# AAOS Clinical Guideline on Osteoarthritis of the Knee (Phase II)
# Support Document

## OVERVIEW

Goals & Rationale

This clinical guideline has been created to improve patient care by outlining the appropriate information gathering and decision making processes involved in managing osteoarthritis of the knee in adults. Musculoskeletal care is provided in many different settings by many different providers. This guideline has been created as an educational tool to guide qualified physicians through a series of diagnostic and treatment decisions in an effort to improve 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 by the treating physician after a full assessment of all circumstances presented by a patient, including the needs and resources of a particular locality or institution.

Scope & Organization

This document addresses the treatment of osteoarthritis of the knee in skeletally mature individuals. The increasing elderly and increasingly overweight population has resulted in an increased prevalence of osteoarthritis of the knee.

This guideline is divided into two parts. Phase I is intended to address issues faced by the first contact physicians only. The physician first contacted by a patient with osteoarthritis of the knee is often a family practitioner or general practitioner. Phase I addresses the treatment rendered during the first twelve weeks after a patient presents with pain due to osteoarthritis of the knee. Phase II of this guideline deals with the management of osteoarthritis of the knee by "musculoskeletal specialists". For the purpose of this guideline, a "musculoskeletal specialist" is defined as "any licensed medical doctor who has completed a resident training program focused on the management of musculoskeletal conditions, including: orthopaedists, physiatrists and rheumatologists." Phase II of the guideline generally deals with management of patients who have had pain for 12 weeks or greater, despite treatment by the first contact physician, or for whom conservative treatment has been ineffective.

This Phase II guideline guides the user through discussion and choice of surgical options, when appropriate, available for patients with osteoarthritis of the knee with symptoms that are unrelieved by conservative treatment.

Methodology

*Revision Panel (1999 - 2003)*: Greg Stocks, MD, Chairman, Doug Dennis, MD, J. Wesley Mesko, MD, John A. Cardea, MD, Charles R. Clark, MD. *Original authors (1996 - 1999)*: Aaron Rosenberg, MD, Chairman, Steven F. Harwin, MD, Thomas Sculco, MD, Doug Dennis, MD, Don Reilly, MD, Howard Fuchs, MD, Chuck Bush Joseph, MD, Calvin Brown, MD, Robert Barrack, MD, Ray Wasielewski, MD, and Michael Kelly, MD.

*Process Overview:* The guideline was adapted from the 1996 AAOS Clinical Guideline on Knee Pain, originally developed by a multi-professional panel led by the American Academy of Orthopaedic Surgeons Task Force on Clinical Algorithms in cooperation with the AAOS Committee on Clinical Policies, the American Association of Neurological Surgeons, the American College of Physical Medicine and Rehabilitation, the American College of Rheumatology, as well as individuals in other medical specialties including family practice. The original panel or work group, with the assistance of the AAOS and various private and academic medical centers, completed a review of the relevant literature. The work group then participated in a series of meetings in which information from the literature was extracted and transformed into draft "decision trees." Information from the literature was supplemented by the consensus opinion of the work group when necessary. Multiple iterations of written review were then conducted by the participating individuals. Modifications, when supported by references from the literature, were then incorporated by the work group chairman.

The revision panel, with the help of Value Health Sciences, performed a new literature search, reviewed and graded articles, incorporating information into the guideline as appropriate. Information from the literature was supplemented by consensus. The work group members and specialty society representatives completed an objective evaluation of the 1996 Clinical Guideline on Knee Pain. These evaluations assisted the work group in focusing on the osteoarthritis diagnosis, and identifying areas of that portion of the guideline that needed expansion or revision.

The guideline will be reviewed and approved by various groups within the AAOS including the Evidence Analysis Work Group, Evidence-Based Practice Committee, Council on Research and Scientific Affairs, Board of Councilors, and Board of Directors prior to publication.

In developing this guideline the work groups made every effort to be consistent with the American Medical Association's Attribute of Practice Parameters. In brief, the guideline was developed by a physician's organization with scientific and clinical expertise and it is based on a reliable methodology that integrates science and consensus. It is comprehensive and specific, is based on current information, and will be widely disseminated.

*Evaluation of Existing Guidelines:* A search of MEDLINE, the National Guidelines Clearinghouse and the AMA's Clinical Practice Guidelines Directory (1999) was performed. Only one relevant guideline was located. The American College of Rheumatology Subcommittee on Osteoarthritis Guidelines: Recommendations for the medical management of Osteoarthritis of the Hip and Knee: 2000 Update, was reviewed by the work group.

*Literature Review: A* search of MEDLINE was performed in order to update the literature used to develop the original guideline. English language peer reviewed journals from 1990 to 2000; human studies of adults over 19 years of age were included. 75 articles were identified and reviewed.

*Weighing the Evidence:* All literature cited in the bibliography were reviewed and evaluated for quality according to the following categories:

| | |
|---|---|
| Type I | Meta-analysis of multiple, well-designed controlled studies; or high power randomized, controlled clinical trial. |
| Type II | Well-designed experimental study; or low-power randomized, controlled clinical trial. |
| Type III | Well-designed, non-experimental studies such as nonrandomized, controlled single-group, pre-post, cohort, time, or matched case-control series. |
| Type IV | Well-designed, non-experimental studies, such as comparative and correlational descriptive and case studies. |
| Type V | Case reports and clinical examples |

*Consensus/opinion as it is used in bibliography:* Articles representing expert consensus and not meeting the rigid I - V measurement are noted to represent consensus/opinion.

*Consensus Development:* The work group participated in a series of conference calls and meetings in which information was extracted and incorporated into the original algorithm. Information from the literature was supplemented by the consensus opinion of the work group, when necessary. Multiple iterations of the guideline were then completed and reviewed by work group members. Modifications (when supported by references from the literature) were then incorporated by the work group chairman.

*Strength of Recommendation:* The strength of the guideline recommendations for or against an intervention was graded as follows:

| | |
|---|---|
| A | Type I evidence or consistent findings from multiple studies of types II, III, or IV |
| B | Types II, III, or IV evidence and findings are generally consistent |
| C | Types II, III, or IV evidence, but findings are inconsistent |
| D | Little or no systematic empirical evidence |

*Revision Plans:* The guideline will be reviewed in 2008.

Definition of Terms:
**Musculoskeletal Specialist:** Any licensed medical doctor who has completed a resident training program focused on the management of musculoskeletal conditions, including but not limited to orthopaedists, physiatrists and rheumatologists.

## DIAGNOSIS

### Osteoarthritis

*Definition of the problem*
Osteoarthritis of the knee is an increasingly common problem due to a more active society, often leading to prior knee injuries; an increasingly elderly population; and a growing percentage of the population that is overweight. Osteoarthritis of the knee should be suspected when a patient presents with knee pain that has been longstanding, increases with activity, particularly weight bearing and stairs, and improves with rest. Onset of pain and dysfunction is often insidious. Deformity, fixed contracture, crepitance and effusion are common findings. The differential diagnoses include inflammatory arthritis, bursitis or tendonitis, anterior knee pain and internal derangement.

Patients entering Phase II of the guideline have failed to respond to conservative treatment. Pain, instability and function have not improved to a satisfactory level despite conservative treatment rendered, as outlined in Phase I of the guideline. This treatment may have included analgesics or nonsteroidal anti-inflammatory medications, activity modification including weight reduction and therapeutic exercise. It may have included trial of durable medical equipment such as knee braces, ambulatory assistive devices or orthoses. The patient may have undergone intra-articular injection in the knee with steroid or viscosupplementation.

*Recommendations*
For patients with osteoarthritis of the knee presenting to a musculoskeletal specialist, conservative treatment measures should have been exhausted. The age of the patient, level of symptomology, impact of knee dysfunction or pain on quality of life and medical comorbidity should be assessed. If there is a medical contraindication to surgery, conservative treatment should be continued. The diagnosis of neuropathic arthropathy should be considered. The role for surgical intervention, including arthroplasty, is not well defined for a neuropathic joint **("D" Recommendation).**

If a patient without a medical contraindication to surgery or neuropathic joint remains dissatisfied with the outcome of conservative care and has significant knee dysfunction, pain, or both, surgical alternatives should be considered. Evaluation by an orthopaedic surgeon is appropriate. Referral by a rheumatologist or physiatrist to an orthopaedic surgeon is indicated.

Previous Knee Infection or Osteomyelitis

For a patient with osteoarthritis that has failed to respond to conservative treatment and had a previous infection involving the knee, staged total knee replacement or knee fusion should be considered **("D" Recommendation).** The choice to proceed with surgery, and between the two options, should be based on the patient's age, activity level, occupation and a discussion. The discussion should include the natural history of the underlying condition including short- and long-term pain and physical impairment expectations with and without surgery. The efficacy of the proposed surgical procedure should be discussed. The risks and possible complications of each treatment option and reasonable expectation and timeframe to accomplish the expected outcome should be discussed.

Total joint replacement is contraindicated in the presence of active infection. When there is a history of infection, preoperative aspiration is often indicated. The risk of infection remains 10% or greater when total knee arthroplasty is performed even in the presence of infection in the distant past (**"D" Recommendation)**. In a young patient with history of chronic infection, knee fusion should be considered **("D" Recommendation)**. Good results have been reported in total knee arthroplasty in patients under 55 years of age **("B" Recommendation)**.

Knee fusion may be considered in young, active, high demand patients with isolated bi- or tri-compartmental degenerative arthritis, particularly when associated with severe knee instability.

Patients without significant joint space narrowing

Weight bearing standing anterior to posterior (AP) radiographs of the knee should be taken **("A" Recommendation)**. A lateral view of the knee joint and view tangential to the patellofemoral joint should be obtained. A standing radiograph, taken from posterior to anterior, with the knee flexed 45 degrees can show loss of cartilage in the posterior aspect of the knee **("A" Recommendation)**.

If there is suspicion of avascular necrosis (AVN) involving the knee, an MRI scan may be performed. If MRI confirms the presence of AVN in older patients, with extensive involvement of the condyle, total knee arthroplasty is often indicated **("B" Recommendation).** Younger patients with more localized involvement may be candidates for a lesser procedure **("C" Recommendation).**

If AVN is not present, and there is not significant joint space narrowing, arthroscopic debridement can be considered. Arthroscopic debridement may be indicated for the treatment of patients with degenerative arthritis with mechanical symptoms **("B" Recommendation)**. Neither arthroscopic lavage nor debridement is indicated for patients without mechanical symptoms **("A" Recommendation)**. Results of arthroscopic debridement in patients with mechanical symptoms are variable, but high success rates are reported when there is not gross malalignment or instability, there is some articular cartilage remaining, and symptoms are well localized **("B" Recommendation)**.

Abrasion or drilling has not been shown to have added benefit **("C" Recommendation)**. Careful patient selection is required. "For the subgroup of knees with loose bodies or flaps of meniscus or cartilage that are causing mechanical symptoms, especially locking, catching, or giving way of the joint, there is a consensus that arthroscopic removal of these unstable tissues improves joint function and alleviates symptoms." (Felson DT, Buckwalter J; Editorial: Debridement and Lavage for Osteoarthritis of the Knee, New Eng J Med, 347(2):132-3).

If arthroscopic debridement for osteoarthritis of the knee is considered, a discussion with the patient should include the natural history of the underlying condition including short- and long-term pain and physical impairment expectations with and without surgery. The efficacy of the proposed surgical procedure should be discussed. The risks and possible complications of each treatment option and reasonable expectation and timeframe to accomplish the expected outcome should also be discussed.

Bi-compartmental or Tri-compartmental Arthritis

Patients with bi- or tri-compartmental arthritis of the knee, who have failed to respond to conservative treatment, should be considered for total knee arthroplasty **("A" Recommendation).** The decision to proceed with total knee arthroplasty is shared by the patient and surgeon, and is based largely on quality of life issues. The choice to proceed with surgery should be based on the patients age, activity level, occupation and a discussion. The discussion should include the natural history of the underlying condition including short- and long-term pain and physical impairment expectations with and without surgery. The efficacy of the proposed surgical procedure should be discussed. The risks and possible complications of each treatment option and reasonable expectation and timeframe to accomplish the expected outcome should be discussed.

Total joint replacement is contraindicated in the presence of active infection. Good results have been reported in total knee arthroplasty in patients under 55 years of age **("B" Recommendation)**.

Medial Compartment Arthritis

Young, active patients with varus alignment, that have failed to respond to conservative treatment, should be considered for tibial osteotomy **("A" Recommendation).** Prerequisites for predictable results from proximal tibial osteotomy include: a range of motion of $5^o$ to $90^o$ or greater; maintenance of some articular cartilage medially; minimal involvement of the lateral and patellofemoral compartments; and, no more than minimal instability or lateral subluxation.

Patients who are less active may be considered for unicompartmental arthroplasty of the medial compartment of the knee **("B" Recommendation).** Pain should be well localized to the medial compartment and radiographs should demonstrate minimal involvement of the lateral and patellofemoral compartments. Reasonable weight and a functionally intact anterior cruciate ligament are associated with favorable outcome.

Patients with predominantly medial compartment arthritis who are not candidates for a tibial osteotomy or unicompartmental arthroplasty may be a candidate for total knee arthroplasty (**"A" Recommendation).**

A discussion with the patient should include the natural history of the underlying condition including short- and long-term pain and physical impairment expectations with and without surgery. The efficacy of the proposed surgical procedure should be discussed. The risks and possible complications of each treatment option and reasonable expectation and timeframe to accomplish the expected outcome should also be discussed.

Lateral Compartment Arthritis

Young, very active patients with isolated narrowing of the lateral compartment may be candidates for a distal femoral varus osteotomy **("B" Recommendation).** Distal femoral varus osteotomy is indicated when there is $10^{o}$ or more of tibiofemoral valgus, particularly when the joint line is oblique.

Patients who are not candidates for a distal femoral varus osteotomy may be candidates for total knee arthroplasty **("A" Recommendation),** or occasionally unicompartmental arthroplasty of the lateral compartment (**"C" Recommendation**).

Isolated Patellofemoral Arthritis

Young, very active patients with symptoms and radiographic changes isolated to the patellofemoral joint may be considered for a procedure to elevate the tibial tubercle **("D" Recommendation)** or a patellectomy **("D" Recommendation).** The role of patellectomy is not well defined and indications are limited. Results of tibial tubercle elevation have been variable with a significant complication rate.

A patient who is not young or very active may be a candidate for total knee arthroplasty **("B" Recommendation).** A patellofemoral arthroplasty may also be considered, but the role for this surgical procedure is not well defined and indications are limited **("B" Recommendation).**

A discussion with the patient should include the natural history of the underlying condition including short- and long-term pain and physical impairment expectations with and without surgery. The efficacy of the proposed surgical procedure should be discussed. The risks and possible complications of each treatment option and reasonable expectation and timeframe to accomplish the expected outcome should also be discussed.

*Clinical Outcomes*

Successful surgical treatment for osteoarthritis of the knee results in a significant, measurable improvement in quality of life. Arthroplasty procedures are associated with a high short term and long term success rate. Patient satisfaction is good; pain and function usually improve significantly. Ambulation is usually significantly improved

following successful knee arthroplasty. The ability to kneel and squat may not be improved with total knee arthroplasty.

Osteotomy procedures may be slightly less reliably successful and afford slightly less pain relief than arthroplasty procedures, but allow a young patient to remain active. This is important for relatively young patients with high occupational or recreational desires for knee function. Osteotomy procedures generally are associated with a significant short term and medium term improvement in quality of life.

*Alternative Approaches:*
Continued conservative care for osteoarthritis of the knee may result in continued pain, dysfunction and limitation in function. This often results in a diminution in quality of life. The avoidance of the risk and discomfort of surgery, for some patients, is desirable. There is some evidence that a long delay before arthroplasty is performed may result in a slightly poorer outcome, possibly due to worsening of muscle function and joint motion **("C" Recommendation).**

## FUTURE RESEARCH RECOMMENDATIONS

Many important questions regarding the surgical treatment of arthritis of the knee remain unanswered. These issues are outlined in the publication from the American Academy of Orthopaedic Surgery, Improving Musculoskeletal Care in America: Osteoarthritis of the Knee (September, 2002). Knee replacement surgery is frequently performed for severe arthritis of the knee, and generally results in a significant and durable improvement in quality of life. Future research should focus on improving patient-specific outcomes following knee replacement surgery, and other alternatives to total joint arthroplasty. Specifically, studies should address whether the number of patients who need revision surgery can be reduced by a combination of better designed implants made of improved materials, enhanced operative procedures, and the development of methodologies for achieving lasting fixation and reduction of wear.

Outcome studies, which assess and compare surgical therapies, are required to determine the optimum procedures for individual patients, because there is an inadequate empiric basis for determining which of the wide variety of available surgical options is most appropriate for which types or stages of osteoarthritis. These studies should address osteotomy, arthroscopic management, and total joint arthroplasty, and should include the use of new and innovative implants and materials.

Multidisciplinary participation in the design and conduct of the studies, use of a broad range of outcome variables, a combination of retrospective and prospective analyses, and standardization of surgical techniques used, should help elucidate the mechanism underlying observed differences in outcomes.

Continuing research on the role of wear debris on osteolysis is warranted. Research is needed to develop tests and accepted standards for the measurement of wear and wear debris that can be easily and inexpensively administered in the clinic for the early detection and quantification of wear.

Long-term, multi-center study of wear, wear patterns, oxidation, and positioning from revisions and autopsy retrieval is needed to identify differences in success and failure of total joint replacement. Development of a retrieval registry would facilitate the identification of meaningful correlations of wear and wear patterns to surgical procedures and biologic mediators.

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