

Available at jfponline.com **LEARNING OBJECTIVES**

- Identify evidence-based guidelines for diagnosis, treatment, and long-term management of patients with osteoarthritis (OA)
- Evaluate the benefits and challenges of lifestyle modifications and nonpharmacologic medical interventions to reduce the pain and disability associated with OA and to prevent or delay progression of OA
- Evaluate the advantages and disadvantages of various pharmacologic options for the treatment of OA and determine the most appropriate agents based on individualized patient assessment of disease severity, lifestyle factors, and coexisting diseases
- Develop an individualized treatment plan for patients with OA, including plans for initial treatment and routine follow-up to assess effectiveness and safety, and to identify patients who require modification to their treatment plan in response to changes in their OA or overall health status
- Identify potential barriers to achieving optimal long-term outcomes for patients with OA

FACULTY DISCLOSURE STATEMENTS

Dr Altman reports that he is a consultant for Endo Pharmaceuticals, Inc.; Ferring Pharmaceuticals, Inc.; and Novartis Pharmaceuticals.

Dr Kuritzky reports that he is a consultant for Endo Pharmaceuticals, Inc., and Eli Lilly and Company.

Dr Ruoff reports that he has no financial relationships to disclose.

SPONSOR DISCLOSURE STATEMENT

The content collaborators at the Primary Care Education Consortium report that there are no existing financial relationships to disclose.

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Improving long-term management of osteoarthritis: Strategies for primary care physicians

Osteoarthritis (OA) is the most common type of arthritis and a leading cause of pain and physical disability, especially in older individuals.¹⁻³ Current treatment options emphasize lifestyle modifications, including diet and tailored exercise programs to reduce weight, if necessary, and to maintain joint mobility. However, almost all patients with symptoms require some form of pharmacologic intervention to manage those symptoms. This article will support the efforts of primary care physicians to correctly diagnose their patients with OA and initiate an effective treatment plan that includes a combination of lifestyle modifications, weight management, physical therapy, and pharmacologic agents to effectively manage symptoms and improve joint mobility while ensuring patient safety and quality of life.

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CLINICAL PRACTICE RECOMMENDATIONS FOR AAFP EB CME DESIGNATION

Practice Recommendation: Optimal management of osteoarthritis requires combination treatment with non-pharmacologic and pharmacologic interventions.

Evidence-Based Source: Zhang W, Moskowitz RW, Nuki MB, et al. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage*. 2008;16(2):137-162.

Volume/Issue/Page Number of Article of Supporting Evidence: *Osteoarthritis Cartilage*. 2008;16(2):139.

Strength of Evidence: Level 3. Based on expert opinion and results from randomized controlled trials of lower quality and meta-analyses.

Practice Recommendation: Patients with hip and knee osteoarthritis should be encouraged to undertake regular aerobic exercise, muscle strengthening, and range of motion exercises.

Evidence-Based Source: Zhang W, Moskowitz RW, Nuki MB, et al. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage*. 2008;16(2):137-162.

Volume/Issue/Page Number of Article of Supporting Evidence: *Osteoarthritis Cartilage*. 2008;16(2):143.

Strength of Evidence: Level 1. Systematic review and meta-analysis of thirteen randomized controlled trials.

Practice Recommendation: Oral NSAIDs should be used at the lowest effective dose and for the shortest duration in patients who fail to respond to acetaminophen; in patients with increased GI risk, NSAIDs should be administered with a gastroprotective agent or a selective COX-2 inhibitor should be used; in patients with increased cardiovascular risk, COX-2 inhibitors should be used with caution.

Evidence-Based Source: Zhang W, Doherty M, Leeb BF, et al. EULAR evidence based recommendations for the management of hand osteoarthritis: Report of a Task Force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCI-SUT). *Ann Rheum Dis*. 2007;66(3):383.

Volume/Issue/Page Number of Article of Supporting Evidence: *Ann Rheum Dis*. 2007;66(3):383.

Strength of Evidence: Level 1. Three randomized controlled trials for NSAIDs; systematic review of 112 randomized controlled trials for NSAIDs combined with GI protective medications and COX-2 inhibitors.



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CASE STUDY

Ms B is a 66-year-old retired schoolteacher. She mentions that she has noticed increased stiffness in both knees, particularly in the right knee. Ms B reports that the stiffness lasts for about 15 minutes after sitting or lying down, and she has difficulty walking because of weight-bearing pain. She also indicates that her symptoms worsen when she kneels, squats, or walks down stairs. Ms B reports that she uses a heating pad and takes two tablets of acetaminophen 325 mg intermittently to help relieve the pain and stiffness, with partial benefit and no adverse effects.

Physical examination reveals that Ms B measures 5 feet 9 inches and weighs 209 pounds, for a body mass index (BMI) of 31 kg/m², which confirms that she is obese. Evaluation of her lower extremities reveals mild genu varum, her gait is slightly antalgic, and active range of motion (ROM) of both knees reveals palpable crepitus with reduced flexion and extension. Palpation reveals patellar facet tenderness along the medial and lateral joint line. Swelling is evident for both knees, with hard tissue (bony) enlargement. There is no evidence of arthritis in Ms B's hands, feet, cervical or lumbar spine, or hips. She has full lumbosacral ROM and reports no pain associated with motion or palpation. You note that the right lower leg is a half inch shorter than the left. Comorbid history includes moderate hypertension and dyslipidemia, which are managed with pharmacotherapy.

Pathophysiology of Osteoarthritis

OA most commonly affects the hands and weight-bearing joints such as the knees and hips, in addition to the spine.^{2,4} OA is a disease of the entire joint.⁵ The pathophysiology of OA is a dynamic process involving all joint tissues—cartilage, bone, synovium, ligaments, and muscle.^{2,4-7} The process of OA is both biomechanical and biochemical.^{2,4-6} These factors provoke disruption of the articular cartilage in synovial joints. The deterioration of joint cartilage is characterized by loss of aggrecan (proteoglycan) and collagen. Cartilage damage results in erosions, reactive formation of osteophytes, and restructuring of subchondral bone.^{2,4-7} Emerging evidence suggests that some degree of inflammation contributes to the etiology of OA,^{4,6} particularly with respect to symptoms and disease progression, which occur slowly over a number of years.⁸

Differential Diagnosis

The diagnosis of OA is most often clinical, primarily based on examination and information elicited from the patient history about pain and other symptoms.^{6,7,9} A comprehensive physical examination for OA should assess the following: (1) joint pain on manipulation, (2) muscle

strength and ligament stability, (3) body weight and BMI, and (4) postural alignment during standing and walking.^{6,7,9} In general, radiographs are not usually indicated for initial diagnosis and management of a patient with presumed OA, as they often do not provide information that supplements findings from the physical examination.^{7,9} Furthermore, population studies indicate that 40% of patients with radiographic evidence of OA are asymptomatic.⁹ Thus, radiographs are not considered to be useful for the diagnosis of clinical OA unless an additional diagnosis is being considered. However, magnetic resonance imaging may be useful to identify other causes of joint pain that may be suggestive of OA.⁷

Although the low-grade inflammatory nature of OA usually results in normal laboratory findings, laboratory studies may help rule out other disease entities such as other types of arthritis.⁷ Furthermore, a complete blood count, creatinine level, and liver enzymes are important baseline tests to perform before initiating pharmacotherapy, especially in older individuals or those with comorbid health conditions.⁷

It is important to rule out other conditions with symptom and risk profiles similar to OA. These conditions include infection, overuse syndromes, traumatic injuries, bursitis, and other types of arthritis, especially rheumatoid and psoriatic arthritis, seronegative spondyloarthritides such as ankylosing spondylitis, arthritis associated with inflammatory bowel disease, and reactive arthritis.^{7,10} Secondary OA should be considered in patients with chondrocalcinosis, metabolic bone disorders, and neuropathic diseases.⁷ It is also essential to rule out bone and joint disorders that may be caused by treatment of other diseases, such as cancer and sarcoidosis.

CASE STUDY

Ms B has moderate bilateral knee OA. Your initial treatment plan for Ms B involves education about the importance of weight loss to reduce the burden on the knee joints and to control comorbid conditions, and a referral to a nutritionist. You advise Ms B to limit activities that load the patellofemoral joint, such as squatting and walking up and down stairs. You emphasize the importance

of initiating and maintaining a regular program of physical exercise to facilitate weight loss and improve joint mobility. You refer Ms B to a physical therapist, with the goal of increasing her ROM and mobility through muscle strength training for both her quadriceps and hamstrings, which can significantly improve functional ability and reduce knee pain. In addition, you emphasize the importance of increasing strength in all major muscle groups that cross the joint to maintain ROM. You recommend that Ms B take acetaminophen 1000 mg every 4 to 6 hours for pain relief, ensuring she understands that the maximum daily dose is 4000 mg/day in divided doses. You also partially correct the half-inch difference in leg length with a shoe lift.

Treatment Options

The primary treatment goals for OA are to reduce and control pain, improve function, improve or maintain joint mobility, and reduce or prevent physical disability.^{11,12} Treatment options for patients with OA include: (1) lifestyle modifications such as diet and tailored exercise programs, (2) nonpharmacologic medical interventions, including physical and occupational therapy, and (3) pharmacologic interventions, including mild analgesics for pain control, topical agents such as nonsteroidal anti-inflammatory drugs (NSAIDs); oral NSAIDs; cyclooxygenase (COX)-2 inhibitors; and opioid analgesics.^{11,12} Development of an optimal treatment plan requires an understanding of each patient's lifestyle and his or her goals for living with OA, for example, pain relief or regaining levels of physical activity. Lifestyle modifications should be maintained for the duration of care, whereas treatment of pain and mobility with pharmacologic agents should be adjusted to match the cyclic nature of these symptoms.

Lifestyle Modifications

Weight loss is the single most important modifiable risk factor for OA.¹³ However, weight loss generally can be accomplished only through dietary change and regular physical exercise. If necessary, patients should be referred to a registered dietitian or

nutritionist to establish a dietary plan to promote and sustain weight loss. In addition, referral to a physical and/or occupational therapist to develop a tailored exercise program can help patients initiate and sustain regular physical exercise.⁷ Interventions to promote weight loss in patients with knee OA have been shown to significantly improve functional abilities, 6-minute walk distance, stair-climbing time, and pain.^{11,12,14-16}

Dietary Modifications

Among 80 obese patients with OA, 50% of patients randomized to a low-carbohydrate (low-energy) diet (LED) plus weekly dietary education sessions for 8 weeks achieved a weight loss of $\geq 10\%$ compared with 0% of patients randomized to a conventional hypo-energetic, high-protein diet.¹⁴ OA symptoms assessed by the Western Ontario and McMaster Universities (WOMAC) OA index provided measures of self-reported severity of pain, stiffness, and physical limitations. There were significant improvements in the total WOMAC score (difference between the LED and control groups, -219.3 ; 95% confidence interval [CI], -369.2 to -69.4 ; $P = .005$) and functional abilities (difference between LED and control groups, -166.9 ; 95% CI, -274.5 to -59.3 ; $P = .003$).

Exercise

Both home-based personal exercise programs and programs administered by physical therapists have resulted in significant improvements in functional ability and 6-minute walk distances with improvements sustained for up to 1 year.^{7,15-17} A randomized trial compared the effectiveness of a home-based and a clinically based physical therapy program for 134 patients with knee OA.¹⁶ After only 4 weeks, overall WOMAC scores improved 52% (mean score, 535 mm; 95% CI, 426-644) for patients in the clinically based program vs 26% (mean score, 270 mm; 95% CI, 193-346) for patients in the home-based program. Average 6-minute walk distances improved approximately 10% (40 meters; 95% CI, 30-48) for both groups. Average improvements in overall WOMAC scores and 6-minute walk distances in both groups remained statistically significant at the 1-year follow-up.

The Arthritis Foundation¹⁸ offers educational material for patients on diet and exercise and information about exercise programs, such as Walk with Ease and the Life Improvement Series, at www.arthritis.org/resources.php and www.arthritis.org/programs.php.

CASE STUDY

Ms B adheres to your referrals to a registered dietitian and physical therapist. She initially loses 20 pounds and maintains her weight at 189 pounds. However, at a 6-month follow-up visit, Ms B indicates that she continues to experience significant pain in both knees and the acetaminophen has not provided adequate pain relief. You switch Ms B to 375 mg naproxen immediate-release twice daily with food, which reduces her pain by about half. You also add a proton pump inhibitor (PPI) to her regimen to reduce NSAID gastric toxicity, as well as tramadol, titrated slowly up to a dose of one or two 50-mg tablets of tramadol every 6 hours, as needed, for breakthrough pain. You see Ms B again in 4 weeks and she is doing quite well.

Pharmacologic Interventions

Lifestyle modifications should be continued and reinforced at each patient visit. By asking about lifestyle changes and reinforcing their role in the management of OA symptoms, patients may be more likely to sustain long-term adherence to lifestyle modifications. However, most patients with symptomatic OA generally require some form of pharmacologic treatment to achieve optimal symptom management.

The choice of pharmacologic agents for OA treatment should be guided by the need for sustained relief and reduction in the intensity of pain with minimal side effects, while prescribing the lowest effective dose for the shortest interval.¹¹ Care should be taken when prescribing pharmacologic agents for older patients as they are at increased risk for many of the side effects associated with pharmacologic interventions for OA. The agents recommended by the Osteoarthritis Research Society International (OARSI) to treat OA are presented in *Table 1*.¹¹

TABLE 1

OARSI recommendations for pharmacologic treatment of osteoarthritis

PHARMACOLOGIC AGENT	LEVEL OF EVIDENCE	EFFECT SIZE FOR PAIN RELIEF (95% CI)	STRENGTH OF RECOMMENDATION
Acetaminophen up to 4 g/day	1a, knee 4, hip	0.21 (0.02-0.41)	1 3
Oral NSAIDs	1a, knee and hip	0.32 (0.24-0.39)	1
Topical NSAIDs and capsaicin	1a, NSAIDs 1a, capsaicin	0.41 (0.22-0.59)	1 1
Opioid analgesics	1a, weak opioids 4, strong opioids	Not specified Not specified	1 3
Intra-articular injections of corticosteroids	1a, knee 1b, hip	0.72 (.041-1.02)	1 1
Intra-articular injections of hyaluronate	1a, knee 1b, hip	0.32 (0.17-0.47)	1 1
Glucosamine and/or chondroitin	1a, glucosamine 1a, chondroitin	0.45 (0.04-0.86) 0.30 (-0.10-0.70)	1 1

CI, confidence interval; NSAIDs, nonsteroidal anti-inflammatory drugs; OARSI, Osteoarthritis Research Society International.

Level of evidence: 1a, meta-analysis of randomized controlled trials (RCTs); 1b, RCTs; 2b, quasi-experimental studies; 3, observational studies; 4, expert opinion.

Effect size (ES) reflects the mean difference between the treatment and control group, divided by the standard deviation of the difference, with ES = 0.2 considered a small positive clinical benefit; ES = 0.5, a moderate positive clinical benefit; and ES >0.8, a large positive clinical benefit.

Strength of recommendation is based on the American Academy of Family Practice Strength of Recommendation Taxonomy (SORT).

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According to OARSI,^{11,12} initial treatment of OA should begin with acetaminophen at 1000 mg 3 to 4 times per day, not to exceed 4 grams per day, for relief of mild to moderate pain. An NSAID, in oral or topical formulation, is an effective alternative or adjunct if acetaminophen does not provide adequate pain relief; patient risk of adverse gastrointestinal (GI) events should be considered in selecting among product formulations and determining the need for GI protective therapy.

Oral NSAIDs should be prescribed at the lowest effective dose, and since the symptoms of OA are often cyclic, intermittent dosing should be considered to prevent side effects and potential GI, cardiovascular, and renal complications.^{11,12} Some physicians may choose to prescribe NSAIDs at the lower end of the dosing range in addition to acetaminophen before opting to discontinue acetaminophen. Patients at risk of GI toxicity will benefit from the addition of a PPI to reduce production of gastric acid, or misoprostol for GI protection to reduce the risk of

developing ulcers and other GI events such as bleeding.^{11,12,19} Long-term use of oral NSAIDs should be avoided if at all possible.^{11,19}

Topical NSAIDs and capsaicin (*Table 2*),^{20,21} which are considered second-line therapeutic agents for OA, offer the advantage of maximizing local delivery of pain relief while minimizing risk of systemic side effects and toxicities. A study by Lin et al found that topical NSAIDs provided improvements in pain relief, function, and joint mobility that were superior to placebo for the first 2 weeks of therapy, although these benefits were not sustained during weeks 3 and 4.²² This meta-analysis of pooled data from 13 randomized controlled trials of patients with clinical or radiographic evidence of OA (N = 1983) compared pain relief, improvement in functional ability, and joint mobility between patients treated with topical NSAIDs, placebo, and oral NSAIDs. Topical NSAIDs were less effective than oral NSAIDs for pain relief, but there was no difference between the 2 types of NSAIDs with respect to overall clinical response.

TABLE 2

Topical agents for the treatment of osteoarthritis

AGENT	DOSAGE RECOMMENDATION
Diclofenac sodium topical gel, 1%	<ul style="list-style-type: none"> • Lower extremities: 4 g up to 4 times/day, not to exceed 16 g/day • Upper extremities: 2 g up to 4 times/day, not to exceed 8 g/day • Total daily dose for all affected joints combined: not to exceed 32 g/day
Capsaicin, 0.025% or 0.075%	<ul style="list-style-type: none"> • Up to 4 times/day • Not reviewed or approved by the US Food and Drug Administration

Diclofenac sodium topical gel. <http://www.voltarengel.com/pdf/Voltaren-PI-10-19.pdf>. Accessed December 31, 2008.

Capsaicin. In: Deglin JH, Vallerand AH. *Davis's Drug Guide for Nurses*. 11th ed. Philadelphia, PA: F.A. Davis Company; 2009:261-263.

Systemic adverse events were predictably lower among patients using topical NSAIDs than among those using oral NSAIDs; however, patients using topical NSAIDs reported local side effects, including skin irritation such as rash, itching, and burning.

Topical capsaicin creams contain a lipophilic alkaloid extract from chili peppers that activates and sensitizes peripheral C nociceptors.¹¹ In a meta-analysis of 3 randomized controlled trials reported in the OARSI guidelines, capsaicin (0.025% cream 4 times per day) reduced pain by 33% in patients with knee and hand OA after 4 weeks of therapy.¹¹ However, 40% of patients reported local burning, stinging, or erythema. When selecting among treatment options, the local side effects of topical NSAIDs and capsaicin must be weighed against the GI, renal, and cardiovascular effects that may be provoked by oral NSAIDs and selective COX-2 inhibitors.²² Patients should be cautioned about the use of direct heat or heat therapy modalities, such as heating pads in combination with topical agents, as this practice can result in an increase in systemic absorption, local irritation, and the risk of burns.

Selective COX-2 inhibitors provide another treatment option for patients with OA.^{11,12,19} If the patient is unable to tolerate oral NSAIDs or does not achieve the desired clinical response, treatment with a selective COX-2 inhibitor alone or in combination

with acetaminophen may be considered, but only after evaluation for cardiovascular and GI risk and other recommended precautions. In elderly patients or others at risk for GI complications, selective COX-2 inhibitors should be coadministered with misoprostol or a PPI to prevent GI side effects. High-risk patients should be monitored for GI, cardiovascular, renal, and hepatic toxicities.^{11,12,19}

Some patients require advancing OA therapy to other prescription analgesics, such as tramadol or opioids, or to intra-articular injections of corticosteroids or hyaluronic acid to manage the pain of OA.¹¹ Tramadol or tramadol plus acetaminophen should be initiated at low doses and titrated gradually to the lowest effective dose; patients should be advised to take the medication at night until tolerance to possible dizziness or nausea is established.^{7,11} Use caution in elderly patients and adjust doses for renal or hepatic impairment. Opioid analgesics may be necessary to manage highly refractory pain or for patients with severe OA. These agents should be initiated cautiously at low doses and titrated slowly to minimize sedation and other side effects. Clinicians should monitor patients taking opioids for drug interactions, since all of the opioids, except oxycodone, are involved with cytochrome P450 metabolism. Intra-articular injections of a depot corticosteroid or hyaluronic acid within recommended guidelines can also offer relief for patients with OA.^{7,11}

Nutritional Supplements

The OARSI guidelines suggest that glucosamine and chondroitin and similar nutritional supplements may relieve OA symptoms for some patients¹¹; however, there is some controversy regarding the efficacy of these agents. The Glucosamine/chondroitin Arthritis Intervention Trial (GAIT) randomly assigned 1583 patients with knee OA to treatment with glucosamine 1500 mg/day, chondroitin sulfate 1200 mg/day, combination glucosamine/chondroitin sulfate, celecoxib 200 mg/day, or placebo for 24 weeks.²³ Patients were stratified to treatment regimen by severity of pain at baseline; the primary study end point was a 20% reduction in pain from baseline to 24 weeks'

follow-up. Pain relief for all patients combined was not significantly better for the glucosamine, chondroitin sulfate, and combination regimens compared with placebo at 24 weeks. However, among patients with moderate to severe pain at baseline, 79.2% achieved a significant reduction in pain in response to the glucosamine/chondroitin sulfate combination versus placebo (54.3%, $P = .002$). A recent report from the GAIT trial evaluating objective radiographic measures of knee OA progression showed that no treatment group achieved predefined differences in joint space width loss over placebo, although the power of the study was limited.²⁴ Many patients choose to use such products, given the data and the relatively mild side effect profile. However, it is advisable to ask patients if they are taking other supplements or over-the-counter products purchased at drug or health food stores and to monitor for potential side effects and drug interactions. OARSI guidelines suggest discontinuation of these products if no favorable response is noted after 6 months of use.¹¹

Flavocoxid is marketed as a medical food for the management of OA. Two small, unpublished studies suggest some benefit in meeting the nutritional requirements of patients with OA.²⁵ It is important to note that the safety and efficacy of medical foods are not reviewed or approved by the US Food and Drug Administration, although medical food manufacturers are required to comply with good manufacturing practices. Medical foods must be used with physician supervision.

Tailoring Treatment to Patient Lifestyle and Clinical Factors

Effective treatment of OA requires accurate assessment of the severity of the disease and its impact on patient quality of life at initial diagnosis. A hierarchical treatment approach is recommended, beginning with lifestyle changes to reduce weight, if necessary, through diet and appropriate exercise regimens, and nonpharmacologic medical interventions.⁷ Pharmacologic agents also play a significant role in providing optimal symptom relief. The choice of pharmacologic intervention should be based on the patient's current

health status and the degree of pain and mobility, consideration of disease progression, and evaluation of the risks and benefits of oral vs topical agents.

Combination treatment that integrates exercise, lifestyle modifications, other nonpharmacologic medical interventions, and pharmacologic therapies are essential to achieve optimal management of OA.^{11,12} The OARSI guidelines for management of hip and knee OA explicitly state that all 12 existing guidelines recommend combination treatment with pharmacologic and nonpharmacologic interventions to achieve optimal management of OA.¹¹ Treatment plans should be tailored to individual patient needs with the goal of alleviating or reducing pain and improving mobility.

Ongoing assessment of the extent to which the disease affects patients' quality of life and their ability to perform activities of daily living is essential. Primary care physicians should determine whether the prescribed treatment regimen requires modification to ensure optimal pain management and joint mobility. Routine follow-up also provides opportunities for identification of adverse events, polypharmacy, and monitoring of comorbid health conditions, such as GI conditions, diabetes, depression, and cardiovascular disease, that might be contraindications to specific medical interventions.

It is essential to emphasize to patients that diet and exercise must be lifelong changes. Primary care physicians should provide patients with ongoing support and encouragement to initiate and sustain the lifestyle modifications that support weight loss and weight maintenance, and to adhere to their individualized exercise programs.^{7,11,12} It is also important to encourage patients to follow up with referrals to allied health professionals such as physical therapists, occupational therapists, and registered dietitians, who can also encourage patient adherence to weight loss and exercise programs.

Summary

Appropriate diagnosis and treatment of OA is essential to provide optimal symptom relief. Diagnosis of OA includes assessment of patient complaints

and risk factors for OA, including overweight/obesity and low activity levels. Optimal treatment of OA combines lifestyle modifications, nonpharmacologic medical interventions, and pharmacologic interventions to achieve maximum pain control and joint mobility. Topical NSAIDs may offer effective relief while minimizing the risk of systemic toxicities associated with oral medications. Oral medications should be used at the lowest possible effective doses and for the shortest duration of time or on an intermittent dosing schedule.

Patients with OA require routine follow-up and monitoring to sustain lifestyle changes and to identify those with inadequate pain control and decreased joint mobility. An individualized treatment plan that includes modification of treatment strategies, as needed, to address changes in OA symptoms, as well as regular monitoring to ensure early identification of adverse events or the development of comorbid conditions that might preclude the use of specific pharmacologic agents, is essential for all patients with OA. ■

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