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## Osteoarthritis Treatment Guidelines from Six Professional Societies: Similarities and Differences

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Osteoarthritis; Treatment guidelines; GRADE

### Introduction

Osteoarthritis (OA) affects approximately 500 million people worldwide,<sup>1</sup> and contributes substantially to years lived with disability worldwide.<sup>2</sup> Furthermore, in the United States, osteoarthritis is the third leading hospital discharge diagnosis after childbirth-related (#1) and sepsis-related (#2) hospitalizations due to the large volume of joint replacements performed annually,<sup>3</sup> highlighting the substantial public health impact of this disease. Despite its prevalence and burden, there are no approved pharmacologic agents to date that effectively halt disease progression; thus management largely focuses on symptoms.

Numerous treatment guidelines exist for OA from various professional societies across the world. Whereas different methodologies have historically been used to develop treatment guidelines, formal guideline methodology to develop evidence-based guidelines have been

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generally adopted by professional societies, as advocated by the Institute of Medicine (IOM),<sup>4</sup> and reviewed elsewhere in this issue (*see* article “[ACR policies and procedures for guideline development](#)”). To facilitate translation and implementation of guidelines into practice, we endeavored to evaluate and summarize the most recent treatment guidelines published in the past 5 years, and to examine similarities and differences among them.

## Methods

We performed a literature search to identify OA guidelines published/updated within the past 5 years (search conducted in November, 2021) from major societies. We did not consider surgical management guidelines, and did not include articles evaluating single interventions, a single aspect of OA care, diagnosis of OA, or unspecified site of OA in recommendations made, or editorial pieces. Guidelines were selected by two expert rheumatologist/epidemiologists (TN and AN); data extraction was performed by TN, AN, and a senior rheumatology fellow (CO). A data extraction form (Excel spreadsheet) was reviewed and edited by all authors. Extracted data included: publication year, country, specialties involved, whether a systematic review was performed, the target users, and whether competing interests were discussed. Each author extracted recommendations from two guidelines into a shared document, and the strength of recommendation was recorded. All authors reviewed the extraction tables for accuracy and completeness.

To ease interpretation of the recommendations, the authors independently reviewed the data extraction tables for all guidelines and converted each guideline’s recommendations to a uniform standard of strongly or conditionally recommended for or against, and indicated where the intervention was not discussed or no recommendations were made despite consideration.

## Results

We identified and selected the following six guidelines for OA management, which collectively addressed management of hand, knee, hip, and polyarticular OA (listed in alphabetical order of the professional society sponsoring the guideline):

- American Academy of Orthopedic Surgeons (AAOS) Management of Osteoarthritis of the Knee (Non-Arthroplasty) Evidence-Based Clinical Practice Guideline
- American College of Rheumatology/Arthritis Foundation (ACR/AF) Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee<sup>5,6</sup>
- An updated algorithm recommendation for the management of knee osteoarthritis from the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO)<sup>7</sup>
- 2018 update of the European Alliance of Associations for Rheumatology (EULAR) recommendations for the management of hand osteoarthritis<sup>8</sup>
- Osteoarthritis Research Society International (OARSI) guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis<sup>9</sup>

- Veterans Affairs and Department of Defense (VA/DOD) Clinical Practice Guideline For The Non-Surgical Management Of Hip & Knee Osteoarthritis (accessed at: <https://www.healthquality.va.gov/guidelines/CD/OA/VADoDOACPG.pdf>)

Three of the guidelines were from the United States, two were from Europe, and one included international input from Canada, Europe, Australia, China, and Japan. Two guidelines also included surgical recommendations (AAOS, EULAR hand), which we will not review here. Most recommendations were directed toward physicians and allied health professionals, and most guidelines had multi-disciplinary input from rheumatologists, general practitioners, orthopedists and physical therapists; some also included physical medicine & rehabilitation specialists, geriatricians, sports medicine, and public health specialists. GRADE methodology was used in all but one guideline (EULAR hand), and all but one (AAOS) had patient representation.

All guidelines had an explicit statement about conflicts of interest with the exception of the AAOS. However, handling of conflicts of interest varied across the guidelines. For example, in some guidelines, like the ACR/AF, at least 50% of guidelines contributors had to be free of any perceived or real conflicts of interest in line with IOM recommendations, whereas others only required a declaration of any potentially relevant conflicts of interest. The issue of potential conflicts of interest among guidelines participants has been scrutinized since they can undermine trust in guideline recommendations if not adequately managed.<sup>10</sup>

## Terminology

A major set of management options for OA falls under the umbrella of what has traditionally been labeled as “non-pharmacologic” therapies. However, attention should be paid to terminology used to describe those options to engage patients positively in the shared decision-making process. It is increasingly recognized that semantics matter and that active or participatory language is important for patient engagement.<sup>11</sup> For example, describing a therapy as “non-X” prefix, such as “non-pharmacologic” or “non-surgical”, may inadvertently connote those “non-X” therapeutic options to be less effective or preferred than the therapies named after the prefix. Consensus on appropriate terminology to promote positive and empowering language that supports patient engagement in such modalities has not yet been addressed. In the ACR/AF Guideline, the term “non-pharmacologic” was replaced with descriptive terms such as physical, mind-body, and behavioral modalities. We have opted to use the term Physical and Behavioral Modalities to refer to this category of management options.

## Physical and Behavioral Modalities

All guidelines made recommendations regarding physical and behavioral modalities, often considering these as foundational to the management of OA. The recommendations can be generally grouped in the following 4 themes: (1) education and self-management, (2) exercise and weight loss, (3) joint support and assistive devices, (4) alternative and complementary modalities. A summary of the recommendations for the knee are shown in Table 1, for the hip in Table 3, and for the hand in Table 4.

**1. Education and self-management**—All guidelines made moderate to strong recommendations for education and self-management as part of OA management. The importance of patient education was addressed, including education about the disease, medication effects and potential side effects, joint protection measures, and exercise goals and approaches. Self-efficacy and self-management programs were consistently strongly recommended across guidelines; these programs typically use a multidisciplinary group-based format addressing skill-building, education about the disease and therapies, joint protection measures, managing weight, and fitness and exercise approaches and goals. It should be noted that often such recommendations were not based upon randomized controlled data, but rather driven by the low cost, low harm, and high likelihood of benefit.

**Summary recommendations:** Education and self-management constitute a key component of OA management. Referral to self-management programs should be provided, and patients should receive education on OA, management approaches, joint protection strategies, and exercise.

**2. Exercise and weight loss**—Exercise and physical activity were consistently and strongly recommended across the guidelines. “Low-impact aerobic exercise” encompasses a variety of more specific recommendations, including aquatic and land-based exercise, and was strongly recommended in 3/6 guidelines (OARSI, ACR/AF, AAOS), especially for knee and hip OA. Exercise was strongly recommended for knee OA in the ESCEO guidelines and as part of a self-management program for knee and hip OA in the VA/DOD guidelines, but no specific exercise recommendations were provided in these guidelines. Balance training was conditionally recommended for knee and hip OA in the ACR/AF guidelines, and neuromuscular training, which includes balance, agility, and coordination exercises, was recommended for knee OA by AAOS. The ACR/AF guidelines provided a conditional recommendation in support of yoga for knee OA due to lack of high-quality evidence in knee OA. In general, recommendations were made for both supervised (i.e., in a physical therapy program) and unsupervised exercise. Generally there is insufficient evidence to recommend a hierarchy of one type of exercise over another, and therefore patient-specific impairments, preferences, and feasibility should be taken into account. Physical therapy referral, as a component of self-management, was conditionally recommended in the VA/DOD guidelines. Range of motion/flexibility exercises were strongly recommended for hand OA in the EULAR guidelines, but overall there was less agreement on the benefits of exercise for hand OA. Weight loss for overweight individuals was consistently recommended for knee and hip OA, with generally moderate to high quality of evidence.

**Summary recommendations:** Patients with OA should be advised to engage in regular low impact aerobic exercise (land or aquatic-based) and to lose weight if overweight. Range of motion/flexibility training should be advised for hand OA. Neuromuscular/balance training and physical/occupational therapy referrals can be considered on an individualized basis. There is no evidence to suggest hierarchy of one exercise approach over another. Exercise recommendations should be tailored to the individual patient.

**3. Joint support and assistive devices**—There was a lack of agreement among guidelines for assistive devices. Kinesiotaping was conditionally recommended for knee and/or first CMC joint OA in the ACR/AF guidelines. In contrast, patellar taping was conditionally not recommended by the OARSI guidelines, due to weak quality of evidence. This modality was not specifically addressed in the other guidelines. Knee braces (including unloader braces with varus force for lateral knee OA or valgus force for medial knee OA) were recommended with moderate quality of evidence in the AAOS guidelines. Tibiofemoral braces were strongly recommended for knee OA, while patellofemoral braces were conditionally recommended for knee OA in the ACR/AF guidelines given variable results across published trials and difficulty some individuals have tolerating these braces. Soft knee braces were conditionally not recommended in the OARSI guidelines but may be considered in some individuals with knee OA according to VA/DOD, though a strength of recommendation was not provided. Use of medial and lateral heel wedges was addressed in 3/6 guidelines (OARSI, ACR/AF, AAOS), and supporting evidence was of weak quality. The OARSI guidelines provided a conditional recommendation for heel wedges for knee OA and a conditional recommendation against heel wedges in polyarticular OA. The ACR guidelines provided conditional recommendation against heel wedges for knee and hip OA, and AAOS strongly recommended against use of lateral heel wedges in knee OA. Walking aids (e.g., canes, crutches) were generally recommended as needed for knee and hip OA, with moderate to high quality of evidence for use of canes. Splints for trapeziometacarpal OA were conditionally recommended by EULAR and ACR/AF. First CMC splinting was strongly recommended in the ACR/AF guidelines for hand OA involving the CMC joint.

**Summary recommendations:** Walking aids and other assistive devices are recommended on an as needed basis to improve mobility and activities of daily living in patients with OA. Knee braces, including unloader braces (with varus or valgus force as indicated) and tibiofemoral braces, can be considered for knee OA in appropriate clinical settings based on at least moderate level of evidence. Patellofemoral knee braces may be considered, but supporting evidence is of weaker quality. Tolerability of knee braces is an issue that should be taken into account. Appropriate fitting and use guided by a physical therapist should be considered when prescribing knee braces. Kinesiotaping may be considered for knee and/or first CMC joint OA, although supporting evidence is limited. Current evidence does not support the use of heel wedges for knee and/or hip OA. Splinting can be considered for patients with hand OA, especially involving the first CMC joint.

**4. Alternative and complementary physical or mind-body modalities**—Recommendations for alternative and complementary physical or mind-body treatment approaches were somewhat controversial and differed among societies. Acupuncture was conditionally recommended for patients with knee, hip, and/or hand OA in the ACR/AF guidelines despite limited evidence, given the positive effect of acupuncture for analgesia and low risk of harm. AAOS cited limited evidence for acupuncture in knee OA, and OARSI provided a conditional recommendation against acupuncture for knee, hip, and/or polyarticular OA. Tai chi was strongly recommended for knee and hip OA by ACR/AF and for knee OA by OARSI (also conditionally recommended for hip and polyarticular OA by

OARSI). Yoga was conditionally recommended by ACR/AF for knee OA, with a caution for hip OA due to potential issues related to excessive hip abduction.

Thermal modalities were strongly recommended for hip OA by OARSI (conditionally not recommended for knee and polyarticular OA) and conditionally recommended by ACR/AF for knee, hip, and/or hand OA. Transcutaneous electrical nerve stimulation (TENS) was consistently not recommended across guidelines, including in patients who are not surgical candidates. There was insufficient evidence to recommend therapeutic ultrasound, massage therapy, laser therapy, balneotherapy, electromagnetic therapy, nerve block, or extracorporeal shock wave therapy. Cognitive behavioral therapy (CBT) was conditionally recommended for patients with knee, hip, and/or hand OA by ACR/AF on the basis of data regarding chronic pain management, although further study is needed to better assess the benefit of CBT in OA directly. OARSI provided a conditional recommendation for CBT in patients with knee OA, as well as those with hip and/or polyarticular OA who are frail and/or have cardiovascular or gastrointestinal comorbidities.

**Summary recommendations:** Tai chi is recommended for patients with knee, hip, and/or hand OA, with strongest evidence in knee OA. Acupuncture may be considered for knee, hip, and/or hand OA based on potential benefit for analgesia and low risk of harm, although supporting evidence is limited. Thermal modalities may be considered, with strongest evidence in hip OA. Cognitive behavioral therapy may be helpful for pain reduction and coping and may be considered as a component of OA management. TENS is not recommended, including in poor surgical candidates, based on very limited supporting evidence. There is insufficient evidence to recommend therapeutic ultrasound, massage therapy, laser therapy, balneotherapy, nerve block, or extracorporeal shock wave therapy.

**Pharmacologic recommendations:** In general, two topical agents, 12 classes of oral medications, and 3 types of intra-articular therapies were considered across these guidelines. A summary is provided in Table 2.

Acetaminophen had mixed, primarily weak or conditional recommendations both for and against its use, reflecting recognition of its poor efficacy but also the need for an alternative for patients in whom other oral agents may not be safe or tolerated. The only guidelines that provided a strong recommendation for acetaminophen were AAOS for the knee and EULAR for the hand.

Oral NSAIDs were generally recommended for all sites of OA, but strength of recommendations (conditional/weak versus strong) varied among guidelines, primarily reflecting concerns about adverse effects. Some guidelines included discussion of gastroprotection, but only the OARSI guideline provided a formal GRADE recommendation.

Topical NSAIDs were uniformly strongly recommended for knee OA by all guidelines and were strongly and conditionally recommended for hand OA by EULAR and ACR/AF, respectively, with the strength of recommendation influenced by practicality of using topical agents on finger joints. Topical NSAIDs were not recommended for the hip due

to the deepness of the joint. In contrast, topical capsaicin was conditionally or weakly recommended for knee OA by ACR/AF and VA/DOD, but conditionally recommended against by OARSI. For the hand, EULAR made no recommendations due to challenges with blinding trials, and ACR made a conditional recommend against topical capsaicin primarily due to logistics of applying the topical agent to the hands and risk of wiping one's eyes, etc., that could result in burning sensations elsewhere. Again, this topical agent was not considered for the hip due to the depth of the joint.

Recommendations on the use of tramadol were mixed, either conditionally/weakly against or conditionally/weakly for; this variation was primarily related to the recognition that some patients require an option for pain management when oral NSAIDs are not an option (contraindicated, not tolerated, or ineffective), particularly when considering input from patient panels. In contrast, other forms of opioids were generally recommended against, either strongly or conditionally, due to recognition of their poor efficacy, substantial adverse effects and concerns regarding various aspects of the opioid epidemic; dependency was a particular concern voiced by members of the patient panel.

Though duloxetine is approved for OA in some countries, there were only conditional or weak recommendations for its use across all guidelines, reflecting general concerns about efficacy and tolerability.

Glucosamine had substantial variation in recommendations across the guidelines. ESCEO made a strong recommendation for the use of glucosamine sulfate in knee OA, whereas OARSI and ACR/AF recommended against its use in knee and hip OA (conditionally and strongly, respectively) and AAOS made a weak recommendation for its use in knee OA. ACR also made a strong recommendation against its use in hand OA, while EULAR made no recommendation due to lack of placebo-controlled trials conducted in patients with hand OA. Chondroitin, on the other hand, had a conditional recommendation for its use in hand OA by both EULAR and ACR/AF on the basis of a single trial that had low risk of bias, and none of the guidelines recommended chondroitin for other sites with the exception of ESCEO which again provided a strong recommendation for its use in knee OA.

In terms of intra-articular therapies, all of the guidelines recommended intra-articular corticosteroid (IACS) injections for the knee and hip, with most providing a weak or conditional recommendation and ACR/AF providing a strong recommendation; for the hip, the ACR/AF also strongly recommended ultrasound guidance for intra-articular therapy. EULAR made a strong recommendation against IACS for hand OA though commented on its potential use in the case of "clear joint inflammation", whereas ACR provided a conditional recommendation for its use.

In contrast, the recommendations regarding intra-articular hyaluronic acid (IAHA) were quite mixed. For the knee, OARSI, VA/DOD, and ESCEO made weak recommendations for its use, with some specifications, such as if refractory (VA/DoD) or if failed NSAIDs (ESCEO). Both ACR and AAOS provided a conditional recommendation against use of IAHA for the knee, related to lack of efficacy data when considering high-quality, low risk of bias trials from well-conducted meta-analyses. IAHA was not recommended for the hip

or hand by any of the guidelines. Finally, some guidelines considered intra-articular platelet-rich plasma (PRP) and stem cell therapies. Most guidelines indicated either insufficient evidence to make a recommendation or provided recommendations against their use; the one exception was AAOS which made a weak recommendation for use of intra-articular PRP.

No DMARDs were recommended by any of the guidelines; in fact, there was a strong recommendation against their use by the ACR/AF due to lack of efficacy demonstrated in numerous trials. Some guidelines considered oral herbal therapies, vitamins, diacerein, avocado soybean unsaponifiables, and collagen. There were mixed recommendations, primarily weak, related to poor or insufficient data, with primarily recommendations against use.

**Summary recommendations**—Oral and topical NSAIDs are the pharmacologic agents most recommended for OA, though oral formulations should be avoided in those with contraindications and intolerances, and topical formulations are not appropriate for a deep joint such as the hip. Acetaminophen is no longer considered “first-line” for OA due to its relative poor efficacy,<sup>12</sup> though it is still an option for those who have contraindications or intolerances to NSAIDs. IACS may be considered, whereas other intra-articular therapies were generally not recommended, or in the case of IAHA, only to be considered if other therapies have failed. Opioids, including tramadol, are generally not recommended, though guidelines did acknowledge that in some cases, such as in instances of contraindications, intolerance to, or inadequate response to NSAIDs, tramadol can be considered for pain relief in the absence of other viable options.

## Discussion

The OA treatment guidelines developed by several professional societies over the past few years have numerous similarities in terms of methodology. They have all used GRADE methodology (*see* article “The GRADE method”), included a multidisciplinary team, and for the most part have included patient partners. Clear and transparent management of potential conflicts of interest remain varied, with the ACR/AF having the strongest policy that is in line with recommendations for development of clinical practice guidelines.

These guidelines also have numerous similarities in their recommendations. They universally recommend education, self-management approaches, and a wide array of physical modalities, with exercise and physical activity (for knee and hip OA primarily) being strongly recommended across all guidelines that considered this modality. For those who are obese or overweight with knee or hip OA, weight loss is also recommended across all guidelines. For pharmacologic therapies, oral and topical NSAIDs remain the primary recommended treatment, though with appropriate caveats regarding contraindications and intolerances. Intra-articular corticosteroids were recommended at varying strengths throughout the guidelines in recognition of their short-term efficacy. Other intra-articular agents had mixed recommendations. In particular, intra-articular hyaluronic acid had conditional recommendations both for and against its use, reflecting the mixed interpretation about efficacy findings in the context of publication and other biases, and high-quality meta analyses demonstrating no meaningful efficacy in low risk of bias trials.<sup>13,14</sup> Glucosamine



and chondroitin also had mixed levels of recommendations for and against its use, also reflecting the mixed quality of the evidence in the literature with regards to bias.<sup>15</sup>

Why might there be variations in recommendations across guidelines using similar methodologies? First, the systematic literature review is structured with PICO (patient – intervention – comparator – outcome) questions; for a given intervention of interest, what kind of patient, comparator, and outcome is assessed can affect the type of data ultimately available in the evidence report. While the GRADE methodology relies on an evidence report, quality of evidence can be up- or down-graded based upon risk of bias, which groups may not evaluate in a uniform manner. The voting panel is tasked with interpreting the evidence report as providing evidence “for” or “against” an intervention, and must also decide upon the strength of recommendations by taking into account not only the quality of the evidence, but also the balance between potential benefits and potential harms, values and preferences (including feasibility, convenience, etc.), and cost considerations. Thus, some recommendations could vary by geographic regions due to cost, for example. Another consideration regarding differences across guidelines is that conflicts of interest could certainly influence discussions and ultimately the vote among the expert voting panel.

No clear hierarchy is noted in these guidelines regarding type of modality to start with (e.g., exercise versus NSAIDs, as one example), or for approaches to use first within a modality. For example, there is no hierarchy for type of exercise to use, and thus patient-centered decision-making can be made to select the right type or combination of exercises. Additionally, one can and should develop an evidence-based individualized multimodal management approach depending on the needs and impairments present in a given patient using the recommended modalities from these guidelines (Figure 1).<sup>16</sup> Thus, there is no longer a treatment pyramid paradigm in managing OA. Instead, one may need to revisit various modalities over time, often in combination, in the course of a given individual’s OA journey.

Despite the strong recommendations regarding weight loss, exercise, and physical modalities implemented by physical therapists, lifestyle counseling and referral to physical therapy are substantially underutilized by primary care physicians in the US over the past 15 years, while NSAID and opioid prescriptions have risen over that same period of time.<sup>17</sup> The rise in prescription of NSAIDs is of concern given that multimorbidity is common in OA,<sup>18</sup> with many such comorbidities being contraindications to NSAIDs. In a population-based Swedish study, ~30% of people with incident knee or hip OA had a contraindication to NSAIDs or a condition that merits precaution with NSAIDs.<sup>19</sup> Furthermore, >20% of those with contraindications to or precautions with NSAIDs were prescribed NSAIDs and were ~30% more likely to be prescribed opioids than those without such contraindications or precautions.<sup>19</sup> People who are obese with OA have a ~2-fold increased risk of being prescribed opioids than those who are normal weight and OA is among those most common reasons for opioid prescription among those who are obese.<sup>20</sup> Thus addressing obesity, referring to physical therapy, and counseling regarding exercise and physical activity (e.g., [www.cdc.gov/arthritis/interventions/index.htm](http://www.cdc.gov/arthritis/interventions/index.htm), <https://oaaction.unc.edu/individuals/>) are important evidence-based approaches to not only managing OA, but may also help

decrease the use of NSAIDs among those with contraindications or precautions to NSAIDs and reduce inappropriate prescription of opioids.

Thus, although professional society treatment guidelines are fairly consistent regarding core recommendations for weight loss, exercise, use of NSAIDs (in the absence of contraindications or precautions), and avoidance of opioids, patterns in clinical practice do not reflect these recommendations. Since OA is largely managed in primary care, greater efforts are needed to disseminate and implement evidence-based guidelines into primary care practices.

## Summary

The OA treatment guidelines across 6 professional societies are largely concordant with one another. The lack of adequate management for people with OA in the community largely reflects lack of adequate dissemination and implementation, as well as a paucity of safe and effective pharmacologic options. Patient engagement with culturally appropriate participatory language and counseling regarding weight loss (where appropriate), exercise and physical activity, and greater access to physical modalities such as physical therapy are urgently needed to optimize OA management in the setting of few pharmacologic agents with high-quality evidence to support their use. These guidelines also highlight a major unmet need for developing a broader array of safe, effective therapies and the need for engaging in multimodal care with better targeting of impairments and underlying contributors to symptoms.

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### Key Points

- Contemporary treatment guidelines for osteoarthritis published by various professional societies in the past 5 years have used Grading of Recommendations, Assessment, Development and Evaluations (GRADE) methodology, making their approaches more comparable than in the past.
- Each of the recent OA guidelines generally had similar recommendations regarding education, self-management, and physical approaches, as well as recommending oral and topical NSAIDs as the primary pharmacologic approaches.
- There is a paucity of recommended pharmacologic therapies, highlighting a major unmet need in OA management.

### Synopsis

Despite the high prevalence and burden of osteoarthritis worldwide, management of osteoarthritis continues to primarily focus on symptom management due to the lack of approved pharmacologic agents that halt disease progression. Recent recommendations from six professional societies support the importance of education, self-management approaches, weight loss, and physical modalities in managing osteoarthritis. These recent guidelines also highlight the paucity of effective and safe treatment options, with recommendations against ineffective therapies outnumbering those for effective ones. NSAIDs, oral and topical, remain the primary recommended pharmacologic management option for osteoarthritis. (Table 2)

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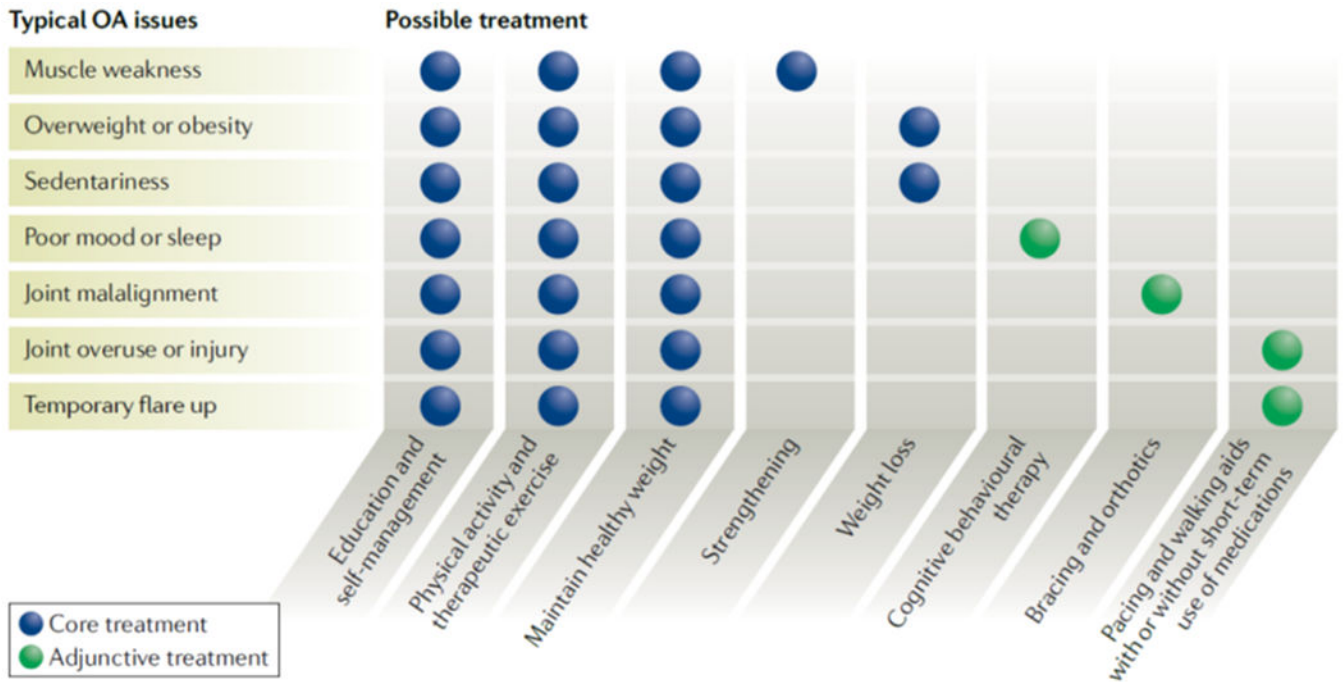
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**Clinics Care Points – *Bulleted list of evidence-based pearls and pitfalls relevant to the point of care***

- All patients with OA should receive appropriate education about the disease and management options, as well as counseling regarding self-management approaches.
- Physical modalities including exercise, physical activity, and various physical therapy modalities for knee and hip OA are well-supported by moderate to high quality evidence. Those who are obese or overweight should be counseled regarding weight loss approaches.
- There remains a paucity of effective and safe pharmacologic options for management of OA, with oral and topical NSAIDs being the primary medications recommended.
- Where guidelines are not fully in agreement with one another, that discrepancy usually reflects inadequate strength of evidence supporting efficacy being balanced by consideration of the therapy when other options are ineffective or cannot be used (e.g., contraindications or intolerances). These therapeutic options require engaging in shared decision-making and an individualized management approach.



**Fig. 1 | Core and adjunctive treatment options for OA.**

A broad range of treatments are recommended by international clinical guidelines for osteoarthritis (OA) management that can be utilized to address different modifiable risk factors. Education and self- management, therapeutic exercise and physical activity, and maintaining a healthy weight are core treatments for OA. Additional adjunctive treatments can be prescribed depending on the needs of the individual, including the ones shown. Core and adjunctive treatments for OA should be tailored to the individual for optimal personalized care.

**From** Bowden JL, Hunter DJ, Deveza LA, Duong V, Dziedzic KS, Allen KD, Chan PK, Eyles JP. Core and adjunctive interventions for osteoarthritis: efficacy and models for implementation. *Nat Rev Rheumatol.* 2020 Aug;16(8):434-447.

**Table 1:**

**Physical & Behavior Modality Recommendations For The Management of Knee Osteoarthritis**

	OARSI	VA/DoD	ACR/AF	AAOS	ESCEO
<b>Self management programs and education</b>	Education				
	Self-mgmt				
<b>Weight Loss</b> (if overweight)					
<b>Exercise</b>		nd			
Low impact aerobic exercise (aquatic and/or land based)	Land-based				nd
	Aquatic				
Yoga; Range of motion/flexibility	nd	nd	Yoga	nd	nd
Supervised exercise with manual therapy	nd	nd			nd
Balance		nd		nd	nd
Manual therapy alone	nd	nd		nd	nd
Group and home equally effective/individualize	nd	no preference	nd	nd	nd
Consider PT/OT referral	nd		nd	nd	mentioned, but no specific GRADE rec
Mobilization and manipulation		nd	nd	nd	nd
neuromuscular training		nd	nd		nd
<b>Joint support and assistive devices</b>					
Patellar taping		nd		nd	nd
Brace with varus/valgus as indicated		*	tibiofemoral		nd
			Patellofemoral		
Heel wedges (medial or lateral as indicated)		nd		lateral	nd
Walking aids as needed		nd	cane	cane	nd
Soft brace		*	nd	nd	nd
<b>Alternative and complementary modalities</b>					
Acupuncture		insuff evid			nd
Tai Chi/mind body		insuff evid		nd	nd
Thermal modalities		nd		nd	nd
TENS (if not surgical candidate)	nd	insuff evid			nd
Therapeutic ultrasound		nd	nd	nd	nd
Cognitive behavioral therapy		nd		nd	nd
Massage		insuff evid			nd
Laser therapy		nd	nd		nd
Balneotherapy		nd	nd	nd	nd
Electromagnetic therapy		nd			nd
Nerve block therapy		nd	nd	nd	nd
extracorporeal shock wave	nd	nd	nd		nd

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\* Note for DoD bracing: consider soft brace for knee OA, valgus brace for medial compartment OA

Colors indicate direction and strength of recommendations.

Color	Direction	Strength
Dark Green	For	Strong
Light Green	For	Conditional
Very Light Green	For	Weak
Light Red	Against	Conditional
Dark Red	Against	Strong

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**Table 2:**

Pharmacologic Modality Recommendations For The Management of Knee Osteoarthritis

	OARSI	VA/DoD	ACR/AF	AAOS	ESCEO
Acetaminophen/paracetamol (<4g/day)					weak against for long-term use; weak for short-term use
Oral NSAID					
Topical NSAID					
Topical capsaicin				nd	nd
Glucosamine		insuff evid			
Chondroitin		insuff evid			
combination glucosamine AND chondroitin		insuff evid		nd	weak against short-term use
Gastroprotection for high-risk patients (COX2, topicals, add PPI)		*	Discussed, rec as appropriate	nd	discussed, but no specific rec
Tramadol					
Opioids					
Duloxetine				nd	
Diacerhein		nd	nd	nd	
Avocado Soybean unsaponifiables		insuff evid	nd	nd	
Herbal remedies	Boswellia, Curcuminoid:	insuff evid	nd	turmeric, ginger	nd
Vitamins	MSM, vitamin D	insuff evid	Vitamin D	Vitamin D	nd
Intra-articular corticosteroids					
Intra-articular hyaluronic acid					
Intra-articular platelet-rich plasma or growth factors	nd	PRP: insuff evid			nd
		stem cells			nd
DMARDs	nd	nd		nd	nd
Collagen		insuff evid		nd	nd

\* Consider adding proton pump inhibitor or misoprostol in patients at risk for upper gastrointestinal events who require treatment with NSAIDs or COX-2 inhibitors.

Colors indicate direction and strength of recommendations.

Color	Direction	Strength
	For	Strong
	For	Conditional
	For	Weak
	Against	Conditional
	Against	Strong

**Table 3:**

Recommendations For The Management of Hip Osteoarthritis

	OARSI	Va/DoD	ACR
<b>Self management programs and education</b>	Education		
	Self-mgmt		
<b>Weight Loss</b> (if overweight)			
<b>Exercise</b>		nd	
Low impact aerobic exercise (aquatic and/or land based)			
Supervised exercise with manual therapy	nd	nd	
Balance		nd	
Manual therapy alone	nd	nd	
Group and home equally effective/individualize	nd	no preference	nd
Consider PT/OT referral	nd		nd
Mobilization and manipulation		nd	nd
<b>Joint support and assistive devices</b>			
Heel wedges (medial or lateral as indicated)	nd	nd	
Walking aids as needed		nd	
<b>Alternative and complementary modalities</b>			
Acupuncture		insuff evid	
Tai Chi/mind body		insuff evid	
Thermal modalities		nd	
TENS (if not surgical candidate)	nd	insuff evid	
Cognitive behavioral therapy (with or without exercise)		nd	
Massage		insuff evid	
Balneotherapy		nd	nd
<b>PHARMACOLOGIC</b>			
Acetaminophen/paracetamol (<4g/day)			
Oral NSAID			
Topical NSAID		insuff evid	nd
Topical capsaicin	nd	insuff evid	nd
Glucosamine and/or chondroitin		insuff evid	
Gastroprotection for high risk patients (COX2, topicals, add PPI)		*	Discussed, rec as appropriate
Tramadol			
Opioids			
Duloxetine		nd	
Diacerhein		nd	nd
Avocado Soybean unsaponifiables		insuff evid	nd

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	OARSI	Va/DoD	ACR
Herbal remedies	Boswellia, curcumin	insuff evid	nd
Vitamins	MSM or vitamin D	insuff evid	Vit D
Intra-articular corticosteroids			
Intra-articular hyaluronic acid			
Intra-articular platelet-rich plasma or growth factors	nd	PRP: insuff evid	
DMARDs	nd	nd	
Collagen		insuff evid	nd

\* Consider adding proton pump inhibitor or misoprostol in patients at risk for upper gastrointestinal events who require treatment with NSAIDs or COX-2 inhibitors.

Colors indicate direction and strength of recommendations.

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Color	Direction	Strength
	For	Strong
	For	Conditional
	For	Weak
	Against	Conditional
	Against	Strong

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**Table 4:**

Recommendations For The Management of Hand Osteoarthritis

	EULAR	ACR
<b>Education and Self-management</b>		
Self management programs and education		
Individualized treatment		Discussed and recommended as appropriate
<b>Exercise</b>		
	nd	
Range of motion/flexibility		nd
<b>Joint support and assistive devices</b>		
Assistive devices to improve ADLs		nd
Splints for trapeziometacarpal OA		1st CMC
		Other hand joints
<b>Alternative and complementary modalities</b>		
Acupuncture	nd	
Thermal modalities	nd	
Cognitive behavioral therapy (with or without exercise)	nd	
<b>PHARMACOLOGIC</b>		
Acetaminophen/paracetamol (<4g/day)		
Oral NSAID		
Topical NSAID		
Topical capsaicin	Discussed but no recommendation	
Glucosamine	nd	
Chondroitin		
Tramadol	Discussed but no recommendation	
Opioids (refractory pain)	nd	
Duloxetine	nd	
Vitamin D	nd	
Intra-articular corticosteroids		
Intra-articular hyaluronic acid	nd	1st CMC
DMARDs		

Colors indicate direction and strength of recommendations.

Color	Direction	Strength
	For	Strong
	For	Conditional
	For	Weak
	Against	Conditional

Color	Direction	Strength
Red	Against	Strong

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