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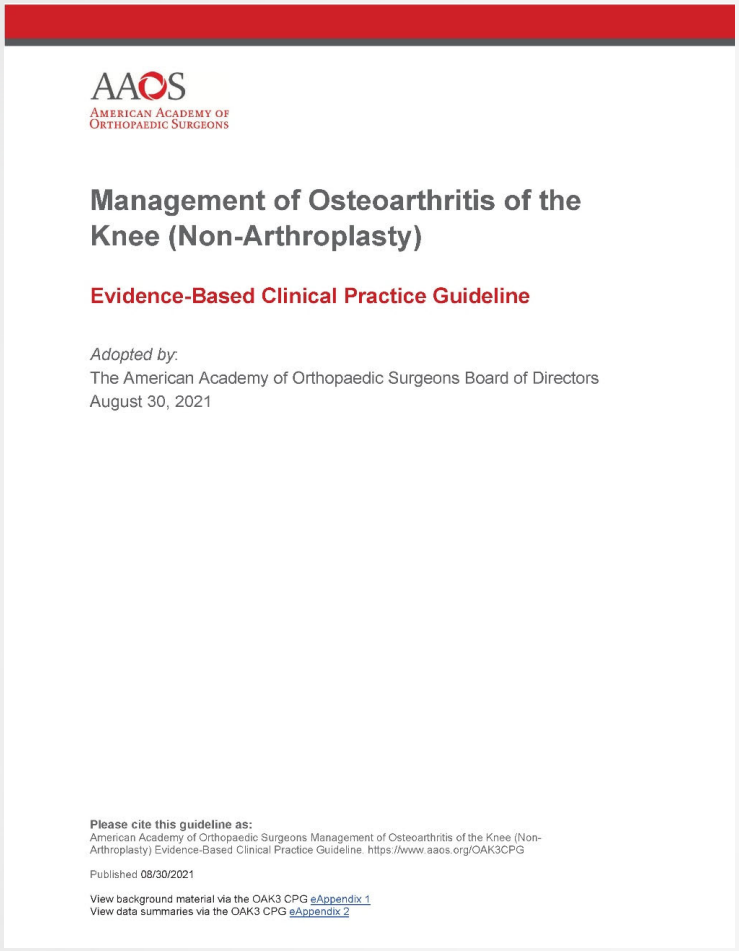
Clinical Practice Guideline for the Management of Osteoarthritis of the Knee (Non-Arthroplasty) 3rd Edition

Adopted by the American Academy of Orthopaedic Surgeons (AAOS) Board of Directors

August 31, 2021



The American Academy of Orthopaedic Surgeons 2021 Clinical Practice Guideline for the Management of Osteoarthritis of the Knee (Non-Arthroplasty) 3rd Edition

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WHAT IS A CLINICAL PRACTICE GUIDELINE?

Clinical Practice Guideline

A clinical practice guideline is a series of recommendations created to inform clinicians of best practices, based on best available evidence

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GOALS AND RATIONALE OF A CLINICAL PRACTICE GUIDELINE

- Improve treatment based on current best evidence
- Guides qualified physicians through treatment decisions to improve quality and efficiency of care
- Identify areas for future research

CPG recommendations are not meant to be fixed protocols; patients' needs, local resources, and clinician independent medical judgement must be considered for any specific procedure or treatment

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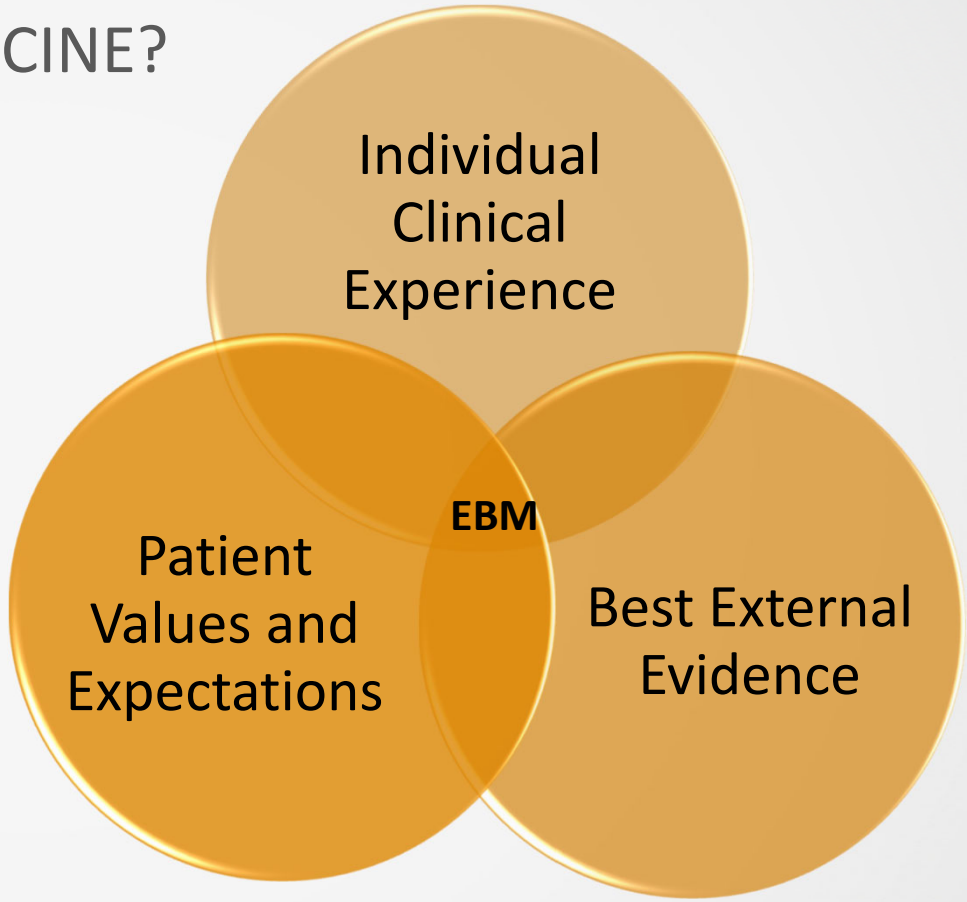
WHAT IS EVIDENCE-BASED MEDICINE?

Evidence-Based Medicine is a Combination of:

- ✓ *Individual Clinical Experience*
- ✓ *Best External Evidence*
- ✓ *Patient Values and Expectations*



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WHAT IS EVIDENCE-BASED MEDICINE?

Evidence-Based Medicine

Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence from clinical care research in the management of individual patients

Haynes, Sackett et al, 1996

Transferring evidence from research into practice

Sacket et al, 1996, BMJ

EBM: what it is and isn't

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IOM STANDARDS FOR DEVELOPING TRUSTWORTHY GUIDELINE

- Establish Transparency
- Management of Conflict of Interest
- Guideline Development Group Composition
- Clinical Practice Guideline-Systematic Review Intersection
- Establish Evidence of Foundations for and Rating Strength of Recommendations
- Articulation of Recommendations
- External Review
- Updating

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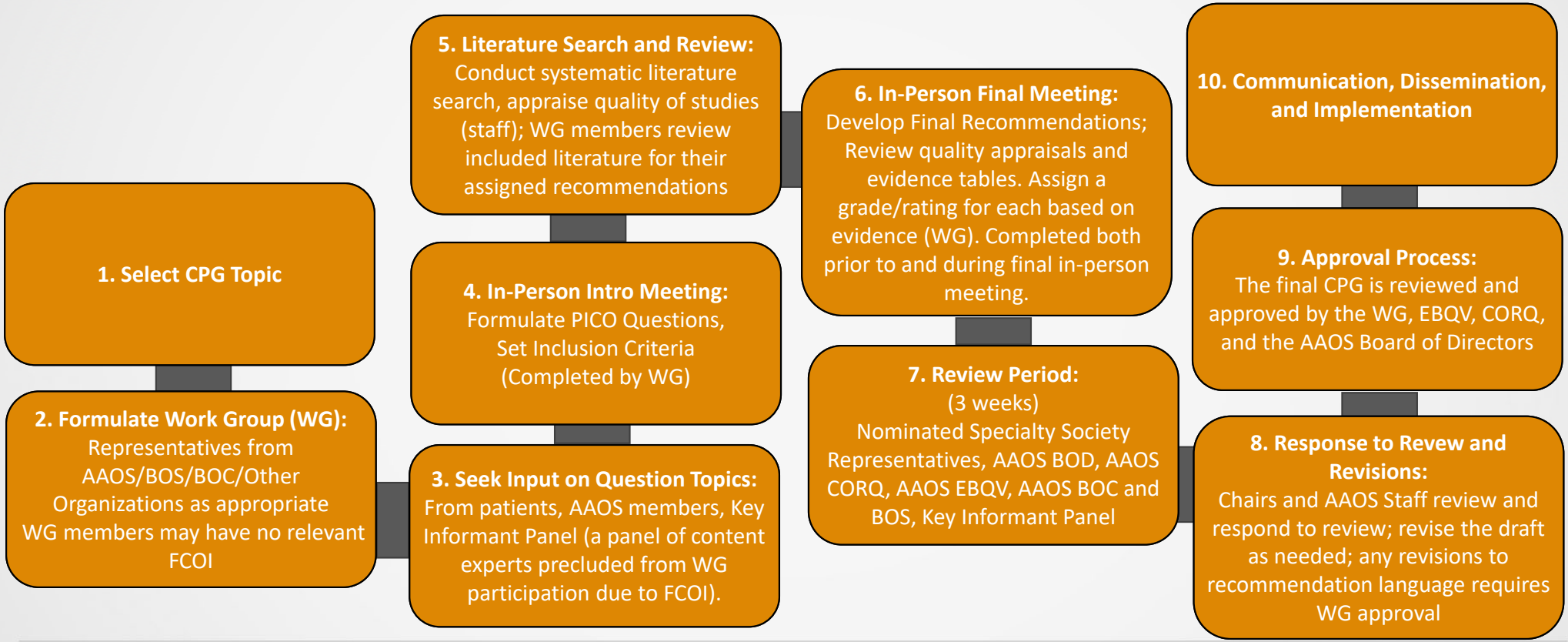
CLINICAL PRACTICE GUIDELINE PROCESS FLOWCHART



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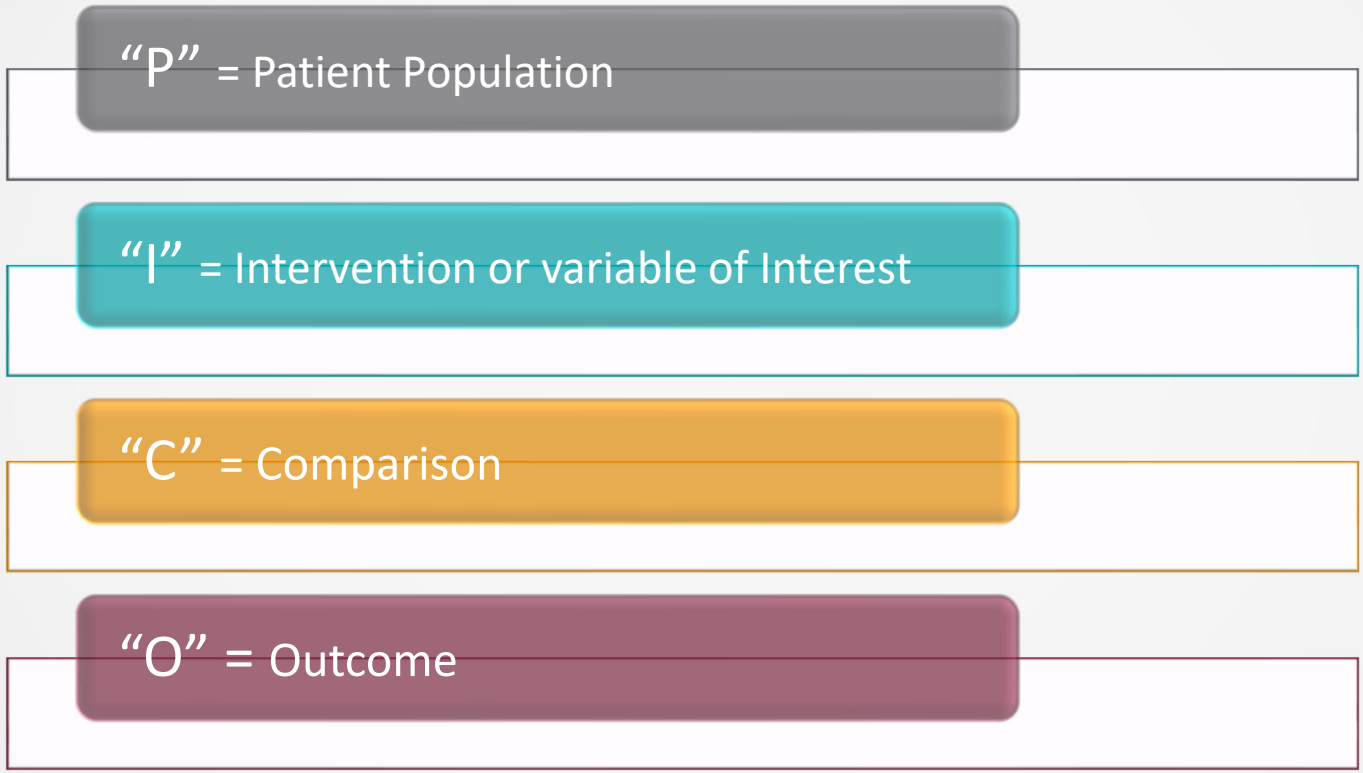
FORMULATING PICOs



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INCLUSION/EXCLUSION CRITERIA

Standard inclusion criteria include:

- Must study humans
- Must be published in English
- Can not be performed on cadavers

Work group members define additional exclusion criteria based on PICO question

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LITERATURE SEARCHES

- Databases used:
  - MEDLINE
  - EMBASE (Excerpta Medica dataBASE)
  - Cochrane Central Register of Controlled Trials
- Search using key terms from work group's PICO questions and inclusion criteria
- Secondary manual search of the bibliographies of all retrieved publications for relevant citations
- Recalled articles evaluated for inclusion based on the study selection criteria

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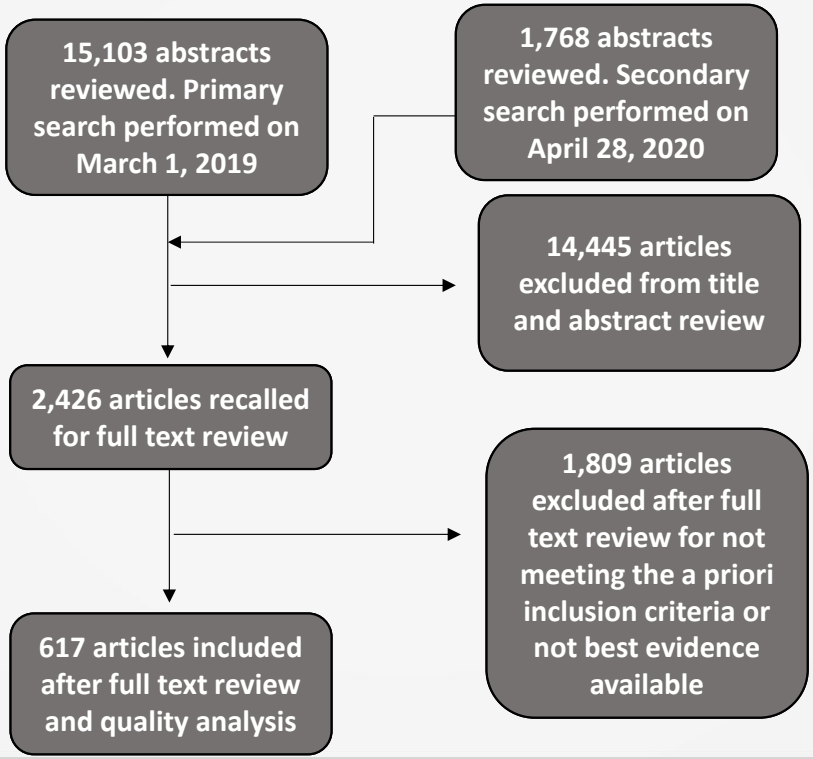
RESULTS OF QUALITY ASSESSMENT: STUDY ATTRITION FLOWCHART



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BEST EVIDENCE SYNTHESIS

Include only highest quality evidence for any given outcome if available

If there are fewer than two occurrences of an outcome of this quality, the next lowest quality is considered until at least two occurrences have been acquired.

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ASSESSING QUALITY OF EVIDENCE

- All included studies undergo a quality assessment.
- Each study's design is evaluated for risk of bias and receives a final quality grade, depending on the number of study design flaws.
- Study quality tables are made available to the work group in the final data report and the final publication of the guideline

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STRENGTH OF RECOMMENDATIONS

STRENGTH	OVERALL STRENGTH OF EVIDENCE	OVERALL STRENGTH OF EVIDENCE	STRENGTH VISUAL
STRONG	STRONG	Two or more HIGH Strength Studies with consistent findings for recommending for or against the intervention. Also requires no reasons to downgrade from the EtD framework	
MODERATE	MODERATE OR STRONG	Evidence from two or more MODERATE quality studies with consistent findings, or evidence from a single "HIGH" quality study for recommending for or against the intervention. Or Rec is upgraded or downgraded from Limited or Strong using the EtD framework.	
LIMITED	LIMITED, MODERATE OR STRONG	Evidence from one or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study recommending for or against the intervention. Or Rec is downgraded from Strong or Moderate using the EtD framework.	
CONSENSUS	NO RELIABLE EVIDENCE	There is no supporting evidence, or higher quality evidence was downgraded due to major concerns addressed in the EtD framework. In the absence of reliable evidence, the guideline workgroup is making a recommendation based on their clinical opinion.	

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Incorporating the GRADE Evidence to Decision Framework into Recommendation Strengths

- Benefits and Harms
- Certainty of Evidence
- Outcome Importance
- Cost Effectiveness
- Acceptability and Feasibility

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TRANSLATING RECOMMENDATIONS IN A CPG

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	More	Possible / Anticipates
Consensus	Most	Most Important	Impact unknown

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FINAL MEETING

The work group is charged with:

- Review of data summaries
- Final recommendation language
- Rationale and risk/harm construction
- Future research

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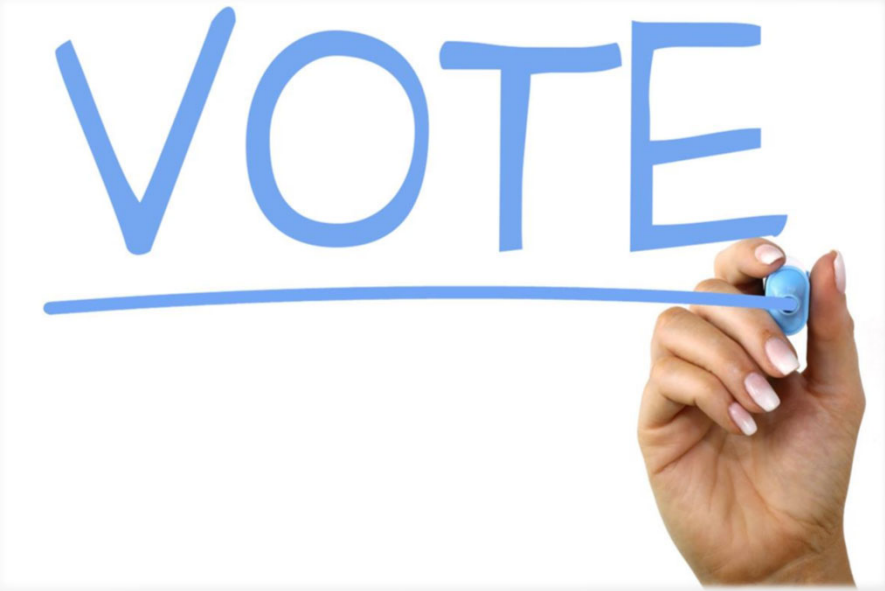
VOTING ON THE RECOMMENDATIONS

- Recommendations and recommendation strengths voted on by work group during final meeting
- Approved and adopted by simple majority (60%) when voting on every recommendation
- If disagreement, further discussion to whether the disagreement could be resolved



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REVIEW PERIOD

- Specialty societies are solicited for nominations of reviewers approximately six weeks prior to final meeting
- CPG is also provided to:
  - **AAOS Board of Directors**
  - **AAOS Council on Research and Quality**
  - **AAOS Committee on Evidence-Based Quality and Value**
  - **AAOS Board of Councilors**
  - **AAOS Board of Specialty Societies**
  - **200 commentators have the opportunity to provide input into each CPG.**
- Recommendation changes required a majority vote by work group
- A detailed report of all resulting revisions is published with the guideline document

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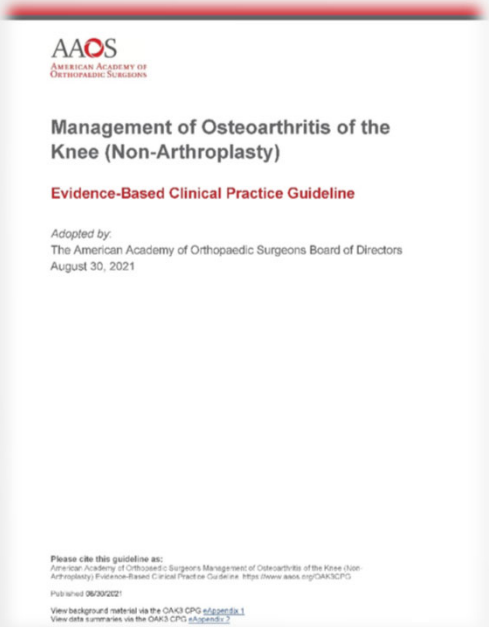
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Management of Osteoarthritis of the Knee (Non-Arthroplasty)

Evidence-Based Clinical Practice Guideline

Adopted by:
The American Academy of Orthopaedic Surgeons Board of Directors
August 30, 2021

Please cite this guideline as:
American Academy of Orthopaedic Surgeons Management of Osteoarthritis of the Knee (Non-Arthroplasty) Evidence-Based Clinical Practice Guideline. https://www.aaos.org/OAKSCPG

Published 08/30/2021

View background material via the OAK3 CPG eAppendix 1
View data summaries via the OAK3 CPG eAppendix 2

- Based on a systematic review of published studies examining the non-arthroplasty treatment of osteoarthritis of the knee
- Evaluates the current best evidence associated with treatment.
- Highlights limitations in literature and areas requiring future research
- This guideline is intended to by used by orthopaedic surgeons and other healthcare providers managing patients with osteoarthritis of the knee.

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LATERAL WEDGE INSOLES

- Lateral wedge insoles are not recommended for patients with knee osteoarthritis.

Strength of Recommendation: Strong

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CANES

- Canes could be used to improve pain and function in patients with knee osteoarthritis.

Strength of Recommendation: Moderate

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BRACES

- Brace treatment could be used to improve function, pain and quality of life in patients with knee osteoarthritis.

Strength of Recommendation: Moderate

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ORAL/DIETARY SUPPLEMENTS

- The following supplements may be helpful in reducing pain and improving function for patients with mild to moderate knee osteoarthritis; however, the evidence is inconsistent/limited and additional research clarifying the efficacy of each supplement is needed.

  a) Turmeric
  b) Ginger extract
  c) Glucosamine
  d) Chondroitin
  e) Vitamin D

Strength of Recommendation: Limited (downgrade)

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TOPICAL TREATMENTS

- Topical NSAIDs should be used to improve function and quality of life for treatment of osteoarthritis of the knee, when not contraindicated.

Strength of Recommendation: Strong

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SUPERVISED EXERCISE

- Supervised exercise, unsupervised exercise, and/or aquatic exercise are recommended over no exercise to improve pain and function for treatment of knee osteoarthritis.

Strength of Recommendation: Strong

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NEUROMUSCULAR TRAINING

- Neuromuscular training (i.e., balance, agility, coordination) programs in combination with traditional exercise could be used to improve performance-based function and walking speed for treatment of knee osteoarthritis.

Strength of Recommendation: Moderate (downgrade)

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SELF-MANAGEMENT

- Self-management programs are recommended to improve pain and function for patients with knee osteoarthritis.

Strength of Recommendation: Strong

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PATIENT EDUCATION

- Patient education programs are recommended to improve pain in patients with knee osteoarthritis

Strength of Recommendation: Strong

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WEIGHT LOSS INTERVENTION

- Sustained weight loss is recommended to improve pain and function in overweight and obese patients with knee osteoarthritis.

Strength of Recommendation: Moderate (downgrade)

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MANUAL THERAPY

- Manual therapy in addition to an exercise program may be used to improve pain and function in patients with knee osteoarthritis.

Strength of Recommendation: Limited (downgrade)

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MASSAGE

- Massage may be used in addition to usual care to improve pain and function in patients with knee osteoarthritis.

Strength of Recommendation: Limited (downgrade)

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LASER TREATMENT

- FDA-approved laser treatment may be used to improve pain and function in patients with knee osteoarthritis.

Strength of Recommendation: Limited (downgrade)

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ACUPUNTURE

- Acupuncture may improve pain and function in patients with knee osteoarthritis.

Strength of Recommendation: Limited (downgrade)

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TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION

- Modalities that may be used to improve pain and/or function in patients with knee osteoarthritis include:

a) Transcutaneous Electrical Nerve Stimulation (pain)

Strength of Recommendation: Limited (downgrade)

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PERCUTANEOUS ELECTRICAL NERVE STIMULATION

- Modalities that may be used to improve pain and/or function in patients with knee osteoarthritis include:

  a) Percutaneous Electrical Nerve Stimulation (pain and function)

  b) Pulsed Electromagnetic Field Therapy (pain)

Strength of Recommendation: Limited (downgrade)

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EXTRACORPOREAL SHOCKWAVE THERAPY

- Extracorporeal shockwave therapy may be used to improve pain and function for treatment of osteoarthritis of the knee.

Strength of Recommendation: Limited (downgrade)

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ORAL NSAIDs

- Oral NSAIDs are recommended to improve pain and function in the treatment of knee osteoarthritis when not contraindicated.

Strength of Recommendation: Strong

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ORAL ACETAMINOPHEN

- Oral Acetaminophen is recommended to improve pain and function in the treatment of knee osteoarthritis when not contraindicated.

Strength of Recommendation: Strong

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ORAL NARCOTICS

- Oral narcotics, including tramadol, result in a significant increase in adverse events and are not effective at improving pain or function for treatment of osteoarthritis of the knee.

Strength of Recommendation: Strong

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HYALURONIC ACID

- Hyaluronic Acid intra-articular injection(s) is not recommended for routine use in the treatment of symptomatic osteoarthritis of the knee.

Strength of Recommendation: Moderate (downgrade)

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INTRA-ARTICULAR CORTICOSTEROIDS

- Intra-articular (IA) corticosteroids could provide short-term relief for patients with symptomatic osteoarthritis of the knee.

Strength of Recommendation: Moderate (downgrade)

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PLATELET-RICH PLASMA

- Platelet-rich plasma (PRP) may reduce pain and improve function in patients with symptomatic osteoarthritis of the knee.

Strength of Recommendation: Limited (downgrade)

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DENERVATION THERAPY

- Denervation therapy may reduce pain and improve function in patients with symptomatic osteoarthritis of the knee.

Strength of Recommendation: Limited (downgrade)

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LAVAGE/DEBRIDEMENT

- Arthroscopy with lavage and/or debridement in patients with a primary diagnosis of knee osteoarthritis is not recommended.

Strength of Recommendation: Moderate

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PARTIAL MENISCECTOMY

- Arthroscopic partial meniscectomy can be used for treatment of meniscal tears in patients with concomitant mild to moderate OA who have failed physical therapy or other non-surgical treatments.

Strength of Recommendation: Moderate

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TIBIAL OSTEOTOMY

- High tibial may be considered to improve pain and function in properly indicated patients with unicompartmental knee osteoarthritis.

Strength of Recommendation: Limited (downgrade)

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DRY NEEDLING

- In the absence of reliable evidence, it is the opinion of the workgroup that the utility/efficacy of dry needling is unclear and requires additional evidence.

Strength of Recommendation: Consensus

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FREE FLOATING INTERPOSITIONAL DEVICES

- In the absence of reliable evidence, it is the opinion of the workgroup not to use free-floating (un-fixed) interpositional devices in patients with symptomatic medical compartment osteoarthritis of the knee.

Strength of Recommendation: Consensus

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FUTURE RESEARCH – LATERAL WEDGE INSOLES

- We did not identify any studies of sufficient size comparing a “walking shoe” versus a random or conventional shoe. The studies reviewed by the workgroup suggest that a walking shoe or a soft neutral insole might provide some degree of pain relief. Future studies addressing this treatment option could confirm some type of specialized yet commercially available shoe as beneficial to the patient with knee arthritis.

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FUTURE RESEARCH – CANES

- More studies would be beneficial to the knowledge base confirming value to patients with knee osteoarthritis.

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FUTURE RESEARCH – BRACES

- Future high-quality studies that are well powered are required to assess the real efficacy of unloader braces vs knee sleeves in a population with similar mechanical axis with a similar degree of OA.

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FUTURE RESEARCH – ORAL/DIETARY SUPPLEMENTS

- The most important future research will need to provide multiple investigations demonstrating reproducible results illustrating the effectiveness of dietary supplements. Additionally, future research is necessary to determine the appropriate dose, frequency, and duration of treatment with dietary supplements.

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FUTURE RESEARCH – TOPICAL TREATMENTS

- Future research might be directed at determining if continued topical NSAID use is required to sustain benefits or if benefits continue after usage for a defined period of time.

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FUTURE RESEARCH – SUPERVISED EXERCISE

- Identifying factors that could discriminate between people who would likely benefit from supervised programs vs independent exercise programs is an area of research that could improve clinical decision-making for prescribing exercise. More studies are also needed to examine delivery of exercise through telerehabilitation compared with in-person supervised programs. Studies should also examine differences in outcomes between varying modes of delivering telerehabilitation exercise programs. More research would also be beneficial in examining the role of booster session delivery of exercise programs.

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FUTURE RESEARCH – NEUROMUSCULAR TRAINING

- Given the mixed results between exercise programs with and without neuromuscular exercise programs, it would be beneficial for future research to identify factors that would discriminate between patients who would have better success with a neuromuscular exercise program versus those who would have better success with a traditional strength and joint mobility exercise program.

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FUTURE RESEARCH – SELF-MANAGEMENT

- Future research should examine delivery methods designed to increase access for patients (e.g., online delivered programs). Given that some patients with severe symptoms and disability may not be able to respond to self-management programs, future research should assess whether the outcomes of self-management programs vary with disease severity. This research should determine if there is a threshold of disease or disability severity that discriminates between responders and non-responders of this treatment approach.

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FUTURE RESEARCH – PATIENT EDUCATION

- Further research is needed to determine the best practice of education for reducing pain and other PROM for knee OA and the delivery method. Since many studies use different components and delivery methods and multiple interventions, it is impossible to recommend one particular educational module or particular component.

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FUTURE RESEARCH – WEIGHT LOSS INTERVENTION

- Future research should focus on large randomized clinical trials and should focus more on function and quality of life measures since it appears obvious that pain improved through weight loss.

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FUTURE RESEARCH – MANUAL THERAPY

- Future studies should examine ways to sustain the effects of manual therapy and exercise for extended follow-up periods. Research is needed to determine the effectiveness of self-applied manual therapy and telerehabilitation applications of manual therapy and exercise interventions for improving pain and function in patients with knee osteoarthritis.

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FUTURE RESEARCH – MASSAGE

- Future research may be warranted to determine how massage could be combined with other interventions for knee osteoarthritis to sustain longer term effects on pain and function.

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FUTURE RESEARCH – LASER TREATMENT

- Continued study of laser treatment for pain control, improving function and cost-effectiveness in people with knee osteoarthritis is encouraged.

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FUTURE RESEARCH – ACUPUNCTURE

- Continued research is encouraged, with more studies that improve blinding effectiveness in the methodology and studies that may identify patient characteristics that could discriminate between responders and non-responders of this treatment approach.

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FUTURE RESEARCH – Transcutaneous Electrical Nerve Stimulation

- Continued research with larger randomized trials that examine long-term effectiveness of the interventions is warranted. Studies that identify factors discriminating between responders and non-responders to the interventions would also be important.

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FUTURE RESEARCH – PERCUTANEOUS ELECTRICAL NERVE STIMULATION

- Continued research with larger randomized trials that examine long-term effectiveness of the interventions is warranted. Studies that identify factors discriminating between responders and non-responders to the interventions would also be important.

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FUTURE RESEARCH – EXTRACORPOREAL SHOCKWAVE THERAPY

- Future studies should examine methods to sustain longer term effects of the intervention (e.g., optimal dosage, use of booster interventions), investigate the potential of ESWT as an osteoarthritis diseasemodifying agent, and identify characteristics of patients that may discriminate between responders and non-responders of the intervention. The mechanisms of action of these interventions in human subjects is not well understood. Future studies investigating the mechanisms of action of these interventions in human subjects would be helpful.

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FUTURE RESEARCH – Oral NSAIDs

- Most important future research will provide high quality investigation through either prospective randomized trials or prospective cohort studies to establish efficacy within specific subgroups and populations to tailor systemic medications increasing efficacy and decreasing risk of adverse effects.

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FUTURE RESEARCH – Oral ACETAMINOPHEN

- Most important future research will provide high quality investigation through either prospective randomized trials or prospective cohort studies to establish efficacy within specific subgroups and populations to tailor systemic medications increasing efficacy and decreasing risk of adverse effects.

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FUTURE RESEARCH – ORAL NARCOTICS

- Most important future research will provide high quality investigation through either prospective randomized trials or prospective cohort studies to establish efficacy within specific subgroups and populations to tailor systemic medications increasing efficacy and decreasing risk of adverse effects.

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FUTURE RESEARCH – HYALURONIC ACID

- Future research in this area should embrace detailed osteoarthritis characterization including sub-group analyses and osteoarthrosis severity stratification. Furthermore, using clinically relevant outcomes and controls for bias are warranted along with cost-effectiveness analysis.

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FUTURE RESEARCH – INTRA-ARTICULAR CORTICOSTEROIDS

- Future research in this area should embrace detailed osteoarthritis characterization including sub-group analyses and osteoarthrosis severity stratification. Furthermore, using clinically relevant outcomes and controls for bias are warranted along with cost-effectiveness analysis.

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FUTURE RESEARCH – PLATELET-RICH PLASMA

- Future research in this area should embrace detailed osteoarthritis characterization including sub-group analyses and osteoarthrosis severity stratification. Furthermore, using clinically relevant outcomes and controls for bias are warranted along with cost-effectiveness analysis. Specifically, to platelet rich plasma it will be of outmost importance to include comprehensive platelet rich plasma characterization and description of platelet rich plasma preparation protocol.

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FUTURE RESEARCH – DENERVATION THERAPY

- Future research in this area should embrace detailed osteoarthritis characterization including sub-group analyses, osteoarthrosis severity stratification, and end stage disease in patients unable to have total knee arthroplasty (e.g. due to age or comorbities). Furthermore, using clinically relevant outcomes and controls for bias are warranted along with cost-effectiveness analysis.

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FUTURE RESEARCH – LAVAGE/DEBRIDEMENT

- Most studies included in this review had compared lavage to variety of nonoperative modalities. However, considering emergence of new modalities and technology it would be worthwhile to do high quality study with arthroscopic lavage done with a standardized size instrument comparing with nonoperative measures which could include PRP injections, nerve ablations, etc. Recent introduction of nanoscopes also warrants further studies of use of such devices in an office setting and comparing it to cost effectiveness of doing procedures in the operating room.

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FUTURE RESEARCH – PARTIAL MENISCECTOMY

- We did not identify any studies that compare outcomes (i.e., knee pain and function) following arthroscopic partial meniscectomy versus physical therapy alone in patients who have failed to improve with an initial course of physical therapy, non-steroidal anti-inflammatory medications (NSAIDs), and a possible intra-articular steroid injection. The three studies reviewed by the work group demonstrate that knee arthroscopy with partial meniscectomy is as effective as physical therapy. Future studies should seek to compare outcomes in patients with mild to moderate knee osteoarthritis and an MRI confirmed meniscal tear who have undergone partial meniscectomy after failing to improve with a course of conservative treatment (NSAIDs, steroid injection, and physical therapy) versus those who have undergone partial meniscectomy without a dedicated course of conservative treatment.

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FUTURE RESEARCH – TIBIAL OSTEOTOMY

- Previous studies have addressed outcomes when converting UKA to TKA and likewise for converting HTO to TKA. Studies looking at functional improvement and pain relief of HTO in direct comparison to knee replacement surgery (total or partial) would be of great value to our collective knowledge base, especially if such a study could track patients from baseline into HTO versus UKA and then long term to TKA. It is unlikely such a study could be performed prospectively over such a long time, yet data from a registry might prove fruitful.

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FUTURE RESEARCH – DRY NEEDLING

- Continued research with larger studies to examine the effectiveness of dry needling for reducing pain and improving function in patients with knee osteoarthritis is warranted.

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FUTURE RESEARCH – FREE FLOATING INTERPOSITIONAL DEVICES

- Future research should be aimed at producing level one randomized control trials to define clinical efficacy and risk of complication.

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ACKNOWLEDGEMENTS:

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PLEASE CITE CLINICAL PRACTICE GUIDELINE AS:

American Academy of Orthopaedic Surgeons **Clinical Practice Guideline for the Management of Osteoarthritis of the Knee (Non-Arthroplasty) 3rd Edition** www.aaos.org/oak3cpg, or https://www.orthoguidelines.org/topic?id=1035. Published August 31, 2021.

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- Appropriate Use Criteria
- Clinician Checklists
- Impactful Statements
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OrthoGuidelines

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- (*Strong, Moderate, Limited, Consensus)*
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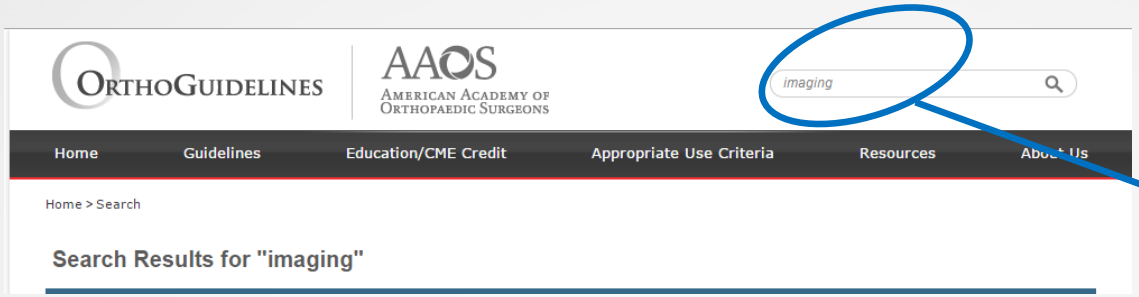
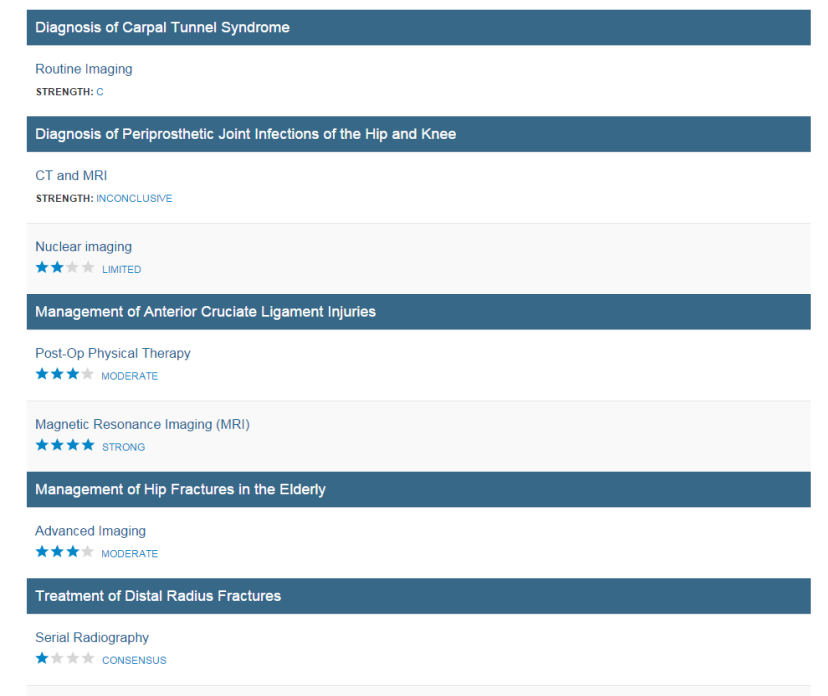


Imaging

Search across all CPG and AUC
Via a Single Keyword Search



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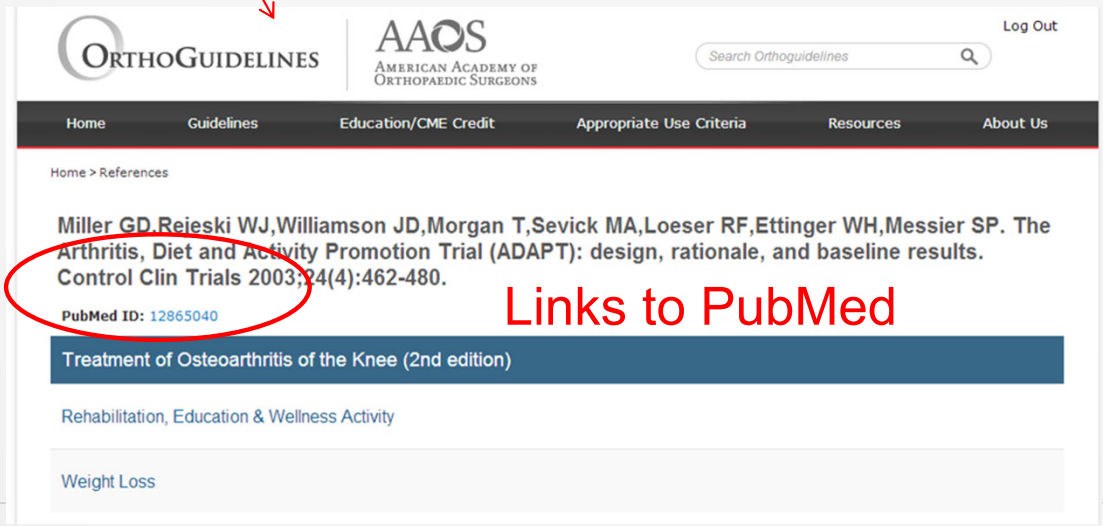
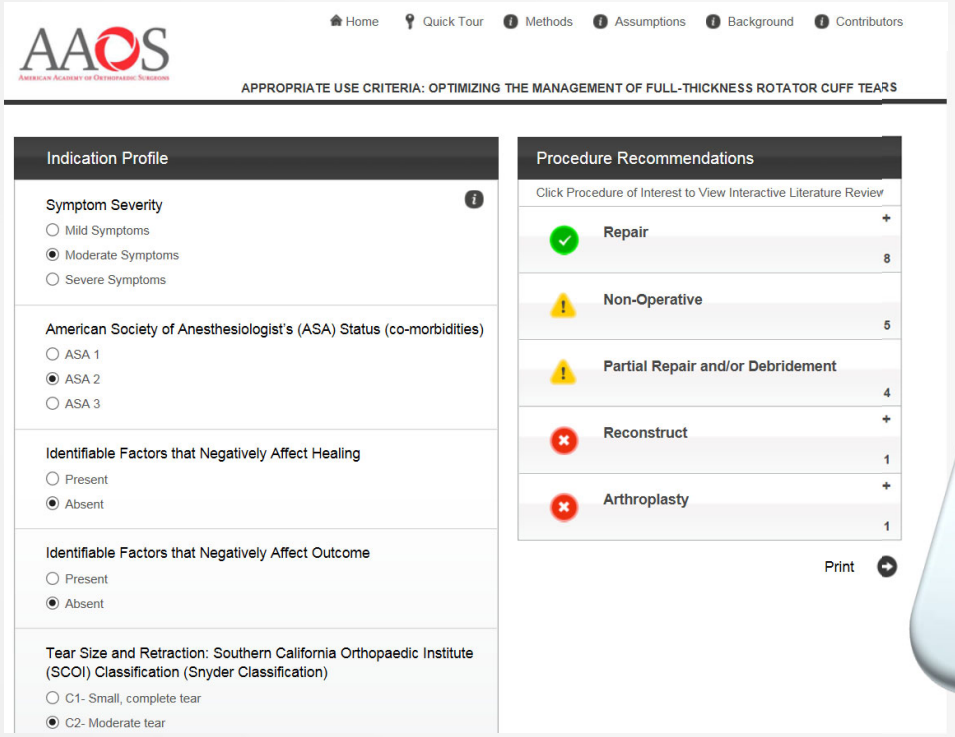
References provided for each recommendation

Miller GD,Rejeski WJ,Williamson JD,Morgan T,Sevick MA,Loeser RF,Ettinger WH,Messier SP. The Arthritis, Diet and Activity Promotion Trial (ADAPT): design, rationale, and baseline results. Control Clin Trials 2003;24(4):462-480.

(20) Lorig K, Lubeck D, Kraines RG, Seleznick M, Holan HR. Outcomes of self-help education for patients with arthritis. Arthritis Rheum 1985;28:680-685



Appropriate Use Criteria Tool



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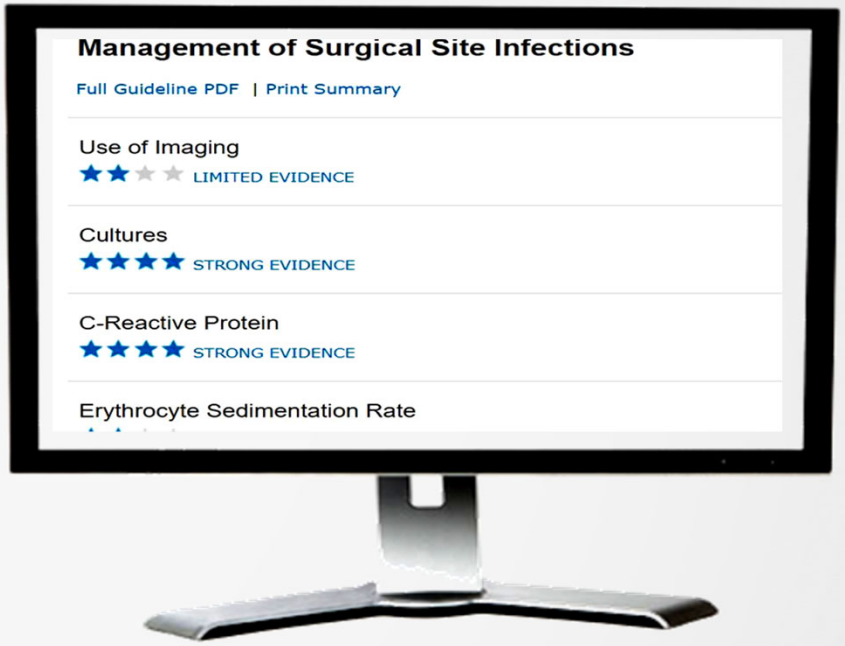
PUBLISHED CLINICAL PRACTICE GUIDELINES

- Acute Compartment Syndrome
- Anterior Cruciate Ligament Injuries
- Carpal Tunnel Syndrome
- Diagnosis and Prevention of Periprosthetic Joint Infections
- Distal Radius Fractures
- Glenohumeral Joint Osteoarthritis
- Hip Fractures in the Elderly
- Limb Salvage or Early Amputation
- Osteoarthritis of the Hip
- Osteoarthritis of the Knee (Arthroplasty)
- Osteoarthritis of the Knee (Non-Arthroplasty)
- Osteochondritis Dissecans
- Pediatric Developmental Dysplasia of the Hip in infants up to Six Months
- Pediatric Diaphyseal Femur Fractures
- Pediatric Supracondylar Humerus Fractures
- Pharmacologic, Physical, and Cognitive Pain Alleviation for Musculoskeletal Extremity/Pelvis Surgery
- Psychosocial Factors Influencing Trauma Recovery
- Prevention of Orthopaedic Implant Infections in Patients Undergoing Dental Procedures
- Rotator Cuff Injuries
- Surgical Site Infections
- VTE Disease in Patients Undergoing Elective Hip & Knee Arthroplasty
- Tranexamic Acid in Total Joint Arthroplasty (Endorsement)
- Use of Imaging Prior to Referral to a Musculoskeletal Oncologist (Endorsement)
- Treatment of Metastatic Carcinoma and Myeloma of the Femur (Endorsement)
- Anesthesia and Analgesia in TJA (Endorsement)



For additional information, please visit
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