Management of Hip Fractures in the Elderly

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Abstract

The purpose of this clinical practice guideline is to help improve treatment and management of hip fractures in the elderly based on current best evidence. The guideline contains twenty-five recommendations, including both diagnosis and treatment. Of those recommendations, strong evidence supports regional analgesia to improve preoperative pain control, similar outcomes for general or spinal anesthesia, arthroplasty for patients with unstable (displaced) femoral neck fractures, the use of a cephalomedullary device for the treatment of patients with subtrochanteric or reverse obliquity fractures, a blood transfusion threshold of no higher than 8 g/dL in asymptomatic postoperative patients, intensive physical therapy postdischarge, use of an interdisciplinary care program in patients with mild to moderate dementia, and multimodal pain management after hip fracture surgery. In addition to the recommendations, the work group highlighted the need for better research in the treatment of hip fractures.

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This Clinical Practice Guideline was approved by the American Academy of Orthopaedic Surgeons Board of Directors on September 5, 2014.

The complete document, *Management of Hip Fractures in the Elderly: Evidence-Based Clinical Practice Guideline,* includes all tables, figures, and appendices, and is available at http://www.aaos.org/guidelines

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Overview and Rationale

The American Academy of Orthopaedic Surgeons (AAOS), with input from representatives from the US Bone and Joint Initiative, American College of Emergency Physicians, Endocrine Society, American Association of Hip and Knee Surgeons, Hip Society, American Osteopathic Academy of Orthopaedics/American Osteopathic Association, American Academy of Physical Medicine and Rehabilitation, American Academy of Family Physicians, American Geriatrics Society, American Society for Bone and Mineral Research, American Association of Clinical Endocrinologists, Orthopaedic Rehabilitation Association, and Orthopaedic Trauma Association, recently published the clinical practice guideline (CPG), *Management of Hip Fractures in the Elderly*.[1] This clinical practice guideline was approved by the AAOS Board of Directors in September 2014 and has been officially endorsed by the American Association of Clinical Endocrinologists, American Geriatrics Society, the Hip Society, the Orthopaedic Rehabilitation Association, the Orthopaedic Trauma Association, and the US Bone and Joint Initiative. The purpose of this clinical practice guideline is to help improve treatment and management based on current best evidence.

Treatment of hip fractures in the elderly has a major impact on the healthcare system in the United States, with an estimated 258,000 fractures in 2010.[2,3] The annual United States economic burden for managing hip fractures was estimated at $17 to $20 billion in 2010; hip fracture treatment was ranked 13th of the top 20 most expensive diagnoses for Medicare in 2011. Hip fractures are projected to become

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more common as life expectancies increase. It is estimated that by the year 2030, the annual number of hip fractures in the United States will be 289,000.[4]

Despite recent studies indicating a downward trend in hip fracture incidence and associated mortality rates, significant concerns remain. The population is aging, and thus there are indications of rising costs of care and increasing volumes of surgeries. In addition to the direct economic impact of hip fracture treatment, there is a considerable societal impact because elderly hip fracture patients are at risk for (1) increased rate of mortality, (2) inability to return to prior living circumstances, (3) the need for an increased level of care and supervision, (4) decreased quality of life, (5) decreased level of mobility and ambulation, and (6) secondary osteoporotic fractures, including a second or contralateral side hip fracture.

To address this healthcare concern, in 2011 the AAOS leadership allocated resources to formulate an evidence-based CPG evaluating the management of hip fractures in the elderly.[1] The work group formulated preliminary recommendations that were designed to be important and actionable interventions to create a clinically relevant document addressing the management of hip fractures across the episode of care. An extensive literature search was done to investigate these preliminary topics, based on strict inclusion criteria designed to identify the best available evidence. The many citations were summarized, classified by patient outcomes, and graded by strength of methodology representing the best available evidence to be used by the work group to formulate final evidence-based recommendations. The recommendations underwent a rigorous internal and external peer review process resulting in the final approved CPG.

The entire process adhered to the strict evidence-based CPG methodology developed by the AAOS under the guidance of an oversight chair. The scientific nature of this process is often misunderstood because it includes only primary research articles published in peer-reviewed journals, which excludes all secondary research, including systematic and narrative reviews. However, research analysts comb through the bibliographies of relevant secondary research, and any citations that meet the inclusion criteria are evaluated. Additionally, registry data reports and conference abstracts do not meet the standard of articles published in a peer-reviewed journal; however, if articles based on the registry data or conference proceedings are published, they are then evaluated for inclusion as support for particular recommendations. Sometimes, retrospective series, small case series, and case reports are excluded either because of the inherent risk of bias or because higher quality of evidence is available to address the same question. A "best evidence synthesis" is used whereby only the best available evidence for any given outcome is applied to create the recommendation ratings as strong, moderate, or limited. The use of this best-evidence protocol reduces the adverse or favorable effect of poorly designed studies on the final recommendation. A consensus recommendation can be formulated only by the work group if there is no supporting evidence and when not establishing a recommendation could have catastrophic consequences, such as loss of life or limb. There are no consensus recommendations in the AAOS *Management of Hip Fractures in the Elderly* CPG.

In summary, the hip fracture guideline involved reviewing more than 16,000 abstracts and more than 1,700 full-text articles to develop 25 recommendations supported by 169 research articles that meet stringent inclusion criteria. Each recommendation is based on a systematic review of the research literature related to its topic, which resulted in 8 recommendations classified as strong, 15 as moderate, and 2 as limited. Strength of recommendation is assigned based on the quality of the supporting evidence.

Collectively, from these recommendations, a theme emerges. The optimal care of the geriatric hip fracture patient occurs in the setting of a multidisciplinary team of providers with a patient-centered focus. This is demonstrated by the fact that the guideline has recommendations regarding treatments throughout the continuum of care involving multiple specialties, including regional analgesia in the emergency room with multimodal pain control, anesthesia, postoperative physical and occupational therapy, interdisciplinary care, nutritional supplementation, and

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osteoporosis evaluation, in addition to the surgical recommendations.

This CPG provides orthopaedic surgeons and other physicians with evidence-based principles that should be used to develop programs and to advocate for improving the standard of care for hip fracture patients. These recommendations will form the basis of developing appropriate use criteria and quality measures to improve the care of elderly hip fracture patients in the future.

This summary overview describes the pertinent highlights and limitations of the guideline, which will contribute to understanding the nuances associated with these recommendations so that they may be used in the appropriate context of the supporting evidence to best affect patient care.

First and foremost, minimizing delirium is critical to achieving good outcomes and is a common goal of many of the recommendations. Recommendations that may reduce the incidence of delirium include preoperative regional analgesia and multimodal pain control designed to minimize narcotic use; minimizing delay to surgery to allow early mobility; nutritional support; and an interdisciplinary approach that includes intensive physical therapy. The practice of regional blocks is not standard in many hospital settings and represents an opportunity for improvement in patient care.

Another key goal to improve the care of patients with hip fractures addressed in the guideline is the prevention of secondary fractures and the identification and treatment of osteoporosis. A strong recommendation reflecting interdisciplinary care involves intensive physical therapy throughout the continuum of care focused on improving balance, mobility, functional activities of daily living, strength, and fall prevention to reduce the risk of further fragility fractures. The important goal of reducing subsequent fragility fractures is also addressed with a moderate recommendation that patients who have sustained a hip fracture be referred for an osteoporosis evaluation, as well as implementation of vitamin D and calcium supplementation. Concern was expressed during public commentary because these recommendations were rated moderate, whereas other respected clinical guidelines focusing on the treatment of osteoporosis and fragility fracture prevention seem to be stronger. However, the moderate-strength recommendation is a reflection of a smaller evidence base specific to hip fractures compared with a larger pool of evidence relating to the treatment of primary osteoporosis and fragility fracture prevention. This moderate recommendation is not meant to de-emphasize the importance of diagnosis and treatment of osteoporosis for prevention of secondary fractures; rather, it specifically supports that patients be evaluated and treated for osteoporosis after sustaining a hip fracture.

Venous thromboembolism (VTE) prophylaxis and transfusion is also addressed in the CPG recommendations with moderate evidence to support use of VTE prophylaxis in hip fracture patients. Concerns were again expressed in peer review that this recommendation did not merit a "strong" rating, but this is a reflection of the moderate evidence available specific to hip fracture patients, rather than the probable effectiveness and benefit of such therapy. The work group emphasized the significant risk factors associated with VTE complications and recommended that VTE prophylaxis be used to prevent the significant consequences of deep venous thrombosis or pulmonary embolism as a complication in this high-risk population.

A strong recommendation supports a lower transfusion threshold of hemoglobin no greater than 8 g/dL in asymptomatic postoperative hip fracture patients, which has the potential to reduce the incidence of blood transfusions. Hip fracture patients historically have significant transfusion rates (>30%), which leaves considerable room for improvement to decrease transfusions, thus reducing associated complications and hospital costs.[5,6] In a randomized controlled trail, Gruber-Baldini et al[7] investigated the incidence of delirium associated with transfusion triggers of 8 g/dL and 10 g/dL; they reported no significant difference between these two groups.

The CPG also has a moderate-strength recommendation supporting early surgery within 48 hours, which may reduce mortality. This recommendation was challenging in that much of the evidence is confounded because the sickest patients often have the longest delays. Patients delayed because of medical reasons had the highest mortality rate, and it is this subset of patients that could potentially benefit the most from earlier surgery.

Some of the recommendations of interest to the peer reviewers involved surgical technique, particularly with regard to cemented stems and partial versus total hip arthroplasty (THA) for the treatment of displaced femoral neck fractures. Regarding surgical treatment of displaced femoral neck fractures, a moderate recommendation supports both the preferential use of cemented femoral stems in patients undergoing arthroplasty and reports similar outcomes with the use of unipolar and bipolar implants. The recommendation supporting the utility of cemented stems was addressed during public commentary and, although supported by evidence suggesting lower complications, particularly with regard to fracture, the work group acknowledges that results may be affected by implant design and the experience of the

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surgeon. This is also a topic that may be better addressed by further research involving larger randomized comparative trials or registry data.

The recommendation addressing hemiarthroplasty versus THA cites moderate evidence in support of THA in properly selected patients with unstable femoral neck fractures and was also addressed during peer review. The important part of this recommendation involves not only appropriate patient selection but also the fact that it is critical that treatment be predicated on surgeon experience. Although THA may offer improved function and long-term results in select patients, surgeon experience and patient factors need to be considered to outweigh the inherent risks of a more complicated and expensive procedure.

The CPG also contained a moderate recommendation supporting higher dislocation rates with the posterior approach compared with the anterolateral approach when treating displaced femoral neck fractures with hip arthroplasty. Reviewers identified that some surgeons may not be experienced with the anterolateral approach. The evidence available supports this recommendation, but the authors agree with the caveat that surgeons need to make treatment decisions for their patients commensurate with their experience and level of training. The recommendation does not advocate an anterior approach, stating only that the literature supports a higher dislocation rate with a posterior approach. As stated in the CPG, "input based on ... the clinician's surgical experience and skills increases the probability of identifying patients who will benefit from specific treatment options."[1]

An additional recommendation found moderate support for the use of MRI as the advanced imaging method of choice for the diagnosis of presumed hip fracture not apparent on initial radiographs. MRI is the literature standard with regard to accuracy and does not have the time constraints of a bone scan, although the work group acknowledges that CT is often more accessible. Limited studies with small sample sizes have examined the use of CT in the diagnosis of occult hip fractures, but these did not meet inclusion criteria. Additionally, there is concern that a negative CT scan is not sufficient to exclude the possibility of fracture. Although the work group acknowledges with this recommendation that the type of secondary imaging used may be limited by considerations of access and availability, the current best evidence supports the use of MRI in this regard. Future research should include more comparative studies to better delineate the role of advanced imaging. This recommendation does not advocate transfer of a patient if MRI is unavailable, only that MRI is preferred if available.

Regarding anesthesia considerations, the guideline has a strong recommendation supporting the equivalency of either general or spinal anesthesia. Some of the data supporting spinal anesthesia date to the 1980s, challenging the medical community to address this issue with better-quality research in the future.

In summary, this guideline is not meant to discourage innovative care of patients with hip fractures. Rather, it is meant to elevate and possibly help standardize the current level of care and stimulate additional research where experience and evidence are not in agreement. It is a document that captures hip fracture treatment evidence as published before mid-2013. As part of a continuous improvement cycle, new data will emerge that clinicians will need to evaluate and then use to adjust and optimize care for their patients. It is also important that, as clinicians, we close the quality cycle by evaluating the outcomes of these recommendations in patient care to validate the clinical utility of the guideline.

The recommendations in this guideline are not intended to be a fixed protocol and, as with all evidence-based recommendations, practitioners must also rely on their clinical judgment and experience, as well as their patients' and their families' preferences and values, when making treatment decisions.

Recommendations

This summary of recommendations of the AAOS *Management of Hip Fractures in the Elderly: Evidence-Based Guideline* contains a list of the evidence-based treatment recommendations. Discussion of how each recommendation was developed and the complete evidence report are contained in the full guideline, available at www.aaos.org/guidelines. Readers are urged to consult the full guideline for the comprehensive evaluation of the available scientific studies. The recommendations were established using methods of evidence-based medicine that rigorously control for bias, enhance transparency, and promote reproducibility.

This summary of recommendations is not intended to stand alone. Medical care should be based on evidence, a physician's expert judgment, and the patient's circumstances, values, preferences, and rights. For treatment procedures to provide benefit, mutual collaboration with shared decision-making between patient and physician/allied healthcare provider is essential.

A Strong recommendation means that the quality of the supporting evidence is high. A Moderate recommendation means that the benefits exceed the potential harm (or that the potential harm clearly exceeds the benefits, in the case of a negative recommendation), but the quality/applicability of the supporting evidence is not as strong. A Limited recommendation means that there is

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a lack of compelling evidence that has resulted in an unclear balance between benefits and potential harm. A Consensus recommendation means that expert opinion supports the guideline recommendation even though there is no available empirical evidence that meets the inclusion criteria of the guideline's systematic review.

Advanced Imaging

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

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Preoperative Regional Analgesia

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

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

Preoperative Traction

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

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Surgical Timing

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

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Aspirin and Clopidogrel

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

Strength of recommendation: Limited.

Implication: Practitioners should feel little constraint in following a recommendation labeled as Limited, exercise clinical judgment, and be alert for emerging evidence that clarifies or helps to determine the balance between benefits and potential harm. Patient preference should have a substantial influencing role.

Anesthesia

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

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

Stable Femoral Neck Fractures

Moderate evidence supports operative fixation for patients with stable (nondisplaced) femoral neck fractures.

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Displaced Femoral Neck Fractures

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

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Hemiarthroplasty 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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new

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information and be sensitive to patient preferences.

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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

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.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

Unstable Intertrochanteric Fractures

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

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Venous Thromboembolism Prophylaxis

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

Strength of recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Transfusion Threshold

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

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

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.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Intensive Physical Therapy

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

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

Nutrition

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

Strength of Recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

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.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

Postoperative Multimodal Analgesia

Strong evidence supports multimodal pain management after hip fracture surgery.

Strength of recommendation: Strong.

Implication: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

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Calcium and Vitamin D

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

Strength of Recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

Screening

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

Strength of recommendation: Limited.

Implication: Practitioners should feel little constraint in following a recommendation labeled as Limited, exercise clinical judgment, and be alert for emerging evidence that clarifies or helps to determine the balance between benefits and potential harm. Patient preference should have a substantial influencing role.

Osteoporosis Evaluation and Treatment

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

Strength of Recommendation: Moderate.

Implication: Practitioners should generally follow a Moderate recommendation but remain alert to new information and be sensitive to patient preferences.

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