E.; Steinberg,E.L.	2012	Expandable proximal femoral nails versus 95 degrees dynamic condylar screw-plates for the treatment of reverse oblique intertrochanteric fractures	Restrospective Comparative Study

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Elkhodair,S.; Mortazavi,J.; Chester,A.; Pereira,M.	2011	Single fascia iliaca compartment block for pain relief in patients with fractured neck of femur in the emergency department: a pilot study	Very Low Quality
Elmerson,S.; Andersson,G.B.; Irstam,L.; Zetterberg,C.	1988	Internal fixation of femoral neck fracture. No difference between the Rydell four-flanged nail and Gouffon's pins	Unclear if average age is at least 65 for stable patient subgroup
Emerson,R.H.,Jr.	2012	Increased anteversion of press-fit femoral stems compared with anatomic femur	Incorrect Average Age: <65
Enocson,A.; Hedbeck,C.J.; Tornkvist,H.; Tidermark,J.; Lapidus,L.J.	2012	Unipolar versus bipolar Exeter hip hemiarthroplasty: a prospective cohort study on 830 consecutive hips in patients with femoral neck fractures	Registry Data
Erez,O.; Dougherty,P.J.	2012	Early complications associated with cephalomedullary nail for intertrochanteric hip fractures	Classification: OTA
Eriksson,B.I.; Bauer,K.A.; Lassen,M.R.; Turpie,A.G.	2001	Fondaparinux compared with enoxaparin for the prevention of venous thromboembolism after hip-fracture surgery	Comparison not considered for this guideline: pharmacalogic vs pharmacalogic
Erturer,R.E.; Sonmez,M.M.; Sari,S.; Seckin,M.F.; Kara,A.; Ozturk,I.	2012	Intramedullary osteosynthesis of instable intertrochanteric femur fractures with Profin(registered trademark) nail in elderly patients	Retrospective case series
Erturk,C.; Cagman,B.; Altay,M.A.; Isikan,U.E.	2011	The use of Ender nail in intertrochanteric fractures supported with external fixation	Classification: AO/OTA contains more than hip fracture patients
Erturk,E.; Tutuncu,C.; Eroglu,A.; Gokben,M.	2010	Clinical comparison of 12 mg ropivacaine and 8 mg bupivacaine, both with 20 microg fentanyl, in spinal anaesthesia for major orthopaedic surgery in geriatric patients	

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Esser,M.P.; Kassab,J.Y.; Jones,D.H.	1986	Trochanteric fractures of the femur. A randomised prospective trial comparing the Jewett nail-plate with the dynamic hip screw	Combined stability
Exaltacion,J.J.; Incavo,S.J.; Mathews,V.; Parsley,B.; Noble,P.	2012	Hip arthroplasty after intramedullary hip screw fixation: a perioperative evaluation	Retrospective case series
Fairclough,J.; Colhoun,E.; Johnston,D.; Williams,L.A.	1987	Bone scanning for suspected hip fractures. A prospective study in elderly patients	Insufficient data to calculate diagnostic test performance
Fantini,M.P.; Fabbri,G.; Laus,M.; Carretta,E.; Mimmi,S.; Franchino,G.; Favero,L.; Rucci,P.	2011	Determinants of surgical delay for hip fracture	Retrospective chart review
Farina,E.K.; Kiel,D.P.; Roubenoff,R.; Schaefer,E.J.; Cupples,L.A.; Tucker,K.L.	2012	Plasma phosphatidylcholine concentrations of polyunsaturated fatty acids are differentially associated with hip bone mineral density and hip fracture in older adults: the Framingham Osteoporosis Study	Does not assess risk after hip fracture.
Feehan LM; Beck CA; Harris SR; Macintyre DL; Li LC; New Zealand Guidelines Group (	2011	Exercise prescription after fragility fracture in older adults: a scoping review	Review, not limited to hipfx
Feldstein,A.C.; Nichols,G.A.; Elmer,P.J.; Smith,D.H.; Aickin,M.; Herson,M.	2003	Older women with fractures: patients falling through the cracks of guideline-recommended osteoporosis screening and treatment	Does not address efficacy- it only addresses how often treatment is used in clinical practice
Field,E.S.; Nicolaides,A.N.; Kakkar,V.V.; Crellin,R.Q.	1972	Deep-vein thrombosis in patients with fractures of the femoral neck	Not relevant, Screening for DVT
Finlayson,B.J.; Underhill,T.J.	1988	Femoral nerve block for analgesia in fractures of the femoral neck	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Firica,A.; Troianescu,O.; Petre,M.	1978	Osteosynthesis of fractures of the femur with flexible metallic intramedullary nails	
Fisher,A.A.; Goh,S.L.; Srikusalankul,W.; Southcott,E.N.; Davis,M.W.	2009	Serum leptin levels in older patients with hip fracture--impact on peri-operative myocardial injury	Very low quality
Fisher,C.G.; Blachut,P.A.; Salvian,A.J.; Meek,R.N.; O'Brien,P.J.	1995	Effectiveness of pneumatic leg compression devices for the prevention of thromboembolic disease in orthopaedic trauma patients: a prospective, randomized study of compression alone versus no prophylaxis	Combines pelvic and hip fractures
Follacci,F.M.; Charnley,J.	1969	A comparison of the results of femoral head prosthesis with and without cement	Less than 50 % follow up
Foss,N.B.; Kristensen,M.T.; Kehlet,H.	2008	Anaemia impedes functional mobility after hip fracture surgery	Not relevant. examines anemia as a risk factor for negative outcomes, without addressing treatment efficacy of transfusion
Fox,H.J.; Hughes,S.J.; Pooler,J.; Prothero,D.; Bannister,G.C.	1993	Length of hospital stay and outcome after femoral neck fracture: a prospective study comparing the performance of two hospitals	Age not reported, different treatments not examined - only 2 different hospitals
Franklin,A.; Gallannaugh,S.C.	1983	The bi-articular hip prosthesis for fractures of the femoral neck--a preliminary report	Does not study posterior approach
Froimson,A.I.	1970	Treatment of comminuted subtrochanteric fractures of the femur	Narrative Review
Galante,J.	1971	Total hip replacement	Unclear if average age > 65
Galasko,C.S.; Edwards,D.H.; Fearn,C.B.; Barber,H.M.	1976	The value of low dosage heparin for the prophylaxis of thromboembolism in patients with transcervical and intertrochanteric femoral fractures	Does not meet study selection criteria: mean age cannot be determined

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Galloway,H.R.; Meikle,G.R.; Despois,M.	2004	Patterns of injury in patients with radiographic occult fracture of neck of femur as determined by magnetic resonance imaging	Retrospective case series, no diagnostic data
Galvard,H.; Samuelsson,S.M.	1995	Orthopedic or geriatric rehabilitation of hip fracture patients: a prospective, randomized, clinically controlled study in Malmo, Sweden	Different treatments not examined - only geriatric ward vs orthopedic ward
Gangadharan,S.; Nambiar,M.	2010	Intertrochanteric fractures in elderly high risk patients treated with Ender nails and compression screw	Includes stable and unstable fractures
Garg,B.; Marimuthu,K.; Kumar,V.; Malhotra,R.; Kotwal,P.P.	2011	Outcome of short proximal femoral nail antirotation and dynamic hip screw for fixation of unstable trochanteric fractures. A randomised prospective comparative trial	Not full article
Gargan,M.F.; Gundle,R.; Simpson,A.H.	1994	How effective are osteotomies for unstable intertrochanteric fractures?	Not considered for this guideline, osteotomy for intertrochanteric fractures
Gdalevich,M.; Cohen,D.; Yosef,D.; Tauber,C.	2004	Morbidity and mortality after hip fracture: the impact of operative delay	Unclear if average age over 65
Geerts,W.H.; Bergqvist,D.; Pineo,G.F.; Heit,J.A.; Samama,C.M.; Lassen,M.R.; Colwell,C.W.	2008	Prevention of venous thromboembolism: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)	Guideline
Geerts,W.H.; Pineo,G.F.; Heit,J.A.; Bergqvist,D.; Lassen,M.R.; Colwell,C.W.; Ray,J.G.	2004	Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy	Guideline
Geijer,M.; Dunker,D.; Collin,D.; Gothlin,J.H.	2012	Bone bruise, lipohemarthrosis, and joint effusion in CT of non-displaced hip fracture	Insufficient data to calculate diagnostic test performance

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Geller,J.A.; Saifi,C.; Morrison,T.A.; Macaulay,W.	2010	Tip-apex distance of intramedullary devices as a predictor of cut-out failure in the treatment of peritrochanteric elderly hip fractures	Not relevant looks at prognostic factor associated with cut-out
Gilbert,T.B.; Hawkes,W.G.; Hebel,J.R.; Hudson,J.I.; Kenzora,J.E.; Zimmerman,S.I.; Felsenthal,G.; Magaziner,J.	2000	Spinal anesthesia versus general anesthesia for hip fracture repair: a longitudinal observation of 741 elderly patients during 2-year follow-up	Case series
Gilbey,H.J.; Ackland,T.R.; Wang,A.W.; Morton,A.R.; Trouchet,T.; Tapper,J.	2003	Exercise improves early functional recovery after total hip arthroplasty	Not specific to hip fracture
Giliberty,R.P.	1983	Hemiarthroplasty of the hip using a low-friction bipolar endoprosthesis	Not all patients had a displaced hip fracture
Gill,J.B.; Jensen,L.; Chin,P.C.; Rafiei,P.; Reddy,K.; Schutt,R.C.,Jr.	2007	Intertrochanteric hip fractures treated with the trochanteric fixation nail and sliding hip screw	Combines stable and unstable
Gillespie,Lesley D.; Robertson,M.Clare; Gillespie,William J.; Lamb,Sarah E.; Gates,Simon; Cumming,Robert G.; Rowe,Brian H.	2009	Interventions for preventing falls in older people living in the community	Systematic review
Gillespie,W.J.; Avenell,A.; Henry,D.A.; O'Connell,D.L.; Robertson,J.	2001	Vitamin D and vitamin D analogues for preventing fractures associated with involutional and post-menopausal osteoporosis	Systematic Review
Glick,J.M.	1988	Hip arthroscopy using the lateral approach	Studies hip arthroscopy
Glick,J.M.; Sampson,T.G.; Gordon,R.B.; Behr,J.T.; Schmidt,E.	1987	Hip arthroscopy by the lateral approach	Studies hip arthroscopy
Goh,S.K.; Samuel,M.; Su,D.H.; Chan,E.S.; Yeo,S.J.	2009	Meta-analysis comparing total hip arthroplasty with hemiarthroplasty in the treatment of displaced neck of femur fracture	Meta-analysis, bibliography screened

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Goldhagen,P.R.; O'Connor,D.R.; Schwarze,D.; Schwartz,E.	1994	A prospective comparative study of the compression hip screw and the gamma nail	Study combines results for stable and unstable fractures
Goosen,J.H.; Kollen,B.J.; Castelein,R.M.; Kuipers,B.M.; Verheyen,C.C.	2011	Minimally invasive versus classic procedures in total hip arthroplasty: a double-blind randomized controlled trial	Insufficient reporting of outcomes that compare posterior and anterior approaches
Gordon,M.	1989	Restoring functional independence in the older hip fracture patient	Review
Gosch,M.; Roth,T.; Kammerlander,C.; Joosten-Gstrein,B.; Benvenuti-Falger,U.; Blauth,M.; Lechleitner,M.	2011	Treatment of osteoporosis in postmenopausal hip fracture patients after geriatric rehabilitation: changes over the last decade	Not relevant
Gosselin,S.; Desrosiers,J.; Corriveau,H.; Hebert,R.; Rochette,A.; Provencher,V.; Cote,S.; Tousignant,M.	2008	Outcomes during and after inpatient rehabilitation: Comparison between adults and older adults	Very low quality study
Green,S.; Moore,T.; Proano,F.	1987	Bipolar prosthetic replacement for the management of unstable intertrochanteric hip fractures in the elderly	Retrospective case series
Greenspan,S.L.; Perera,S.; Nace,D.; Zukowski,K.S.; Ferchak,M.A.; Lee,C.J.; Nayak,S.; Resnick,N.M.	2012	FRAX or fiction: determining optimal screening strategies for treatment of osteoporosis in residents in long-term care facilities	Evaluates more than hip fractures
Greer,R.B.,III; Niemann,K.M.	1971	Fractures about the hip. 3. Massie nail fixation contrasted with Austin Moore replacement in fresh intracapsular fractures	Uncelar if all patients had unstable fractures
Gruber,U.F.	1985	Prevention of fatal pulmonary embolism in patients with fractures of the neck of the femur	Not relevant comparison. if both groups were used as seperate case series, the strength of evidence would be very low

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Gruson,K.I.; Aharonoff,G.B.; Egol,K.A.; Zuckerman,J.D.; Koval,K.J.	2002	The relationship between admission hemoglobin level and outcome after hip fracture	Looks at anemia as a risk factor, and does not evaluate treatment efficacy
Guanche,C.A.; Kozin,S.H.; Levy,A.S.; Brody,L.A.	1994	The use of MRI in the diagnosis of occult hip fractures in the elderly: a preliminary review	Retrospective case series
Gulur,P.; Nishimori,M.; Ballantyne,J.C.	2006	Regional anaesthesia versus general anaesthesia, morbidity and mortality	Narrative review
Guo,J.J.; Yang,H.; Qian,H.; Huang,L.; Guo,Z.; Tang,T.	2010	The effects of different nutritional measurements on delayed wound healing after hip fracture in the elderly	Very low strength of evidence
Gustke,K.A.	1984	Hemiarthroplasty and total arthroplasty in the treatment of intracapsular hip fractures	Narrative review
Haentjens,P.; Autier,P.; Barette,M.; Venken,K.; Vanderschueren,D.; Boonen,S.	2007	Survival and functional outcome according to hip fracture type: a one-year prospective cohort study in elderly women with an intertrochanteric or femoral neck fracture	Doesn't does assess levels of relevant prognostic factor
Hagsten,B.; Soderback,I.	1994	Occupational therapy after hip fracture: A pilot study of the clients, the care and the costs	Very low quality study
Haines,L.; Dickman,E.; Ayvazyan,S.; Pearl,M.; Wu,S.; Rosenblum,D.; Likourezos,A.	2012	Ultrasound-guided fascia iliaca compartment block for hip fractures in the emergency department	Very Low Quality
Hallert,O.; Li,Y.; Brismar,H.; Lindgren,U.	2012	The direct anterior approach: initial experience of a minimally invasive technique for total hip arthroplasty	Not a study of posterior approach
Han,S.K.; Kim,Y.S.; Kang,S.H.	2012	Treatment of femoral neck fractures with bipolar hemiarthroplasty using a modified minimally invasive posterior approach in patients with neurological disorders	Not relevant comparison: minimmally invasive posterior approach versus standard posterior approach

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Han,S.K.; Lee,B.Y.; Kim,Y.S.; Choi,N.Y.	2010	Usefulness of multi-detector CT in Boyd-Griffin type 2 intertrochanteric fractures with clinical correlation	Not relevant, no diagnostic data
Handoll HHG; Cameron ID; Mak JCS; Finnegan TP; New Zealand Guidelines Group (	2009	Multidisciplinary rehabilitation for older people with hip fractures (Cochrane review) [with consumer summary]	Systematic Review
Handoll HHG; Farrar MJ; McBirnie	2002	Heparin, low molecular weight heparin and physical methods for preventing deep vein thrombosis and pulmonary embolism following surgery for hip fractures (Cochrane review) [with consumer summary]	Systematic Review
Handoll HHG; Parker MJ; New Zealand Guidelines Group (	2008	Conservative versus operative treatment for hip fractures in adults (Cochrane review) [with consumer summary]	Systematic review, bibliography screened
Handoll HHG; Queally JM; Parker MJ; New Zealand Guidelines Group (	2011	Preoperative traction for hip fractures in adults (Cochrane review) [with consumer summary]	Systematic Review
Handoll,H.H.; Cameron,I.D.; Mak,J.C.; Finnegan,T.P.	2009	Multidisciplinary rehabilitation for older people with hip fractures	Systematic review, bibliography screened
Handoll,H.H.; Farrar,M.J.; McBirnie,J.; Tytherleigh-Strong,G.; Milne,A.A.; Gillespie,W.J.	2002	Heparin, low molecular weight heparin and physical methods for preventing deep vein thrombosis and pulmonary embolism following surgery for hip fractures	Systematic review, bibliography screened
Handoll,H.H.; Parker,M.J.	2008	Conservative versus operative treatment for hip fractures in adults	Systematic review, bibliography screened
Handoll,H.H.; Queally,J.M.; Parker,M.J.	2011	Preoperative traction for hip fractures in adults	Systematic Review
Handoll,H.H.; Sherrington,C.; Mak,J.C.	2011	Interventions for improving mobility after hip fracture surgery in adults	Systematic review, bibliography screened

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Hanks,G.A.; Foster,W.C.; Cardea,J.A.	1988	Treatment of femoral shaft fractures with the Brooker-Wills interlocking intramedullary nail	Does not meet study selection criteria: mean age less than 65 years of age
Hans,D.; Genton,L.; Drezner,M.K.; Schott,A.M.; Pacifici,R.; Avioli,L.; Slosman,D.O.; Meunier,P.J.	2002	Monitored impact loading of the hip: initial testing of a home-use device	Population not specific to hipfx rehab
Hansen,B.A.; Solgaard,S.	1978	Impacted fractures of the femoral neck treated by early mobilization and weight-bearing	Very low strength of evidence-concomitant non-op treatment given with early weight bearing
Hansen,S.T.; Winquist,R.A.	1979	Closed intramedullary nailing of the femur. Kuntscher technique with reaming	Retrospective case series
Hardin,G.T.	1990	Timing of fracture fixation: a review	Narrative Review, bibliography screened
Hardy,D.C.; Drossos,K.	2003	Slotted intramedullary hip screw nails reduce proximal mechanical unloading	Comparison not considered for this guideline, one vs two screws transfixing IM nail
Harju,E.; Punnonen,R.; Tuimala,R.; Salmi,J.; Paronen,I.	1989	Vitamin D and calcitonin treatment in patients with femoral neck fracture: a prospective controlled clinical study	Not relevant comparison
Harper,M.C.	1982	The treatment of unstable intertrochanteric fractures using a sliding screw-medial displacement technique	Not considered for this guideline, treatment of unstable intertrochanteric fractures with compression hip screw unstable fractures
Harrington,P.; Nihal,A.; Singhania,A.K.; Howell,F.R.	2002	Intramedullary hip screw versus sliding hip screw for unstable intertrochanteric femoral fractures in the elderly	Exclude. Not enough information (number of pts at follow up)
Harris,J.; Lightowler,C.D.; Todd,R.C.	1972	Total hip replacement in inflammatory hip disease using the Charnley prosthesis	Unclear if patients also had a hip fracture
Harris,L.J.	1980	Closed retrograde intramedullary nailing of peritrochanteric fractures of the femur with a new nail	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Hartman JT; Pugh JL; Smith RD; Robertson WW Jr; Yost RP; Janssen HF; New Zealand Guidelines Group (	1982	Cyclic sequential compression of the lower limb in prevention of deep venous thrombosis	Duplicate
Hartman,J.T.; Pugh,J.L.; Smith,R.D.; Robertson,W.W.,Jr.; Yost,R.P.; Janssen,H.F.	1982	Cyclic sequential compression of the lower limb in prevention of deep venous thrombosis	Study combines results for fracture and elective hip replacement
Harty,J.A.; McKenna,P.; Moloney,D.; D'Souza,L.; Masterson,E.	2007	Anti-platelet agents and surgical delay in elderly patients with hip fractures	Very low strength
Hayward,S.J.; Lowe,L.W.; Tzevelekos,S.	1983	Intertrochanteric fractures: a comparison between fixation with a two-piece nail plate and Ender's nails	The outcome that is stratified by stability is not validated
Healy,W.L.; Iorio,R.	2004	Total hip arthroplasty: optimal treatment for displaced femoral neck fractures in elderly patients	Combined results
Hedstrom,M.; Sjoberg,K.; Brosjo,E.; Astrom,K.; Sjoberg,H.; Dalen,N.	2002	Positive effects of anabolic steroids, vitamin D and calcium on muscle mass, bone mineral density and clinical function after a hip fracture. A randomised study of 63 women	Not relevant comparison: (vitamin D +calcium + steroids) versus calcium alone
Hefley,F.G.,Jr.; Nelson,C.L.; Puskarich-May,C.L.	1996	Effect of delayed admission to the hospital on the preoperative prevalence of deep-vein thrombosis associated with fractures about the hip	Effect of delayed admission to hospital on the preoperative revalence of venous thromboembolic disease
Heiple,K.G.; Brooks,D.B.; Samson,B.L.; Burstein,A.H.	1979	A fluted intramedullary rod for subtrochanteric fractures	Does not meet study selection criteria: mean age less than 65 years of age
Hempsall,V.J.; Robertson,D.R.; Campbell,M.J.; Briggs,R.S.	1990	Orthopaedic geriatric care--is it effective? A prospective population-based comparison of outcome in fractured neck of femur	Different treatments not examined - only geriatric ward vs orthopedic ward

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Hernigou,P.; Charpentier,P.	2001	Routine use of adjusted low-dose oral anticoagulants during the first three postoperative months after hip fracture in patients without comorbidity factors	Very low strength
Hershkovitz,A.; Kalandariov,Z.; Hermush,V.; Weiss,R.; Brill,S.	2007	Factors affecting short-term rehabilitation outcomes of disabled elderly patients with proximal hip fracture	Very low strength of evidence
Hesse,B.; Gachter,A.	2004	Complications following the treatment of trochanteric fractures with the gamma nail	Very low strength of evidence
Hessels,G.J.	1975	Unstable intertrochanteric fractures	Retrospective case series
Heyse-Moore,G.H.; MacEachern,A.G.; Evans,D.C.	1983	Treatment of intertrochanteric fractures of the femur. A comparison of the Richards screw-plate with the Jewett nail-plate	
Hitz,M.F.; Jensen,J.E.; Eskildsen,P.C.	2007	Bone mineral density and bone markers in patients with a recent low-energy fracture: effect of 1 y of treatment with calcium and vitamin D	No patient oriented outcomes
Ho,C.A.; Li,C.Y.; Hsieh,K.S.; Chen,H.F.	2010	Factors determining the 1-year survival after operated hip fracture: a hospital-based analysis	Very low strength
Ho,H.H.; Lau,T.W.; Leung,F.; Tse,H.F.; Siu,C.W.	2010	Peri-operative management of anti-platelet agents and anti-thrombotic agents in geriatric patients undergoing semi-urgent hip fracture surgery	Narrative review
Hoffman,C.W.; Lynskey,T.G.	1996	Intertrochanteric fractures of the femur: a randomized prospective comparison of the Gamma nail and the Ambi hip screw	Combines stable and unstable
Hogh,J.	1982	Sliding screw in the treatment of trochanteric and subtrochanteric fractures	Study combines results for stable and unstable fractures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Hogh,J.; Jensen,J.; Lauritzen,J.	1982	Dislocated femoral neck fractures. A follow-up study of 98 cases treated by multiple AO (ASIF) cancellous bone screws	Retrospective case series
Holmberg,S.; Mattsson,P.; Dahlborn,M.; Ersmark,H.	1990	Fixation of 220 femoral neck fractures. A prospective comparison of the Rydell nail and the LIH hook pins	Not relevant comparison
Holstein,P.; Jensen,J.S.	1975	Functional results after Moore arthroplasty in femoral neck fractures. A long-term follow-up study	Unclear if average age >65
Holt,E.M.; Evans,R.A.; Hindley,C.J.; Metcalfe,J.W.	1994	1000 femoral neck fractures: the effect of pre-injury mobility and surgical experience on outcome	Prognostic
Holt,G.; Smith,R.; Duncan,K.; McKeown,D.W.	2010	Does delay to theatre for medical reasons affect the peri-operative mortality in patients with a fracture of the hip?	Does not meet study selection criteria: mean age cannot be determined
Holt,Jr	1974	Rigid fixation by use of the Holt nail	Not a treatment study, explanation of technique
Hommel,A.; Ulander,K.; Bjorkelund,K.B.; Norrman,P.O.; Wingstrand,H.; Thorngren,K.G.	2008	Influence of optimised treatment of people with hip fracture on time to operation, length of hospital stay, reoperations and mortality within 1 year	Not relvant, clinical pathway
Hopley,C.; Stengel,D.; Ekkernkamp,A.; Wich,M.	2010	Primary total hip arthroplasty versus hemiarthroplasty for displaced intracapsular hip fractures in older patients: systematic review	Systematic review, bibliography screened
Hornby,R.; Grimley,Evans J.; Vardon,V.	1986	Trochanteric fractures in the elderly	Report
Hossain,M.; Akbar,S.A.; Andrew,G.	2010	Misdiagnosis of occult hip fracture is more likely in patients with poor mobility and cognitive impairment	Not relevant

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Host,H.H.; Sinacore,D.R.; Bohnert,K.L.; Steger-May,K.; Brown,M.; Binder,E.F.	2007	Training-induced strength and functional adaptations after hip fracture	Very low strength of evidence
Hourigan,S.R.; Nitz,J.C.; Brauer,S.G.; O'Neill,S.; Wong,J.; Richardson,C.A.	2008	Positive effects of exercise on falls and fracture risk in osteopenic women	Incorrect patient population - not hipfx patients
Howard,C.B.; Mackie,I.G.; Fairclough,J.; Austin,T.R.	1983	Forum. Femoral neck surgery using a local anaesthetic technique	Not relevant
Howard,M.; Burns,S.; Chu,J.	2006	Critical appraisal: Do calcium and vitamin D supplements prevent fractures?	Narrative Review
Hsu,J.D.	1969	Rehabilitation of patients suffering from fracture of the hip. II. Treatment by hip pinning	Mean age < 65
Hubbard,M.J.; Burke,F.D.; Houghton,G.R.; Bracey,D.J.	1980	A prospective controlled trial of valgus osteotomy in the fixation of unstable pertrochanteric fractures of the femur	Not considered for this guideline, valgus osteotomy in fixation of pertrochanteric fractures
Hunter,G.A.	1969	A comparison of the use of internal fixation and prosthetic replacement for fresh fractures of the neck of the femur	Very low strength
Hunter,G.A.	1975	The results of operative treatment of trochanteric fractures of the femur	Study combines stable and unstable results
Iba,K.; Takada,J.; Hatakeyama,N.; Kaya,M.; Isogai,S.; Tsuda,H.; Obata,H.; Miyano,S.; Yamashita,T.	2006	Underutilization of antiosteoporotic drugs by orthopedic surgeons for prevention of a secondary osteoporotic fracture	Does not answer recommendation. studies utilization of preventative measures
Inderjeeth,C.A.; Foo,A.C.; Lai,M.M.; Glendenning,P.	2009	Efficacy and safety of pharmacological agents in managing osteoporosis in the old old: review of the evidence	Meta-analysis
Ingman,A.M.	2002	Retrograde intramedullary nailing of supracondylar femoral fractures: design and development of a new implant	Does not meet study selection criteria: mean age less than 65 years of age

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Intiso,D.; Di,Rienzo F.; Grimaldi,G.; Lombardi,T.; Fiore,P.; Maruzzi,G.; Iarossi,A.; Tolfa,M.; Pazienza,L.	2009	Survival and functional outcome in patients 90 years of age or older after hip fracture	Very low quality study
Ish,Shalom S.; Segal,E.; Salganik,T.; Raz,B.; Bromberg,I.L.; Vieth,R.	2008	Comparison of daily, weekly, and monthly vitamin D3 in ethanol dosing protocols for two months in elderly hip fracture patients	No patient oriented outcomes
Iwamoto,J.; Takeda,T.; Matsumoto,H.	2012	Sunlight exposure is important for preventing hip fractures in patients with Alzheimer's disease, Parkinson's disease, or stroke	Meta-analysis
Jackson,C.; Gaugris,S.; Sen,S.S.; Hosking,D.	2007	The effect of cholecalciferol (vitamin D3) on the risk of fall and fracture: a meta-analysis	Meta-analysis
Jacobs,R.R.; Armstrong,H.J.; Whitaker,J.H.; Pazell,J.	1976	Treatment of intertrochanteric hip fractures with a compression hip screw and a nail plate	Very low strength of evidence
Jalovaara,P.; Virkkunen,H.	1991	Quality of life after primary hemiarthroplasty for femoral neck fracture. 6-year follow-up of 185 patients	Irrelevant comparison to healthy controls. study is retrospective, so cannot use as case series
Jarnlo,G.B.; Ceder,L.; Thorngren,K.G.	1984	Early rehabilitation at home of elderly patients with hip fractures and consumption of resources in primary care	Very low strength of evidence
Jawad,Z.; Odumala,A.; Jones,M.	2012	Objective sound wave amplitude measurement generated by a tuning fork. An analysis of its use as a diagnostic tool in suspected femoral neck fractures	Not relevant, tuning fork as a diagnostic tool
Jennings,J.J.	1974	Aspirin prophylaxis of thromboembolic disease in patients undergoing hip surgery	Combines results for hip replacement and fracture patients
Jensen,J.S.; Michaelsen,M.	1975	Trochanteric femoral fractures treated with McLaughlin osteosynthesis	Retrospective Case Series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Jette,A.M.; Harris,B.A.; Cleary,P.D.; Campion,E.W.	1987	Functional recovery after hip fracture	Insufficient data for analysis: unclear how many patietns are in the final analysis
Jhamaria,N.L.; Lal,K.B.; Udawat,M.; Banerji,P.; Kabra,S.G.	1983	The trabecular pattern of the calcaneum as an index of osteoporosis	Not relevant, osteoporosis
Ji,H.M.; Lee,Y.K.; Ha,Y.C.; Kim,K.C.; Koo,K.H.	2011	Little impact of antiplatelet agents on venous thromboembolism after hip fracture surgery	Retrospective Case Series
Jones,C.W.; Morris,J.; Hirschowitz,D.; Hart,G.M.; Shea,J.; Arden,G.P.	1977	A comparison of the treatment of trochanteric fractures of the femur by internal fixation with a nail plate and the Ender technique	Combines stability results
Jones,G.R.; Jakobi,J.M.; Taylor,A.W.; Petrella,R.J.; Vandervoort,A.A.	2006	Community exercise program for older adults recovering from hip fracture: a pilot study	Very low quality study
Jones,S.F.; White,A.	1985	Analgesia following femoral neck surgery. Lateral cutaneous nerve block as an alternative to narcotics in the elderly	< 10 in each treatment group
Juelsgaard,P.; Sand,N.P.; Felsby,S.; Dalsgaard,J.; Jakobsen,K.B.; Brink,O.; Carlsson,P.S.; Thygesen,K.	1998	Perioperative myocardial ischaemia in patients undergoing surgery for fractured hip randomized to incremental spinal, single-dose spinal or general anaesthesia	Very low strength
Juhn,A.; Krimerman,J.; Mendes,D.G.	1988	Intertrochanteric fracture of the hip. Comparison of nail-plate fixation and Ender's nailing	Study combines results for stable and unstable fractures
Kamel,H.K.; Iqbal,M.A.; Mogallapu,R.; Maas,D.; Hoffmann,R.G.	2003	Time to ambulation after hip fracture surgery: relation to hospitalization outcomes	Medical record review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Kammerlander,C.; Gebhard,F.; Meier,C.; Lenich,A.; Linhart,W.; Clasbrummel,B.; Neubauer-Gartzke,T.; Garcia-Alonso,M.; Pavelka,T.; Blauth,M.	2011	Standardised cement augmentation of the PFNA using a perforated blade: A new technique and preliminary clinical results. A prospective multicentre trial	Osteoporotic fx
Kanaujia,R.R.; Alam,B.	1983	Non-surgical treatment of fracture neck of femur in elderly patient	No quantitative data
Kandel,L.; Schler,D.; Brezis,M.; Liebergall,M.; Mattan,Y.; Dresner-Pollak,R.	2012	A Simple Intervention for Improving the Implementation Rate of a Recommended Osteoporosis Treatment After Hip Fracture	Duplicate
Kanis,J.A.; Johansson,H.; Oden,A.; De,Laet C.; Johnell,O.; Eisman,J.A.; Mc,Closkey E.; Mellstrom,D.; Pols,H.; Reeve,J.; Silman,A.; Tenenhouse,A.	2005	A meta-analysis of milk intake and fracture risk: low utility for case finding	Meta-analysis
Karthik,K.; Natarajan,M.	2012	Unstable trochanteric fractures in elderly osteoporotic patients: role of primary hemiarthroplasty	Not considered for this guideline, hemiarthroplasty for trochanteric fractures
Kauffman,T.L.; Albright,L.; Wagner,C.	1987	Rehabilitation outcomes after hip fracture in persons 90 years old and older	
Kavlie,H.; Norderval,Y.; Sundal,B.	1975	Femoral head replacement with the christiansen endoprosthesis. A follow-up study, and a report on 175 arthroplasties with the present model of the prosthesis with acrylic cement fixation	Retrospective case series
Kavlie,H.; Sundal,B.	1974	Primary arthroplasty in femoral neck fractures. A review of 269 consecutive cases treated with the christiansen endoprosthesis	Comparison not considered for this guideline-retrospectively compare different arthroplaty techniques

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Kawatani,Y.; Nishida,K.; Anraku,Y.; Kunitake,K.; Tsutsumi,Y.	2011	Clinical results of trochanteric fractures treated with the TARGON(R) proximal femur intramedullary nailing fixation system	Combined stability results
Kennedy,M.T.; Roche,S.; Fleming,S.M.; Lenehan,B.; Curtin,W.	2006	The association between aspirin and blood loss in hip fracture patients	Very low strength of evidence
Kennie,D.C.; Reid,J.; Richardson,I.R.; Kiamari,A.A.; Kelt,C.	1988	Effectiveness of geriatric rehabilitative care after fractures of the proximal femur in elderly women: A randomised clinical trial	Very low quality study
Kenzora,J.E.; McCarthy,R.E.; Lowell,J.D.; Sledge,C.B.	1984	Hip fracture mortality. Relation to age, treatment, preoperative illness, time of surgery, and complications	Risk factors
Khan,A.Z.; Parker,M.J.	2012	Minimally invasive sliding hip screw insertion technique	Retrospective case series
Khan,R.J.; MacDowell,A.; Crossman,P.; Datta,A.; Jallali,N.; Arch,B.N.; Keene,G.S.	2002	Cemented or uncemented hemiarthroplasty for displaced intracapsular femoral neck fractures	<50% follow up for all outcomes except mortality. not best available evidence for mortality
Khan,S.K.; Kalra,S.; Khanna,A.; Thiruvengada,M.M.; Parker,M.J.	2009	Timing of surgery for hip fractures: a systematic review of 52 published studies involving 291,413 patients	Systematic review, bibliography screened
Khan,S.K.; Rushton,S.P.; Courtney,M.; Gray,A.C.; Deehan,D.J.	2013	Elderly men with renal dysfunction are most at risk for poor outcome after neck of femur fractures	Very low quality
Kieffer,W.K.; Rennie,C.S.; Gandhe,A.J.	2013	Preoperative albumin as a predictor of one-year mortality in patients with fractured neck of femur	Very low strength of evidence
Kirkland,L.L.; Kashiwagi,D.T.; Burton,M.C.; Cha,S.; Varkey,P.	2011	The Charlson Comorbidity Index Score as a predictor of 30-day mortality after hip fracture surgery	Very low quality

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Kocum,A.; Turkoz,A.; Ulger,H.; Sener,M.; Arslan,G.	2007	Ropivacaine 0.25% is as effective as bupivacaine 0.25% in providing surgical anaesthesia for lumbar plexus and sciatic nerve block in high-risk patients: Preliminary report	Not all hip fractures
Komulainen,M.H.; KrÃger,H.; Tuppurainen,M.T.; Heikkinen,A.M.; Alhava,E.; Honkanen,R.; Saarikoski,S.	1998	HRT and Vit D in prevention of non-vertebral fractures in postmenopausal women; a 5 year randomized trial	Not all patients have hip fractures
Koot,V.C.; Peeters,P.H.; de Jong,J.R.; Clevers,G.J.; van der Werken,C.	2000	Functional results after treatment of hip fracture: a multicentre, prospective study in 215 patients	Not relevant. study looks at prognostic factors related to functional recovery after rehab.
Kouvidis,G.; Sakellariou,V.I.; Mavrogenis,A.F.; Stavrakakis,J.; Kampas,D.; Galanakis,J.; Papagelopoulos,P.J.; Katonis,P.	2012	Dual lag screw cephalomedullary nail versus the classic sliding hip screw for the stabilization of intertrochanteric fractures. A prospective randomized study	Results combined for stable and unstable fractures
Koval,K.J.; Chen,A.L.; Aharonoff,G.B.; Egol,K.A.; Zuckerman,J.D.	2004	Clinical pathway for hip fractures in the elderly: the Hospital for Joint Diseases experience	Control group treatment not adequately described
Koval,K.J.; Friend,K.D.; Aharonoff,G.B.; Zukerman,J.D.	1996	Weight bearing after hip fracture: a prospective series of 596 geriatric hip fracture patients	Very low quality study
Koval,K.J.; Maurer,S.G.; Su,E.T.; Aharonoff,G.B.; Zuckerman,J.D.	1999	The effects of nutritional status on outcome after hip fracture	Very low quality
Kudrnova,Z.; Kvasnicka,J.; Kudrna,K.; Mazoch,J.; Malikova,I.; Zenahlikova,Z.; Sudrova,M.; Brzezkova,R.	2009	Favorable coagulation profile with fondaparinux after hip surgery in elderly patients	Very low quality
Kuisma,R.	2002	A randomized, controlled comparison of home versus institutional rehabilitation of patients with hip fracture	Unvalidated outcomes measures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Kukla,C.; Heinz,T.; Berger,G.; Kwasny,O.; Rosenberger,A.; Vecsei,V.	1997	Gamma nail vs. Dynamic Hip Screw in 120 patients over 60 years - A randomized trial	Combines stability and instability
Kumar,M.M.; Sudhakar,G.M.; Shah,D.D.; Pathak,R.H.	1996	A study of the role of osteotomy in unstable intertrochanteric fractures	Not relevant, medialisation osteotomy in intertrochanteric fractures
Kumar,V.N.; Redford,J.B.	1984	Rehabilitation of hip fractures in the elderly	Describes rehab, but does not evaluate its efficacy
Kuokkanen,H.; Korkala,O.; Antti-Poika,I.; Tolonen,J.; Lehtimaki,M.Y.; Silvennoinen,T.	1991	Three cancellous bone screws versus a screw-angle plate in the treatment of Garden I and II fractures of the femoral neck	Some patients have displace fractures
Kuokkanen,H.O.; Korkala,O.L.	1992	Factors affecting survival of patients with hip fractures	Very low strength of evidence
Kuzyk,P.R.; Bhandari,M.; McKee,M.D.; Russell,T.A.; Schemitsch,E.H.	2009	Intramedullary versus extramedullary fixation for subtrochanteric femur fractures	Systematic review, bibliography screened
Kwok,D.C.; Cruess,R.L.	1982	A retrospective study of Moore and Thompson hemiarthroplasty. A review of 599 surgical cases and an analysis of the technical complications	Retrospective case series.
Kwok,T.; Khoo,C.C.; Leung,J.; Kwok,A.; Qin,L.; Woo,J.; Leung,P.C.	2012	Predictive values of calcaneal quantitative ultrasound and dual energy X ray absorptiometry for non-vertebral fracture in older men: results from the MrOS study (Hong Kong)	Not all hip fracture
Kwon,M.S.; Kuskowski,M.; Mulhall,K.J.; Macaulay,W.; Brown,T.E.; Saleh,K.J.	2006	Does surgical approach affect total hip arthroplasty dislocation rates?	Workgroup; meta-analysis
Laffosse,J.M.; Accadbled,F.; Molinier,F.; Chiron,P.; Hocine,B.; Puget,J.	2008	Anterolateral mini-invasive versus posterior mini-invasive approach for primary total hip replacement. Comparison of exposure and implant positioning	Minimally invasive

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Lassen,M.R.; Fisher,W.; Mouret,P.; Agnelli,G.; George,D.; Kakkar,A.; Mismetti,P.; Turpie,A.G.	2012	Semuloparin for prevention of venous thromboembolism after major orthopedic surgery: results from three randomized clinical trials, SAVE-HIP1, SAVE-HIP2 and SAVE-KNEE	Narrative Review
Laupacis,A.; Bourne,R.; Rorabeck,C.; Feeny,D.; Tugwell,P.; Wong,C.	2002	Comparison of total hip arthroplasty performed with and without cement : a randomized trial	Patients had OA of the hip
Lausten,G.S.; Vedel,P.	1981	The Monk hard-top endoprosthesis for intracapsular fractures of the femoral neck	Retrospective case series
Learch,T.J.; Pathria,M.N.	2000	Greater trochanter fractures: MR assessment and its influence on patient management	Less than 10 patients per group
Lee,H.P.; Chang,Y.Y.; Jean,Y.H.; Wang,H.C.	2009	Importance of serum albumin level in the preoperative tests conducted in elderly patients with hip fracture	Very low quality
Lee,S.-R.; Kim,S.-T.; Yoon,M.G.; Moon,M.-S.; Heo,J.-H.	2013	The stability score of the intramedullary nailed intertrochanteric fractures:Stability of nailed fracture and postoperative patient mobilization	Combined stability results
Lee,Y.P.; Griffith,J.F.; Antonio,G.E.; Tang,N.; Leung,K.S.	2004	Early magnetic resonance imaging of radiographically occult osteoporotic fractures of the femoral neck	Retrospective medical records review, no diagnostic data
Lejus,C.; Desdoits,A.; Lambert,C.; Langlois,C.; Roquilly,A.; Gouin,F.; Asehnoune,K.	2012	Preoperative moderate renal impairment is an independent risk factor of transfusion in elderly patients undergoing hip fracture surgery and receiving low-molecular-weight heparin for thromboprophylaxis	Very low strength

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Lenich,A.; Vester,H.; Nerlich,M.; Mayr,E.; Stockle,U.; Fuchtmeier,B.	2010	Clinical comparison of the second and third generation of intramedullary devices for trochanteric fractures of the hip - Blade vs screw	Combined stability results
Leonardsson,O.; Garellick,G.; Karrholm,J.; Akesson,K.; Rogmark,C.	2012	Changes in implant choice and surgical technique for hemiarthroplasty. 21,346 procedures from the Swedish Hip Arthroplasty Register 2005-2009	Registry data
Leonardsson,O.; Sernbo,I.; Carlsson,A.; Akesson,K.; Rogmark,C.	2010	Long-term follow-up of replacement compared with internal fixation for displaced femoral neck fractures: results at ten years in a randomised study of 450 patients	Study is continuation of Rogmark 2002 study. Less than 50% follow-up
Leung,F.; Lau,T.W.; Kwan,K.; Chow,S.P.; Kung,A.W.	2010	Does timing of surgery matter in fragility hip fractures?	Narrative review, bibliography screened
Levi,N.; Gebuhr,P.	2000	Early failure and mortality following intramedullary fixation of peritrochanteric fractures	Study combines multiple devices for intramedullary fixation
Levis,S.; Theodore,G.	2012	Summary of AHRQ's comparative effectiveness review of treatment to prevent fractures in men and women with low bone density or osteoporosis: update of the 2007 report	Review
Lewis,J.R.; Hassan,S.K.; Wenn,R.T.; Moran,C.G.	2006	Mortality and serum urea and electrolytes on admission for hip fracture patients	Very low strength of evidence
Lewis,S.L.; Rees,J.I.; Thomas,G.V.; Williams,L.A.	1991	Pitfalls of bone scintigraphy in suspected hip fractures	Not relevant, scintigraphy study
Liao,L.; Zhao,Jm; Su,W.; Ding,Xf; Chen,Lj; Luo,Sx	2012	A meta-analysis of total hip arthroplasty and hemiarthroplasty outcomes for displaced femoral neck fractures	Meta-Analysis

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Licciardone,J.C.; Stoll,S.T.; Cardarelli,K.M.; Gamber,R.G.; Swift,J.N.,Jr.; Winn,W.B.	2004	A randomized controlled trial of osteopathic manipulative treatment following knee or hip arthroplasty	Incorrect patient population
Lieberman,D.; Lieberman,D.	2004	Rehabilitation following hip fracture surgery: a comparative study of females and males	
Light,T.R.; Keggi,K.J.	1980	Anterior approach to hip arthroplasty	Retrospective case series
Lim,W.; Kennedy,N.	1994	Hemi-arthroplasty of the hip under triple nerve block	Case Report
Lindequist,S.; Malmqvist,B.; Ullmark,G.	1989	Fixation of femoral neck fracture. Prospective comparison of von Bahr screws, Gouffon screws, and Hessel pins	Combined stability results
Loizou,C.L.; Parker,M.J.	2009	Avascular necrosis after internal fixation of intracapsular hip fractures; a study of the outcome for 1023 patients	Not relavent compares results for displaced and undisplaced fractures
Long,J.W.; Knight,W.	1980	Bateman UPF prosthesis in fractures of the femoral neck	Unclear if all patients have displaced hip
Lopes,J.B.; Danilevicius,C.F.; Takayama,L.; Caparbo,V.F.; Scazufca,M.; Bonfa,E.; Pereira,R.M.	2009	Vitamin D insufficiency: a risk factor to vertebral fractures in community-dwelling elderly women	Does not report patient oriented outcomes
Lord,S.R.; Needoff,M.	1996	The effects of a community exercise program on fracture risk factors in older womenPreoperative traction for hip fractures in the elderly: a clinical trial	Population not specific to hipfx rehab
Loubignac,F.; Chabas,J.F.	2009	A newly designed locked intramedullary nail for trochanteric hip fractures fixation: results of the first 100 Trochanteric implantations	Unclear if patients have unstable hips

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Louther,S.A.	1977	Nursing care study: internal fixation of intertrochanteric fracture with complicating thromboembolism	Case Report
Low,A.K.; Gursel,A.C.	2012	Mid-term outcome of total hip replacement using the posterior approach for displaced femoral neck fractures	60% of patients are hybrid (cement/uncement)
Luger,T.J.; Kammerlander,C.; Gosch,M.; Luger,M.F.; Kammerlander-Knauer,U.; Roth,T.; Kreutziger,J.	2010	Neuroaxial versus general anaesthesia in geriatric patients for hip fracture surgery: does it matter?	Narrative Review, bibliography screened
Lunsjo,K.; Ceder,L.; Tidermark,J.; Hamberg,P.; Larsson,B.E.; Ragnarsson,B.; Knebel,R.W.; Allvin,I.; Hjalmars,K.; Norberg,S.; Fornander,P.; Hauggaard,A.; Stigsson,L.	1999	Extramedullary fixation of 107 subtrochanteric fractures: a randomized multicenter trial of the Medoff sliding plate versus 3 other screw-plate systems	Combines results from stable and unstable patients
Lyon,L.J.; Nevins,M.A.	1973	Prevention of thromboembolism after hip fracture	Narrative Review
Macaulay,W.; Pagnotto,M.R.; Iorio,R.; Mont,M.A.; Saleh,K.J.	2006	Displaced femoral neck fractures in the elderly: hemiarthroplasty versus total hip arthroplasty	Review
Maggi,S.; Siviero,P.; Wetle,T.; Besdine,R.W.; Saugo,M.; Crepaldi,G.	2010	A multicenter survey on profile of care for hip fracture: predictors of mortality and disability	Prognostic multicenter survey
Mandell,R.M.	1972	Fracture of the femoral neck treated with Austin Moore prosthesis: clinical assessment and review of 60 cases	Retrospective case series
Maniscalco,P.; Rivera,F.; Bertone,C.; Urgelli,S.; Bocchi,L.	2002	Compression hip screw nail-plate system for intertrochanteric fractures	Unclear if stable and unstable hips are combined

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Marcus,R.E.; Heintz,J.J.; Pattee,G.A.	1992	Don't throw away the Austin Moore	Comparison of hemiarthroplasty techniques is not relevant. cannot use as case series, since it is a retrospective study
Marsland,D.; Mears,S.C.; Kates,S.L.	2010	Venous thromboembolic prophylaxis for hip fractures	Narrative review
Matejcic,A.; Bekavac-Beslin,M.; Ivica,M.; Tomljenovic,M.; Krolo,I.; Vucetic,B.	2002	Fractures of the proximal femur in the elderly	Unclear if all patients have stable fractures
Matre,K.; Vinje,T.; Havelin,L.I.; Gjertsen,J.E.; Furnes,O.; Espehaug,B.; Kjellevold,S.H.; Fevang,J.M.	2013	TRIGEN INTERTAN intramedullary nail versus sliding hip screw: a prospective, randomized multicenter study on pain, function, and complications in 684 patients with an intertrochanteric or subtrochanteric fracture and one year of follow-up	Study combines results for stable and unstable fractures
Mattsson,P.; Alberts,A.; Dahlberg,G.; Sohlman,M.; Hyldahl,H.C.; Larsson,S.	2005	Resorbable cement for the augmentation of internally-fixed unstable trochanteric fractures. A prospective, randomised multicentre study	Not relevant, augmentation of trochanteric fractures.
Mauffrey,C.; Morgan,M.; Bryan,S.	2007	The use of lateral X-ray view for the diagnosis and management plan of fractured neck of femurs	Retrospective medical records review, no diagnostic data
Mavrogenis,A.F.; Kouvidis,G.; Stavropoulos,N.A.; Stavrakakis,L.; Katonis,P.; Papagelopoulos,P.J.	2012	Sliding screw implants for extracapsular hip fractures	Classification: AO
Mavrogenis,A.F.; Nikolaou,V.; Efstathopoulos,N.; Korres,D.S.; Pneumaticos,S.G.	2011	Functional outcome and complications using the intramedullary hip screw for intertrochanteric fractures	Study combines results for stable and unstable fractures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
McBride,D.J.; Stother,I.G.	1988	Blood transfusion requirements in elderly patients with surgically treated fractures of the femoral neck	Retrospective case series
McCutchen,J.W.; Carnesale,P.G.	1982	Comparison of fixation in the treatment of femoral neck fractures	Not relevant retrospective comparison. cannot use as case series since study is retrospective
Mehta,K.V.; Lee,H.C.; Loh,J.S.	2010	Mechanical thromboprophylaxis for patients undergoing hip fracture surgery	Serious Methodological Flaw:
Mendelsohn,M.E.; Overend,T.J.; Petrella,R.J.	2004	Effect of rehabilitation on hip and knee proprioception in older adults after hip fracture: a pilot study	Very low quality study
Meuleman,J.	1989	Osteoporosis and the elderly	report
Miedel,R.; Tornkvist,H.; Ponzer,S.; Soderqvist,A.; Tidermark,J.	2011	Musculoskeletal function and quality of life in elderly patients after a subtrochanteric femoral fracture treated with a cephalomedullary nail	Classification: Seinsheimer & OTA, Sample size<10
Miki,R.A.; Oetgen,M.E.; Kirk,J.; Insogna,K.L.; Lindskog,D.M.	2008	Orthopaedic management improves the rate of early osteoporosis treatment after hip fracture. A randomized clinical trial	Does not report mean age
Milisen,K.; Foreman,M.D.; Abraham,I.L.; De,Geest S.; Godderis,J.; Vandermeulen,E.; Fischler,B.; Delooz,H.H.; Spiessens,B.; Broos,P.L.	2001	A nurse-led interdisciplinary intervention program for delirium in elderly hip-fracture patients	Not Relevant - Nurse-Led Intervention Strategies for delirium in patients
Mismetti,P.; Samama,C.M.; Rosencher,N.; Vielpeau,C.; Nguyen,P.; Deygas,B.; Presles,E.; Laporte,S.	2012	Venous thromboembolism prevention with fondaparinux 1.5 mg in renally impaired patients undergoing major orthopaedic surgery. A real-world, prospective, multicentre, cohort study	Not specific to hip fracture
Miyanishi,K.; Jingushi,S.; Torisu,T.	2010	Mortality after hip fracture in Japan: the role of nutritional status	Very low quality

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Moehring,H.D.	1988	Flexible intramedullary fixation of femoral fractures	Narrative Review
Moja,L.; Piatti,A.; Pecoraro,V.; Ricci,C.; Virgili,G.; Salanti,G.; Germagnoli,L.; Liberati,A.; Banfi,G.	2012	Timing Matters in Hip Fracture Surgery: Patients Operated within 48 Hours Have Better Outcomes. A Meta-Analysis and Meta-Regression of over 190,000 Patients	Meta-Analysis
Mok,C.K.; Hoaglund,F.T.; Rogoff,S.M.; Chow,S.P.; Ma,A.; Yau,A.C.	1979	The incidence of deep vein thrombosis in Hong Kong Chinese after hip surgery for fracture of the proximal femur	Not relevant. incidence of DVT
Mok,C.K.; Hoaglund,F.T.; Rogoff,S.M.; Chow,S.P.; Yau,A.C.	1980	The pattern of deep-vein thrombosis and clinical course of a group of Hong Kong Chinese patients following hip surgery for fracture of the proximal femur	Not relevent. incidence of DVT
Monreal,M.; Lafoz,E.; Navarro,A.; Granero,X.; Caja,V.; Caceres,E.; Salvador,R.; Ruiz,J.	1989	A prospective double-blind trial of a low molecular weight heparin once daily compared with conventional low-dose heparin three times daily to prevent pulmonary embolism and venous thrombosis in patients with hip fracture	Dosage study
Montgomery,S.P.; Lawson,L.R.	1978	Primary Thompson prosthesis for acute femoral neck fractures	Retrospective case series
Montrey,J.S.; Kistner,R.L.; Kong,A.Y.; Lindberg,R.F.; Mayfield,G.W.; Jones,D.A.; Mitsunaga,M.M.	1985	Thromboembolism following hip fracture	Very low strength
Moro Alvarez,M.J.; Diaz-Curiel,M.	2007	Pharmacological treatment of osteoporosis for people over 70	Narrative review
Morris,J.B.	1966	Charnley compression arthrodesis of the hip	Only a few patients had hip fracture

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Morrison,R.S.; Magaziner,J.; McLaughlin,M.A.; Orosz,G.; Silberzweig,S.B.; Koval,K.J.; Siu,A.L.	2003	The impact of postoperative pain on outcomes following hip fracture	Prognosis
Morscher,E.; Bombelli,R.; Schenk,R.; Mathys,R.	1981	The treatment of femoral neck fractures with an isoelastic endoprosthesis implanted without bone cement	Not best available evidence: case series that includes outcomes examined in 2 comparative studies
Mosher,G.L.; Robinson,R.H.	1972	Anesthesia for fractured hips. Innovar versus halothane	Comparison not considered for this guideline (two types of anasthesia)
Muir SW; Yohannes AM; New Zealand Guidelines Group (	2009	The impact of cognitive impairment on rehabilitation outcomes in elderly patients ad mitted with a femoral neck fracture: a systematic review	Systematic Review
Mulholland,R.C.; Gunn,D.R.	1972	Sliding screw plate fixation of intertrochanteric femoral fractures	
Mullen,J.O.; Mullen,N.L.	1992	Hip fracture mortality. A prospective, multifactorial study to predict and minimize death risk	Average age unclear
Murphy,P.J.; Rai,G.S.; Lowy,M.; Bielawska,C.	1987	The beneficial effects of joint orthopaedic-geriatric rehabilitation	Very low strength of evidence
Murphy,S.; Conway,C.; McGrath,N.B.; O'Leary,B.; O'Sullivan,M.P.; O'Sullivan,D.	2011	An intervention study exploring the effects of providing older adult hip fracture patients with an information booklet in the early postoperative period	Not relevant treatment
Myhre,H.O.; Storen,E.J.; Auensen,C.A.	1973	Pre- or postoperative start of anticoagulation prophylaxis in patients with fractured hips?	Does not meet study selection criteria: mean age cannot be determined
Myrvold,H.E.; Persson,J.E.; Svensson,B.; Wallensten,S.; Vikterlof,K.J.	1973	Prevention of thrombo-embolism with dextran 70 and heparin in patients with femoral neck fractures	Comparison not considered for this guideline

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Neumann,M.; Friedmann,J.; Roy,M.A.; Jensen,G.L.	2004	Provision of high-protein supplement for patients recovering from hip fracture	Does not answer recommendation
NHS Quality Improvement Scotland	2003	Anaesthesia: Care Before, During and After Anaesthesia	Clinical Standards for Anasthesia
Nicholson,C.M.; Czernwicz,S.; Mandilas,G.; Rudolph,I.; Greyling,M.J.	1997	The role of chair exercises for older adults following hip fracture	Very low quality study
Nicholson,C.M.; Czernwiecz,S.; Mandilas,G.; Rudolph,I.	1994	Post-fracture hip rehabilitation. Functional gains following a group-based chair exercise programme	Very low quality study
Nieminen,S.	1975	Early weightbearing after classical internal fixation of medial fractures of the femoral neck	Retrospective Comparitive Study
Nordkild,P.; Sonne-Holm,S.	1984	Sliding screw-plate for fixation of femoral neck fracture	Combined stability
Nungu,K.S.; Olerud,C.; Rehnberg,L.	1993	Treatment of subtrochanteric fractures with the AO dynamic condylar screw	Combines stable and unstable hips
Nungu,S.; Olerud,C.; Rehnberg,L.	1991	Treatment of intertrochanteric fractures: comparison of Ender nails and sliding screw plates	Study combines results for stable and unstable fractures
Nurmi-Luthje,I.; Luthje,P.; Kaukonen,J.P.; Kataja,M.; Kuurne,S.; Naboulsi,H.; Karjalainen,K.	2009	Post-fracture prescribed calcium and vitamin D supplements alone or, in females, with concomitant anti-osteoporotic drugs is associated with lower mortality in elderly hip fracture patients: a prospective analysis	Medical Records Review
Nyska,M.; Klin,B.; Shapira,Y.; Drenger,B.; Magora,F.; Robin,G.C.	1986	Epidural methadone for preoperative analgesia in patients with proximal femoral fractures	Very low strength

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Nyska,M.; Shapira,Y.; Klin,B.; Drenger,B.; Margulies,J.Y.	1989	Epidural methadone for analgesic management of patients with conservatively treated proximal femoral fractures	Less than 10 patients per group
O'Brien,P.J.; Meek,R.N.; Blachut,P.A.; Broekhuyse,H.M.; Sabharwal,S.	1995	Fixation of intertrochanteric hip fractures: gamma nail versus dynamic hip screw. A randomized, prospective study	Combined stability results
Ohman,U.; Bjorkegren,N.A.; Fahlstrom,G.	1968	Trochanteric fracture of the femur. A five-year follow up	Stability not reported
Ohsawa,S.; Miura,A.; Yagyu,M.; Oizumi,A.; Yamada,E.	2007	Assertive rehabilitation for intracapsular fracture of the proximal femur	Rehab used in place of surgery, instead of after surgery, very low quality
Oka,M.; Monu,J.U.	2004	Prevalence and patterns of occult hip fractures and mimics revealed by MRI	Retrospective case series
Oldmeadow LB; Edwards ER; Kimmel LA; Kipen E; Robertson VJ; Bailey MJ; New Zealand Guidelines Group (NZGG)	2006	No rest for the wounded: early ambulation after hip surgery accelerates recovery	Both groups receive same physical therapy. only difference is early ambulation for one group
Olerud,C.; Rehnberg,L.; Hellquist,E.	1991	Internal fixation of femoral neck fractures. Two methods compared	Not relevant comparison
Olseen,P.; Jonsson,B.; Ceder,L.; Besjakov,J.; Olsson,O.; Sernbo,I.; Lunsjo,K.	2008	The Hansson Twin Hook is adequate for fixation of trochanteric fractures: 2 fixation failures in a series of 157 prospectively followed patients	
Olsson,O.; Ceder,L.; Lunsjo,K.; Hauggaard,A.	2000	Extracapsular hip fractures: fixation with a twin hook or a lag screw?	Some patients had stable fractures
Ooi,L.H.; Wong,T.H.; Toh,C.L.; Wong,H.P.	2005	Hip fractures in nonagenarians--a study on operative and nonoperative management	Combines Intertrochanteric and Femoral Neck Fractures
Orcel,P.	1997	Calcium and vitamin d in the prevention and treatment of osteoporosis	1 Not Recalled Initially. No reason given.

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Orosz,G.M.; Hannan,E.L.; Magaziner,J.; Koval,K.; Gilbert,M.; Aufses,A.; Straus,E.; Vespe,E.; Siu,A.L.	2002	Hip fracture in the older patient: reasons for delay in hospitalization and timing of surgical repair	Not relevant. examines reasons for surgical delay
Ort,P.J.; LaMont,J.	1984	Treatment of femoral neck fractures with a sliding compression screw and two Knowles pins	Retrospective case series
Ostrup,L.T.	1970	Fracture of the femoral neck in cases with coxarthrosis on the affected side	Retrospective case series
Ozdemir,H.; Dabak,T.K.; Urguden,M.; Gur,S.	2003	A different treatment modality for trochanteric fractures of the femur in surgical high-risk patients: a clinical study of 44 patients with 21-month follow-up	Less than 10 patients had unstable fractures
Ozturk,A.; Ozkan,Y.; Akgoz,S.; Yalcyn,N.; Ozdemir,R.M.; Aykut,S.	2010	The risk factors for mortality in elderly patients with hip fractures: postoperative one-year results	Very low strength of evidence
Pakuts,A.J.	2004	Unstable subtrochanteric fractures--gamma nail versus dynamic condylar screw	Some patients had high energy fractures
Palm,H.; Lysen,C.; Krasheninnikoff,M.; Holck,K.; Jacobsen,S.; Gebuhr,P.	2011	Intramedullary nailing appears to be superior in pertrochanteric hip fractures with a detached greater trochanter: 311 consecutive patients followed for 1 year	Not relevant, fracture includes detachment of greater trochanter
Pandey,S.	1971	Intracapsular fracture of the femur neck treated by open reduction, S.-P. nailing and iliopsoas release. Preliminary report	Unclear if all patients have stable fractures
Papagiannopoulos,G.; Stewart,H.D.; Lunn,P.G.	1989	Treatment of subtrochanteric fractures of the femur: a study of intramedullary compression nailing	Does not meet study selection criteria: mean age less than 65 years of age

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Papaioannou,A.; Kennedy,C.C.; Giangregorio,L.; Ioannidis,G.; Pritchard,J.; Hanley,D.A.; Farrauto,L.; Debeer,J.; Adachi,J.D.	2011	A Randomized Controlled Trial of Vitamin D Dosing Strategies After Acute Hip Fracture: No Advantage of Loading Doses Over Daily Supplementation	No patient oriented outcomes
Park,J.H.; Lee,Y.S.; Park,J.W.; Wang,J.H.; Kim,J.G.	2010	A comparative study of screw and helical proximal femoral nails for the treatment of intertrochanteric fractures	Not considered for this guideline, PFN vs HPFN
Park,S.Y.; Yang,K.H.; Yoo,J.H.; Yoon,H.K.; Park,H.W.	2008	The treatment of reverse obliquity intertrochanteric fractures with the intramedullary hip nail	Does not meet study selection criteria: mean age less than 65 years of age
Parker,M.; Johansen,A.	2006	Hip fracture	
Parker,M.J.	2012	Cemented Thompson hemiarthroplasty versus cemented Exeter Trauma Stem (ETS) hemiarthroplasty for intracapsular hip fractures: a randomised trial of 200 patients	Comparison of types of hemi arthroplasty not relevant to guideline. when both groups are used as seperate case series, strength of evidence is very low
Parker,M.J.; Banajee,A.	2005	Surgical approaches and ancillary techniques for internal fixation of intracapsular proximal femoral fractures	Systematic review
Parker,M.J.; Dynan,Y.	2000	Surgical approaches and ancillary techniques for internal fixation of intracapsular proximal femoral fractures	Systematic review, bibliography screened
Parker,M.J.; Griffiths,R.; Appadu,B.N.	2002	Nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures	Systematic review
Parker,M.J.; Handoll,H.H.	2000	Preoperative traction for fractures of the proximal femur	Systematic review, updated
Parker,M.J.; Handoll,H.H.	2001	Preoperative traction for fractures of the proximal femur	Systematic review, updated, bibliography screened

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Parker,M.J.; Handoll,H.H.	2006	Preoperative traction for fractures of the proximal femur in adults	Systematic Review
Parker,M.J.; Handoll,H.H.; Griffiths,R.	2004	Anaesthesia for hip fracture surgery in adults	Meta-analysis
Parker,M.J.; Pryor,G.A.; Myles,J.	2000	11-year results in 2,846 patients of the Peterborough Hip Fracture Project: reduced morbidity, mortality and hospital stay	Unsure if all patients have unstable fractures
Parker,Martyn J.; Gurusamy,Kurinchi Selvan	2001	Internal fixation implants for intracapsular hip fractures in adults	Systematic review
Parker,Martyn J.; Gurusamy,Kurinchi Selvan; Azegami,Shin	2010	Arthroplasties (with and without bone cement) for proximal femoral fractures in adults	Systematic review
Parker,Martyn J.; Handoll-Helen,H.G.	2010	Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults	Systematic review, bibliography screened
Parker,Martyn J.; Handoll-Helen,H.G.	1998	Condylocephalic nails versus extramedullary implants for extracapsular hip fractures	Systematic review, bibliography screened
Parker,Martyn J.; Handoll-Helen,H.G.	2006	Replacement arthroplasty versus internal fixation for extracapsular hip fractures in adults	Systematic review, bibliography screened
Parker,Martyn J.; Handoll-Helen,H.G.	2009	Osteotomy, compression and other modifications of surgical techniques for internal fixation of extracapsular hip fractures	Systematic review, bibliography screened
Parker,Martyn J.; Pervez,Humayon	2002	Surgical approaches for inserting hemiarthroplasty of the hip	Systematic review, bibliography screened

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Parkinson,L.; Chiarelli,P.; Byrne,J.; Gibson,R.; McNeill,S.; Lloyd,G.; Watts,W.; Byles,J.	2007	Continence promotion for older hospital patients following surgery for fractured neck of femur: pilot of a randomized controlled trial	Not relevant
Patiala,H.; Lehto,K.; Rokkanen,P.; Paavolainen,P.	1984	Posterior approach for total hip arthroplasty. A study of postoperative course, early results and early complications in 131 cases	Patients had hip OA, instead of hip fracture
Paton,R.W.; Hirst,P.	1989	Hemiarthroplasty of the hip and dislocation	Appraised as very low strength of evidence
Paul,O.; Barker,J.U.; Lane,J.M.; Helfet,D.L.; Lorich,D.G.	2012	Functional and radiographic outcomes of intertrochanteric hip fractures treated with calcar reduction, compression, and trochanteric entry nailing	Very low quality: non consecutive case series
Paus,A.; Gjengedal,E.; Hareide,A.; Jorgensen,J.J.	1986	Dislocated fractures of the femoral neck treated with von Bahr screws or hip compression screw. Results of a prospective, randomized study	Comparison not considered for this guideline: HCS vs von Bahr screws, displaced fractures
Pavlin,J.D.; Kent,C.D.	2008	Recovery after ambulatory anesthesia	Review
Peterson,M.G.E.; Ganz,S.B.; Allegrante,J.P.; Cornell,C.N.	2004	High-intensity exercise training following hip fracture	Very Low Quality
Petrella,R.J.; Jones,T.J.	2006	Do patients receive recommended treatment of osteoporosis following hip fracture in primary care?	Case series with rehab and osteoporosis preventative treatment. can't tell which treatment causes effect: very low quality
Petrella,R.J.; Payne,M.; Myers,A.; Overend,T.; Chesworth,B.	2000	Physical function and fear of falling after hip fracture rehabilitation in the elderly	Very low quality study
Pfeifer,M.	2010	Musculoskeletal rehabilitation after hip fracture: a review	Review
Phillips,E.M.; Abrandt,B.L.; Cesta,T.; Gallucci,M.A.	1999	Rehabilitation after hip fracture	Different treatments not examined - only case worker vs no case worker

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Pierce,R.O.,Jr.; Powell,S.G.	1980	The treatment of fractures of the hip by Roger Anderson well-leg traction	Retrospective case series (medical record review)
Pimlott,B.J.; Jones,C.A.; Beaupre,L.A.; Johnston,D.W.C.; Majumdar,S.R.	2011	Prognostic impact of preoperative albumin on short-term mortality and complications in patients with hip fracture	Very low strength of evidence
Pini,M.; Tagliaferri,A.; Manotti,C.; Lasagni,F.; Rinaldi,E.; Dettori,A.G.	1989	Low molecular weight heparin (Alfa LHWH) compared with unfractionated heparin in prevention of deep-vein thrombosis after hip fractures	Dosage study
Pivec,R.; Johnson,A.J.; Mont,M.A.	2012	Results of total hip arthroplasty in patients who have rapidly progressive hip disease: a systematic review of the literature	Systematic review
Piziak,V.K.; Rajab,M.H.	2011	An effective team approach to improve postoperative hip fracture care	Does not address efficacy. only measures the number of patients using preventative osteoporosis drugs
Poigenfurst,J.; Schnabl,P.	1977	Multiple intramedullary nailing of pertrochanteric fractures with elastic nails: operative procedure and results	Retrospective case series
Poignard,A.; Bouhou,M.; Pidet,O.; Flouzat-Lachaniette,C.H.; Hernigou,P.	2011	High dislocation cumulative risk in THA versus hemiarthroplasty for fractures	Patients did not have ipsilateral hip disease
Pongkunakorn,A.; Thisayukta,P.; Palawong,P.	2009	Invention technique and clinical results of Lampang cement injection gun used in hip hemiarthroplasty	Not relevant comparison. study is retrospective so it cannot be used as a case series
Porthouse,J.; Cockayne,S.; King,C.; Saxon,L.; Steele,E.; Aspray,T.; Baverstock,M.; Birks,Y.; Dumville,J.; Francis,R.; Iglesias,C.; Puffer,S.; Sutcliffe,A.; Watt,I.; Torgerson,D.J.	2005	Randomised controlled trial of calcium and supplementation with cholecalciferol (vitamin D3) for prevention of fractures in primary care	Primary fracture prevention
Poulsen,T.D.; Ovesen,O.; Andersen,I.	1995	Percutaneous osteosynthesis with two screws in treating femoral neck fractures	Separate results for fracture type not reported

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Prendergast,S.	1982	Thompson's hemi arthroplasty	Case report
Pun,W.K.; Chow,S.P.; Ip,F.K.; Chan,K.C.; Leong,J.C.	1988	Long-term follow-up of Austin Moore hemiarthroplasty for femoral neck fractures	Retrospective case series
Raaymakers,E.L.; Marti,R.K.	1991	Nonoperative treatment of impacted femoral neck fractures. A prospective study of 170 cases	Very low quality study
Radcliff,T.A.; Regan,E.; Cowper Ripley,D.C.; Hutt,E.	2012	Increased use of intramedullary nails for intertrochanteric proximal femoral fractures in veterans affairs hospitals: a comparative effectiveness study	Review
Radford,P.J.; Needoff,M.; Webb,J.K.	1993	A prospective randomised comparison of the dynamic hip screw and the gamma locking nail	Combines stable and unstable hips
Rae,H.C.; Harris,I.A.; McEvoy,L.; Todorova,T.	2007	Delay to surgery and mortality after hip fracture	Risk factors
Rahme,D.M.; Harris,I.A.	2007	Intramedullary nailing versus fixed angle blade plating for subtrochanteric femoral fractures: a prospective randomised controlled trial	Combines stable and unstable hips
Ranhoff,A.H.; Martinsen,M.I.; Holvik,K.; Solheim,L.F.	2011	Use of warfarin is associated with delay in surgery for hip fracture in older patients	Does not answer if warfarin patients with longer durations until surgury has better outcomes
Rantanen,J.; Aro,H.T.	1998	Intramedullary fixation of high subtrochanteric femoral fractures: a study comparing two implant designs, the Gamma nail and the intramedullary hip screw	Unclear if patients have displaced fractures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Reigstad,A.; Brandt,M.; Hetland,K.R.	1986	Total hip replacement with Muller prosthesis and ICLH double cup. 2- to 6-year results of a prospective comparative study	Patients have hip OA. not relevant
Resnick,B.; D'Adamo,C.; Shardell,M.; Orwig,D.; Hawkes,W.; Hebel,J.; Golden,J.; Magaziner,J.; Zimmerman,S.; Yu-Yahiro,J.	0	Adherence to an exercise intervention among older women post hip fracture	Patient oriented outcomes not evaluated - study only looks at likeliness of adherence to program
Reynders,P.A.; Stuyck,J.; Rogers,R.K.; Broos,P.L.	1993	Subtrochanteric fractures of the femur treated with the Zickel nail	Retrospective case series
Riaz,S.; Alam,M.; Umer,M.	2006	Frequency of osteomalacia in elderly patients with hip fractures	Average age was 61
Richy,F.; Schacht,E.; Bruyere,O.; Ethgen,O.; Gourlay,M.; Reginster,J.Y.	2005	Vitamin D analogs versus native vitamin D in preventing bone loss and osteoporosis-related fractures: a comparative meta-analysis (Structured abstract)	Meta-analysis
Ring,P.A.	1974	Total replacement of the hip joint. A review of a thousand operations	Retrospective case series
Roberts,J.A.; Finlayson,D.F.; Freeman,P.A.	1987	The long-term results of the Howse total hip arthroplasty. With particular reference to those requiring revision	Retrospective case series
Robinson,C.M.; Houshian,S.; Khan,L.A.	2005	Trochanteric-entry long cephalomedullary nailing of subtrochanteric fractures caused by low-energy trauma	
Roder,F.; Schwab,M.; Aleker,T.; Morike,K.; Thon,K.P.; Klotz,U.	2003	Proximal femur fracture in older patients--rehabilitation and clinical outcome	Very low quality study
Rodgers,A.; Walker,N.; Schug,S.; McKee,A.; Kehlet,H.; van,Zundert A.; Sage,D.; Futter,M.; Saville,G.; Clark,T.; MacMahon,S.	2000	Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials	Narrative Review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Rogmark,C.; Johnell,O.	2006	Primary arthroplasty is better than internal fixation of displaced femoral neck fractures: a meta-analysis of 14 randomized studies with 2,289 patients	Meta-analysis, Bibliography Screened
Rolland,Y.; Pillard,F.; Lauwers-Cances,V.; Busquere,F.; Vellas,B.; Lafont,C.	2004	Rehabilitation outcome of elderly patients with hip fracture and cognitive impairment	Very low quality study
Rosen,L.L.; Miller,B.J.; Dupuis,P.R.; Jarzem,P.; Hadjipavlou,A.	1992	A prospective randomized study comparing bipolar hip arthroplasty and hemiarthroplasty in elderly patients with subcapital fractures [Abstract]	Not full text article
Rubin,S.J.; Marquardt,J.D.; Gottlieb,R.H.; Meyers,S.P.; Totterman,S.M.; O'Mara,R.E.	1998	Magnetic resonance imaging: a cost-effective alternative to bone scintigraphy in the evaluation of patients with suspected hip fractures	Retrospective medical records review, insufficient data
Ruchlin HS; Elkin EB; Allegrante JP; New Zealand Guidelines Group (	2001	The economic impact of a multifactorial intervention to improve postoperative rehabilitation of hip fracture patients	Patient-oriented outcomes not evaluated
S.V.; Rao,S.K.	2007	One and two femoral neck screws with intramedullary nails for unstable trochanteric fractures of femur in the elderly-Randomised clinical trial	Not relevant comparison
Saarenpaa,I.; Heikkinen,T.; Jalovaara,P.	2007	Treatment of subtrochanteric fractures. A comparison of the Gamma nail and the dynamic hip screw: short-term outcome in 58 patients	Combined stability results
Saarenpaa,I.; Heikkinen,T.; Ristiniemi,J.; Hyvonen,P.; Leppilahti,J.; Jalovaara,P.	2009	Functional comparison of the dynamic hip screw and the Gamma locking nail in trochanteric hip fractures: a matched-pair study of 268 patients	Combines results from stable and unstable patients

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Salama,R.	1966	Trochanteric fractures of the femur in the elderly. Early rehabilitation using a new strong nail plate	Narrative Review
Salazar,Carlos A.; Malaga,German; Malasquez,Giuliana	2010	Direct thrombin inhibitors versus vitamin K antagonists or low molecular weight heparins for prevention of venous thromboembolism following total hip or knee replacement	Systematic review
Salvati,E.A.; Wilson,P.D.,Jr.; Jolley,M.N.; Vakili,F.; Aglietti,P.; Brown,G.C.	1981	A ten-year follow-up study of our first one hundred consecutive Charnley total hip replacements	Average age at surgery <65
Sanders,R.; Regazzoni,P.	1989	Treatment of subtrochanteric femur fractures using the dynamic condylar screw	Does not meet study selection criteria: mean age less than 65 years of age
Santori,F.S.; Vitullo,A.; Stopponi,M.; Santori,N.; Ghera,S.	1994	Prophylaxis against deep-vein thrombosis in total hip replacement. Comparison of heparin and foot impulse pump	Does not investigate intervention for hip fractures (pimary total hip replacement)
Sanz-Reig,J.; Lizaur-Utrilla,A.; Serna-Berna,R.	2012	Outcomes in nonagenarians after hemiarthroplasty for femoral neck fracture. A prospective matched cohort study	Not relevant comparison
Saudan,M.; Lubbeke,A.; Sadowski,C.; Riand,N.; Stern,R.; Hoffmeyer,P.	2002	Pertrochanteric fractures: is there an advantage to an intramedullary nail?: a randomized, prospective study of 206 patients comparing the dynamic hip screw and proximal femoral nail	Study combines results for stable and unstable fractures
Scherfel,T.	1985	A new type of intramedullary nail for the internal fixation of subtrochanteric fractures of the femur	Does not meet study selection criteria: mean age less than 65 years of age

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Schewelov,Tv; Ahlborg,H.; Sanzen,L.; Besjakov,J.; Carlsson,A.	2012	Fixation of the fully hydroxyapatite-coated Corail stem implanted due to femoral neck fracture: 38 patients followed for 2 years with RSA and DEXA	Not relevant, Hydroxyapatite Coated Implant
Schipper,I.B.; van der Werken,C.	2004	Unstable Trochanteric Fractures and Intramedullary Treatment: The Influence of Fracture Patterns on Complications and Outcome	Study combines multiple devices for intramedullary fixation
Schlag,G.; Gaudernak,T.; Pelinka,H.; Kuderna,H.; Welzel,D.	1986	Thromboembolic prophylaxis in hip fracture	To active forms of heparin are compared. The comparison is not relevant. very low quality if used as case series
Schneider,K.; Audige,L.; Kuehnel,S.P.; Helmy,N.	2012	The direct anterior approach in hemiarthroplasty for displaced femoral neck fractures	Very low strength
Schneppendahl,J.; Grassmann,J.P.; Petrov,V.; Bottner,F.; Korbl,B.; Hakimi,M.; Betsch,M.; Windolf,J.; Wild,M.	2012	Decreasing mortality after femoral neck fracture treated with bipolar hemiarthroplasty during the last twenty years	ret
Schultz,E.; Miller,T.T.; Boruchov,S.D.; Schmell,E.B.; Toledano,B.	1999	Incomplete intertrochanteric fractures: imaging features and clinical management	Insufficient data to calculate diagnostic test performance
Schwenk,M.; Schmidt,M.; Pfisterer,M.; Oster,P.; Hauer,K.	2011	Rollator use adversely impacts on assessment of gait and mobility during geriatric rehabilitation	Incorrect patient Population - Included Stroke Patients and other patient groups
Semel,J.; Gray,J.M.; Ahn,H.J.; Nasr,H.; Chen,J.J.	2010	Predictors of outcome following hip fracture rehabilitation	Uses prealbumin as a predictor, instead of albumin
Seral,B.; Garcia,J.M.; Cegonino,J.; Doblare,M.; Seral,F.	2004	3D finite element analysis of the gamma nail and DHS plate in trochanteric hip fractures	Duplicate study

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Seral,B.; Garcia,J.M.; Cegonino,J.; Doblare,M.; Seral,F.	2004	Finite element study of intramedullary osteosynthesis in the treatment of trochanteric fractures of the hip: Gamma and PFN	Biomechanical study
Sernbo,I.; Johnell,O.; Baath,L.; Nilsson,J.A.	1990	Internal fixation of 410 cervical hip fractures. A randomized comparison of a single nail versus two hook-pins	Not relevent comparison
Sernbo,I.; Johnell,O.; Gentz,C.F.; Nilsson,J.A.	1988	Unstable intertrochanteric fractures of the hip. Treatment with Ender pins compared with a compression hip-screw	Comparison not considered for this guideline (CHS vs Ender pins, unstable fractures)
Setiobudi,T.; Ng,Y.H.; Lim,C.T.; Liang,S.; Lee,K.; Das,De S.	2011	Clinical outcome following treatment of stable and unstable intertrochanteric fractures with dynamic hip screw	Retrospective case series
Sharma,S.; Sankaran,B.	1980	Primary replacement arthroplasty of the hip in femoral neck fractures: a study of 145 cases	Average age unclear, and cannot tell if all patients have unstable fractures
Sherk,H.H.; Crouse,F.R.; Probst,C.	1974	The treatment of hip fractures in institutionalized patients. A comparison of operative and nonoperative methods	
Sherk,H.H.; Foster,M.D.	1985	Hip fractures: condylocephalic rod versus compression screw	Stability not reported
Sherrington,C.; Lord,S.R.	1997	Home exercise to improve strength and walking velocity after hip fracture: a randomized controlled trial	No patient oriented outcomes - gait not reported in results and questionaire validity not tested
Shiell,A.; Kenny,P.; Farnworth,M.G.	1993	The role of the clinical nurse co-ordinator in the provision of cost-effective orthopaedic services for elderly people	Not relevant treatment - nurse practitioner not focused on rehab

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Shiga,T.; Wajima,Z.; Ohe,Y.	2008	Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression	Meta-analysis, Bibliography Screened
Shokoohi,A.; Stanworth,S.; Mistry,D.; Lamb,S.; Staves,J.; Murphy,M.F.	2012	The risks of red cell transfusion for hip fracture surgery in the elderly	Not relevant comparison. compares patients who needed transfusion to those that did not need a transfusion. does not answer treatment efficacy
Shyu,Y.I.; Chen,M.L.; Chen,M.C.; Wu,C.C.; Su,J.Y.	2009	Postoperative pain and its impact on quality of life for hip-fractured older people over 12 months after hospital discharge	Case series
Sim,F.H.	1983	Displaced femoral neck fractures: the rationale for primary total hip replacement	Review
Sim,F.H.; Sigmond,E.R.	1986	Acute fractures of the femoral neck managed by total hip replacement	Inadequate reporting of outcomes
Sim,F.H.; Stauffer,R.N.	1980	Management of hip fractures by total hip arthroplasty	Very low strength of evidence-non consecutive enrollement of pateient in case series
Simunovic,N.; Devereaux,P.J.; Sprague,S.; Guyatt,G.H.; Schemitsch,E.; Debeer,J.; Bhandari,M.	2010	Effect of early surgery after hip fracture on mortality and complications: systematic review and meta-analysis	Meta-analysis, Bibliography Screened
Singh,Mangat K.; Mehra,A.; Yunas,I.; Nightingale,P.; Porter,K.	2008	Is estimated peri-operative glomerular filtration rate associated with postoperative mortality in fractured neck of femur patients?	Very low strength of evidence
Sipila,S.; Salpakoski,A.; Edgren,J.; Heinonen,A.; Kauppinen,M.A.; Arkela-Kautiainen,M.; Sihvonen,S.E.; Pesola,M.; Rantanen,T.; Kallinen,M.	2011	Promoting mobility after hip fracture (ProMo): study protocol and selected baseline results of a year-long randomized controlled trial among community-dwelling older people	No results presented. only presents methods and baseline data.

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Sircar,P.; Godkar,D.; Mahgerefteh,S.; Chambers,K.; Niranjan,S.; Cucco,R.	2007	Morbidity and mortality among patients with hip fractures surgically repaired within and after 48 hours	Patient mean age not reported
Siu,C.W.; Sun,N.C.; Lau,T.W.; Yiu,K.H.; Leung,F.; Tse,H.F.	2010	Preoperative cardiac risk assessment in geriatric patients with hip fractures: an orthopedic surgeons' perspective	Narrative Review
Skedros,J.G.	2004	The orthopaedic surgeon's role in diagnosing and treating patients with osteoporotic fractures: standing discharge orders may be the solution for timely medical care	Article address different types of fractures, not just hip fractures. results are not stratified
Skelly,J.M.; Guyatt,G.H.; Kalbfleisch,R.; Singer,J.; Winter,L.	1992	Management of urinary retention after surgical repair of hip fracture	Not relevant treatment - timing of catheterization, not rehab therapy
Skinner,P.; Riley,D.; Ellery,J.; Beaumont,A.; Coumine,R.; Shafighian,B.	1989	Displaced subcapital fractures of the femur: a prospective randomized comparison of internal fixation, hemiarthroplasty and total hip replacement	Duplicate study PM:2693355
Snook,G.A.; Chrisman,O.D.; Wilson,T.C.	1981	Thromboembolism after surgical treatment of hip fractures	Not relevant - Does not address timing
Song,W.; Chen,Y.; Shen,H.; Yuan,T.; Zhang,C.; Zeng,B.	2011	Biochemical markers comparison of dynamic hip screw and Gamma nail implants in the treatment of stable intertrochanteric fracture: A prospective study of 60 patients	Combined stability results
Soreide,O.; Molster,A.; Raugstad,T.S.	1979	Internal fixation versus primary prosthetic replacement in acute femoral neck fractures: a prospective, randomized clinical study	Unsure if patients had unstable fractures

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Soreide,O.; Molster,A.; Raugstad,T.S.; Olerud,S.	1979	Internal fixation of fractures of the neck of the femur using von Bahr screws and allowing immediated weight bearing: a prospective clinical study	Very low strength of evidence
Spreadbury,T.H.	1980	Anaesthetic techniques for surgical correction of fractured neck of femur. A comparative study of ketamine and relaxant anaesthesia in elderly women	Not relevant
Squires,B.; Bannister,G.	1999	Displaced intracapsular neck of femur fractures in mobile independent patients: total hip replacement or hemiarthroplasty?	Very low strength of evidence
Stappaerts,K.H.; Broos,P.L.	1987	Internal fixation of femoral neck fractures. A follow-up study of 118 cases	Very low strength of evidence
Stavrakis,T.A.; Lyras,D.N.; Psillakis,I.G.; Kremmydas,N.V.; Hardoyvelis,C.P.; Dermon,A.R.; Papathanasiou,J.V.; Kokka,A.S.; Rafailidou,E.E.; Ilieva,E.M.; Kazakos,K.I.	2009	Fractures of the femoral neck treated with hemiarthroplasty. A comparative study	<50% follow up
Stenvall,M.; Berggren,M.; Lundstrom,M.; Gustafson,Y.; Olofsson,B.	2012	A multidisciplinary intervention program improved the outcome after hip fracture for people with dementia--subgroup analyses of a randomized controlled trial	This is a subgroup analysis from included article PM:17061151 Stenvall 2007
Stern,M.B.; Goldstein,T.B.	1977	The use of the Leinbach prosthesis in intertrochanteric fractures of the hip	Stability not reported
Stern,R.; Lubbeke,A.; Suva,D.; Miozzari,H.; Hoffmeyer,P.	2011	Prospective randomised study comparing screw versus helical blade in the treatment of low-energy trochanteric fractures	Combined stability results
Strange-Vognsen,H.H.; Klareskov,B.	1989	The effect of skeletal traction on femoral neck fractures	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Stromberg,L.; Ohlen,G.; Lindgren,U.; Svensson,O.	1999	Continuity, assessment and feedback in orthopaedic nursing care practice is cost-effective	Very low strength
Stromqvist,B.; Hansson,L.I.; Nilsson,L.T.; Thorngren,K.G.	1987	Hook-pin fixation in femoral neck fractures. A two-year follow-up study of 300 cases	Very low strength of evidence
Suman,R.K.	1980	Prosthetic replacement of the femoral head for fractures of the neck of the femur: a comparative study	Comparison not considered for guideline: cannot be used as case series since the study is retrospective
Sutipornpalangkul,W.; Harnroongroj,T.	2007	Protein depletion in Thai patients with hip fractures	Very low quality
Svartling,N.; Lehtinen,A.M.; Tarkkanen,L.	1986	The effect of anaesthesia on changes in blood pressure and plasma cortisol levels induced by cementation with methylmethacrylate	No patient oriented outcomes
Svenningsen,S.; Benum,P.; Nesse,O.; Furset,O.I.	1984	Internal fixation of femoral neck fractures. Compression screw compared with nail plate fixation	Not relevant comparator
Symeonidis,P.D.; Clark,D.	2006	Assessment of malnutrition in hip fracture patients: effects on surgical delay, hospital stay and mortality	Very low strength of evidence
Taberner,D.A.; Poller,L.; Thomson,J.M.; Lemon,G.; Weighill,F.J.	1989	Randomized study of adjusted versus fixed low dose heparin prophylaxis of deep vein thrombosis in hip surgery	Dosage study
Taine,W.H.; Armour,P.C.	1985	Primary total hip replacement for displaced subcapital fractures of the femur	Retrospective case series
Tang,P.; Hu,F.; Shen,J.; Zhang,L.; Zhang,L.	2012	Proximal femoral nail antirotation versus hemiarthroplasty: a study for the treatment of intertrochanteric fractures	Not relevant

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Tao,Cheng; Guoyou,Zhang; Xianlong,Zhang	2011	Review: minimally invasive versus conventional dynamic hip screw fixation in elderly patients with intertrochanteric fractures: a systematic review and meta-analysis	Meta-analysis, bibliography screened
Tarantino,U.; Oliva,F.; Impagliazzo,A.; Mattei,A.; Cannata,G.; Pompili,G.F.S.; Maffulli,N.	2005	A comparative prospective study of dynamic variable angle hip screw and Gamma nail in intertrochanteric hip fractures	Stable and unstable results combined
Thakur,A.J.; Karkhanis,A.R.; Rao,D.R.; Mahajan,A.J.	1988	Treatment of intracapsular fracture of the femoral neck by Asnis cannulated hip screws	Does not meet study selection criteria: mean age 44
Thomas,W.G.; Villar,R.N.	1986	Subtrochanteric fractures: Zickel nail or nail-plate?	Retrospective Case Series
Tigani,D.; Laus,M.; Bettelli,G.; Boriani,S.; Giunti,A.	1992	The Gamma nail, sliding-compression plate. A comparison between the long-term results obtained in two similar series	Less than 50% follow-up
Tillberg,B.	1976	Treatment of fractures of the femoral neck by primary arthroplasty	Unclear if patients have displaced fractures
Tinetti,M.E.; Baker,D.I.; Gottschalk,M.; Garrett,P.; McGeary,S.; Pollack,D.; Charpentier,P.	1997	Systematic home-based physical and functional therapy for older persons after hip fracture	Very low strength of evidence
Todd,R.C.; Lightowler,C.D.; Harris,J.	1972	Total hip replacement in osteoarthrosis using the Charnley prosthesis	Mean age cannot be calculated
Tonino,A.J.	1982	The Thompson prosthesis in the treatment of subcapital fractures of the neck of the femur	Retrospective case series

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Toussant,E.M.; Kohia,M.	2005	A critical review of literature regarding the effectiveness of physical therapy management of hip fracture in elderly persons	Narrative Review, bibliography screened
Turner,P.; Cocks,J.; Cade,R.; Ewing,H.; Collopy,B.; Thompson,G.	1997	Fractured neck of the femur (DRG 210/211): prospective outcome study	Not relevant
Ulucay,C.; Eren,Z.; Kaspar,E.C.; Ozler,T.; Yuksel,K.; Kantarci,G.; Altintas,F.	2012	Risk Factors for Acute Kidney Injury After Hip Fracture Surgery in the Elderly Individuals	Creatine is the outcome. creatinine is not treated as a prognostic predictor of positive outcomes
Ungemach,J.W.; Andras,F.J.; Eggert,E.; Schoder,K.	1993	The role of anaesthesia in geriatric patients with hip fractures: A prospective study	Narrative Review
Unosson,M.; Ek,A.-C.; Bjurulf,P.; Von,Schenck H.; Larsson,J.	1995	Influence of macro-nutrient status on recovery after hip fracture	Not full text article
Urwin,S.C.; Parker,M.J.; Griffiths,R.	2000	General versus regional anaesthesia for hip fracture surgery: a meta-analysis of randomized trials	Systematic review
Uy,C.; Kurrle,S.E.; Cameron,I.D.	2008	Inpatient multidisciplinary rehabilitation after hip fracture for residents of nursing homes: a randomised trial	Report
van der Schaaf,D.B.; Steffelaar,H.	1987	Treatment of femoral neck fractures by hemiarthroplasty	Retrospective case series
Varela-Egocheaga,J.R.; Iglesias-Colao,R.; Suarez-Suarez,M.A.; Fernandez-Villan,M.; Gonzalez-Sastre,V.; Murcia-Mazon,A.	2009	Minimally invasive osteosynthesis in stable trochanteric fractures: a comparative study between Gotfried percutaneous compression plate and Gamma 3 intramedullary nail	Combines stable and unstable results
Varley,J.; Parker,M.J.	2004	Stability of hip hemiarthroplasties	Review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Verbeek,D.O.; Ponsen,K.J.; Goslings,J.C.; Heetveld,M.J.	2008	Effect of surgical delay on outcome in hip fracture patients: a retrospective multivariate analysis of 192 patients	Retrospective case series (medical record review)
Verbeeten,K.M.; Hermann,K.L.; Hasselqvist,M.; Lausten,G.S.; Joergensen,P.; Jensen,C.M.; Thomsen,H.S.	2005	The advantages of MRI in the detection of occult hip fractures	Insufficient data to calculate diagnostic test performance
Vidan,M.; Serra,J.A.; Moreno,C.; Riquelme,G.; Ortiz,J.	2005	Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture: a randomized, controlled trial	Insufficient information reported: the methods section page is missing from the study
Vidan,M.T.; Sanchez,E.; Gracia,Y.; Maranon,E.; Vaquero,J.; Serra,J.A.	2011	Causes and effects of surgical delay in patients with hip fracture: a cohort study	Not relevant, cause of surgical delay in patients with hip fracture
Villar,R.N.; Allen,S.M.; Barnes,S.J.	1986	Hip fractures in healthy patients: operative delay versus prognosis	Prognostic
Vochteloo,A.J.; Borger van der Burg BL; Mertens,B.; Niggebrugge,A.H.; de Vries,M.R.; Tuinebreijer,W.E.; Bloem,R.M.; Nelissen,R.G.; Pilot,P.	2011	Outcome in hip fracture patients related to anemia at admission and allogeneic blood transfusion: an analysis of 1262 surgically treated patients	Does not answer recommendation
Vochteloo,A.J.; Niesten,D.; Riedijk,R.; Rijnberg,W.J.; Bolder,S.B.; Koeter,S.; Kremers-van de Hei,K.; Gosens,T.; Pilot,P.	2009	Cemented versus non-cemented hemiarthroplasty of the hip as a treatment for a displaced femoral neck fracture: design of a randomised controlled trial	Study Protocol
von Muhlen,D.G.; Greendale,G.A.; Garland,C.F.; Wan,L.; Barrett-Connor,E.	2005	Vitamin D, parathyroid hormone levels and bone mineral density in community-dwelling older women: the Rancho Bernardo Study	Prognostic study. does not evaluate efficacy of treating vitamin d deficiency in hip fracture patients
Vossinakis,I.C.; Badras,L.S.	2002	The external fixator compared with the sliding hip screw for pertrochanteric fractures of the femur	Study combines stable and unstable results

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Wang,G.; Gu,G.S.; Li,D.; Sun,D.H.; Zhang,W.; Wang,T.J.	2010	Comparative study of anterolateral approach versus posterior approach for total hip replacement in the treatment of femoral neck fractures in elderly patients	Very low strength
Wang,J.; Jiang,B.; Marshall,R.J.; Zhang,P.	2009	Arthroplasty or internal fixation for displaced femoral neck fractures: which is the optimal alternative for elderly patients? A meta-analysis	Meta-analysis, Bibliography Screened
Watanabe,Y.; Minami,G.; Takeshita,H.; Fujii,T.; Takai,S.; Hirasawa,Y.	2002	Migration of the lag screw within the femoral head: a comparison of the intramedullary hip screw and the Gamma Asia-Pacific nail	No patient oriented outcomes
Waters,T.S.; Gibbs,D.M.; Dorrell,J.H.; Powles,D.P.	2006	Percutaneous dynamic hip screw	Stability not reported
Watson,H.G.; Baglin,T.; Laidlaw,S.L.; Makris,M.; Preston,F.E.	2001	A comparison of the efficacy and rate of response to oral and intravenous Vitamin K in reversal of over-anticoagulation with warfarin	Not Hip Fx Patients
Watts,N.B.; Adler,R.A.; Bilezikian,J.P.; Drake,M.T.; Eastell,R.; Orwoll,E.S.; Finkelstein,J.S.	2012	Osteoporosis in men: an Endocrine Society clinical practice guideline	Systematic Review/ Guideline
Weissman,S.L.; Salama,R.	1969	Trochanteric fractures of the femur. Treatment with a strong nail and early weight-bearing	Combines stable and unstable results
Welch,R.B.	1983	The rationale for primary hemiarthroplasty in the treatment of fractures of the femoral neck in elderly patients	Retrospective case series
Wells JL; Seabrook JA; Stolee	2003	State of the art in geriatric rehabilitation. Part II: clinical challenges	Systematic Review

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Wessler,S.; Avioli,L.V.	1968	Anticoagulants in treatment of patients with hip fracture	Report
Whatley,J.R.; Garland,D.E.; Whitecloud,T.,III; Whickstrom,J.	1978	Subtrochanteric fractures of the femur: treatment with ASIF blade plate fixation	Retrospective case series
Whitelaw,G.P.; Segal,D.; Sanzone,C.F.; Ober,N.S.; Hadley,N.	1990	Unstable intertrochanteric/subtrochanteric fractures of the femur	Combined stability results
Wickstrom,I.; Holmberg,I.; Stefansson,T.	1982	Survival of female geriatric patients after hip fracture surgery. A comparison of 5 anesthetic methods	Insufficient data for analysis
Wile,P.B.; Panjabi,M.M.; Southwick,W.O.	1983	Treatment of subtrochanteric fractures with a high-angle compression hip screw	Retrospective case series
Willems,J.M.; De Craen,A.J.; Nelissen,R.G.; van Luijt,P.A.; Westendorp,R.G.; Blauw,G.J.	2012	Haemoglobin predicts length of hospital stay after hip fracture surgery in older patients	Not relevant: studies effects of anemia on hospital stay. does not address efficacy of transfusion
Winter,J.H.; Fenech,A.; Bennett,B.; Douglas,A.S.	1983	Preoperative antithrombin III activities and lipoprotein concentrations as predictors of venous thrombosis in patients with fracture of neck of femur	Prognosis of VTE
Wolfgang,G.L.; Bryant,M.H.; O'Neill,J.P.	1982	Treatment of intertrochanteric fracture of the femur using sliding screw plate fixation	Retrospective case series (medical record review)
Wood,R.J.; White,S.M.	2011	Anaesthesia for 1131 patients undergoing proximal femoral fracture repair: a retrospective, observational study of effects on blood pressure, fluid administration and perioperative anaemia	Retrospective case series (medical record review)
Woogara,R.	1977	Nursing care study: sub-trochanteric fracture of femur	Case Report
Wright,J.K.; Gelikkol,G.; Torrance,J.D.; Peach,B.G.	1982	A preliminary study of the treatment of trochanteric fractures of the femur with the Kenwright nail	Unclear if all fractures are stable

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Xu,L.; McElduff,P.; D'Este,C.; Attia,J.	2004	Does dietary calcium have a protective effect on bone fractures in women? A meta-analysis of observational studies	Meta-analysis
Xu,Y.; Geng,D.; Yang,H.; Wang,X.; Zhu,G.	2010	Treatment of unstable proximal femoral fractures: comparison of the proximal femoral nail antirotation and gamma nail 3	Not considered for this guideline, PFNS vs Gamma Nail 3 for unstable trochanteric fractures
Yan,D.; Soon,Y.; Lv,Y.	2012	Proximal femoral nail antirotation versus Gamma nail in treatment of femoral trochanteric fractures	Combined stability results
Yaozeng,X.; Dechun,G.; Huilin,Y.; Guangming,Z.; Xianbin,W.	2010	Comparative study of trochanteric fracture treated with the proximal femoral nail anti-rotation and the third generation of gamma nail	Combined stability results
York,J.D.; Allen,P.G.; Smith,B.P.; Jinnah,R.H.	2010	Prosthetic treatment of hip fractures in the elderly patient	Narrative review
Young,Y.; Xiong,K.; Pruzek,R.M.; Brant,L.J.	2010	Examining heterogeneity of functional recovery among older adults with hip fractures	Does not determine treatment efficacy. looks at prognostic predictors of recovery among post-op patients who recieve rehab
Yu-Yahiro,J.A.; Resnick,B.; Orwig,D.; Hicks,G.; Magaziner,J.	2009	Design and implementation of a home-based exercise program post-hip fracture: the Baltimore hip studies experience	Outcomes not reported, very low strength of evidence
Zhou,F.; Zhang,Z.S.; Yang,H.; Tian,Y.; Ji,H.Q.; Guo,Y.; Lv,Y.	2012	Less invasive stabilization system (LISS) versus proximal femoral nail anti-rotation (PFNA) in treating proximal femoral fractures: a prospective randomized study	Combines stable and unstable fracture results
Zhu,K.; Devine,A.; Dick,I.M.; Wilson,S.G.; Prince,R.L.	2008	Effects of calcium and vitamin D supplementation on hip bone mineral density and calcium-related analytes in elderly ambulatory Australian women: A five-year randomized controlled trial	No patient oriented outcomes

Studies Excluded for Not Meeting Inclusion Criteria			
Authors	**Year**	**Title**	**Reason for Exclusion**
Zi-Sheng,A.; You-Shui,G.; Zhi-Zhen,J.; Ting,Y.; Chang-Qing,Z.	2012	Hemiarthroplasty vs primary total hip arthroplasty for displaced fractures of the femoral neck in the elderly: a meta-analysis	Meta-Analysis
Zou,J.; Xu,Y.; Yang,H.	2009	A comparison of proximal femoral nail antirotation and dynamic hip screw devices in trochanteric fractures	Does not meet study selection criteria: mean age cannot be determined

APPENDIX XIII
LETTERS OF ENDORSEMENT FROM EXTERNAL ORGANIZATIONS

THE HIP SOCIETY
6300 North River Road, Suite 727
Rosemont, IL 60018-4226 USA
Phone: (847)698-1638
Fax: (847)823-0536
Email: hip@aaos.org
Website: www.hipsoc.org
DEDICATED TO THE ADVANCEMENT OF KNOWLEDGE RELATING TO THE HIP JOINT SINCE 1968.

July 22, 2014

Kevin Shea, MD,
AAOS Clinical Practice Guidelines Section Leader
of the Committee on Evidence-Based Quality and Value American
Academy of Orthopaedic Surgeons
6300 N. River Road Rosemont,
IL 60018

Dear Dr. Shea,

The Hip Society's Board of Directors has voted to endorse the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly. This endorsement implies permission for the AAOS to officially list The Hip Society as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

We would like to take this opportunity and thank AAOS and your group for your leadership on this important project, and for providing an opportunity for The Hip Society's experts to be involved in the process.

Sincerely,

Paul F. Lachiewicz MD

Paul F. Lachiewicz, MD
President
The Hip Society

Cc: Deborah Cummins, Director, Research & Scientific Affairs, AAOS
Jayson N. Murray, MA, Manager, Evidence-Based Medicine Unit, AAOS

American Association of Clinical Endocrinologists
245 Riverside Avenue • Suite 200• Jacksonville, Florida 32202 • Phone: (904) 353-7878 • Fax: (904) 353-8185 • http://www.aace.com

August 5, 2014

Kevin Shea, MD
American Academy of Orthopaedic Surgeons
Clinical Practice Guidelines Section Leaders of the
Committee on Evidenced-Based Quality and Value
6300 North River Road
Rosemont, IL 60018

RE: **Clinical Practice Guideline on the *Management of Hip Fractures in the Elderly***

Dear Dr. Shea,

The AACE Board of Directors at its meeting on August 2, 2014, reviewed your letter inviting AACE to extend an endorsement of its recently completed AAOS Clinical Practice Guideline on the *Management of Hip Fractures in the Elderly*.

Since Dr. Pauline Camacho, AACE Vice President, represented AACE as an active participant on the guideline workgroup from its inception that would meet AACE's criteria for co-sponsorship of another organization's guidelines. Therefore, I am pleased to advice that AACE would be pleased to be listed accordingly as a co-sponsor of the guidelines in the introductory materials and press release. Otherwise, AACE will also be pleased to be listed as an endorsing organization.

Thank you again for your interest in working with AACE in the development of these important guidelines.

Sincerely,

Donald C. Jones, CEO

cc: AACE Executive Committee
Daniel C. Kelsey, Deputy CEO

Orthopaedic Trauma Association
Education • Research • Service
6300 North River Road, Suite 727, Rosemont, Illinois 60018-4226
(847) 698-1631• www.ota.org • ota@aaos

August 15, 2014

Dear Kevin Shea, MD

The Orthopaedic Trauma Association (OTA) has voted to endorse the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Kathleen Caswell

Kathleen Caswell
OTA Executive Director

AGS | THE AMERICAN GERIATRICS SOCIETY
Geriatrics Health Professionals.
Leading change. Improving care for older adults.

40 FULTON STREET, 18TH FLOOR
NEW YORK, NEW YORK 10038
212.308.1414 TEL 212.832.8646 FAX
www.americangeriatrics.org

Dear Kevin Shea, MD,

The American Geriatrics Society has voted to endorse the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly Clinical Practice Guideline. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Wayne McCormick, MD

President, The American Geriatrics Society

Dear Kevin Shea, MD,

The Orthopaedic Rehabilitation Association has voted to endorse the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Ernest B, Marsolais, MD, PhD
President

Dear Kevin Shea, MD

The AAPM&R Board of Governors has voted to endorse the AAOS Clinical Practice Guidelines on the Management of Hip Fractures in the Elderly, and the Management of Anterior Cruciate Ligament Injuries. This endorsement implies permission for the AAOS to officially list our organization as an endorser of these guidelines.

Christina Hielsberg

United States Bone and Joint Initiative, NFP
6300 North River Road
Rosemont, IL 60018

847.430.5052/5053
847.823.1822 Fax
usbji@usbji.org

August 19, 2014

Kevin Shea, MD
Clinical Practice Guidelines Section Leader
Committee on Evidence-Based Quality and Value
American Academy of Orthopaedic Surgeons
6300 N. River road
Rosemont, IL 60018

Dear Dr. Kevin Shea,

The United States Bone and Joint Initiative has voted to endorse the AAOS Clinical Practice Guideline on the Management of Hip Fractures in the Elderly.

This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Toby King
Executive Director