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SPECIAL ARTICLE

American College of Rheumatology 2012 Recommendations for the Use of Nonpharmacologic and Pharmacologic Therapies in Osteoarthritis of the Hand, Hip, and Knee

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Objective. **To update the American College of Rheumatology (ACR) 2000 recommendations for hip and knee osteoarthritis (OA) and develop new recommendations for hand OA.**

Methods. **A list of pharmacologic and nonpharmacologic modalities commonly used to manage knee, hip, and hand OA as well as clinical scenarios representing patients with symptomatic hand, hip, and knee OA were generated. Systematic evidence-based literature reviews were conducted by a working group at the Institute of Population Health, University of Ottawa, and updated by ACR staff to include additions to bibliographic databases through December 31, 2010. The Grading of Recommendations Assessment, Development and Evaluation approach, a formal process to rate scientific evidence and to develop recommendations that are as evidence based as possible, was used by a Technical Expert Panel comprised of various stakeholders to formulate the recommendations for the use of nonpharmacologic and pharmacologic modalities for OA of the hand, hip, and knee.**

Results. **Both "strong" and "conditional" recommendations were made for OA management. Modalities conditionally recommended for the management of hand OA include instruction in joint protection techniques, provision of assistive devices, use of thermal modalities and trapeziometacarpal joint splints, and use of oral and topical nonsteroidal antiinflammatory drugs (NSAIDs), tramadol, and topical capsaicin. Nonpharmacologic modalities strongly recommended for the management of knee OA were aerobic, aquatic, and/or resistance exercises as well as weight loss for overweight patients. Nonpharmacologic modalities conditionally recommended for knee OA included medial wedge insoles for valgus knee OA, subtalar strapped lateral insoles for varus knee OA, medially directed patellar taping, manual therapy, walking aids, thermal agents, tai chi, self-management programs, and psychosocial interventions. Pharmacologic modalities conditionally recommended for the initial management of patients with knee OA included acetaminophen, oral and topical NSAIDs, tramadol, and intraarticular corticosteroid injections; intraarticular hyaluronate injections, duloxetine, and opioids were conditionally recommended in patients who had an inadequate response to initial therapy. Opioid analgesics were strongly recommended in patients who were either not willing to undergo or had contraindications for total joint arthroplasty after having failed medical therapy. Recommendations for hip OA were similar to those for the management of knee OA.**

Conclusion. **These recommendations are based on the consensus judgment of clinical experts from a wide range of disciplines, informed by available evidence, balancing the benefits and harms of both nonpharmacologic and pharmacologic modalities, and incorporating their preferences and values. It is hoped that these recommendations will be utilized by health care providers involved in the management of patients with OA.**

INTRODUCTION

Many patients with a clinical diagnosis of osteoarthritis (OA) are treated with a combination of nonpharmacologic and pharmacologic modalities (1). The American College of Rheumatology (ACR) last published recommendations for the management of hip and knee OA in 2000 (2), with

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an addendum posted on the ACR web site in February 2005 (3). Since 2000, other professional societies have published recommendations for the management of hand, hip, and knee OA, including those developed by the European League Against Rheumatism (EULAR) (4–6), the Osteoarthritis Research Society International (OARSI) (7), and the American Academy of Orthopaedic Surgeons (AAOS) (8).

Past ACR recommendations for the management of hip and knee OA were derived by a small group using an informal consensus approach following an extensive literature review. Since then, the methodology used to develop clinical practice guidelines has matured with the use of systematic literature reviews and the implementation of the Delphi method for development of consensus agreement on propositions (4–7) or the RAND/University of California, Los Angeles Appropriateness Method for determining when the use of certain therapeutic modalities is appropriate in a given clinical scenario (9). The current recommendations were developed using the Grades of Recommendation Assessment, Development and Evaluation (GRADE) approach, a formal process to develop recommendations that are as evidence based as possible. The GRADE approach has been adopted by the World Health Organization, the Cochrane Collaboration, the Agency for Healthcare Research and Quality (AHRQ) (10–14), and numerous professional organizations including, among others, the American College of Physicians and, most recently, the ACR.

Since 2000, new therapies for OA and additional information on the safety and tolerability of existing therapies for OA have become available and, as noted above, the methodology for developing clinical practice guidelines has evolved. These factors combined to contribute to the decision of the ACR to revise and update recommendations for the management of OA of the hip and knee as well as create new recommendations for the management of OA of the hand. Applying these recommendations in clinical practice requires individualized assessment of the patient and consideration of the values and judgments of both the practitioner and the patient. The recommendations provided here are not intended to be used in a "cookbook" fashion, but rather to provide guidance based on clinical evidence and expert panel input. Unlike previous ACR recommendations for the management of OA, these recommendations do not recommend the sequence of subsequent interventions for those failing to have an adequate response to recommended initial therapies, as there are few, if any, high-quality studies that were designed to examine the benefit and safety of specific modalities under such assumptions. Although disseminated under the aegis of the ACR, we hope that these recommendations will have relevance to practitioners throughout the world. We specifically did not make recommendations regarding the use of pharmacologic agents that are not approved in the US and Canada, however, or regarding the use of surgical interventions, as this was beyond the scope of the charge to the committee.

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MATERIALS AND METHODS

Initial systematic literature review. Systematic literature searches were conducted by a working group at the University of Ottawa, which also organized the summary evidence profiles and supporting documents. Systematic literature searches were performed for more than 50 different nonpharmacologic and pharmacologic modalities that were previously identified by separate expert panels (4–7); note that tramadol was considered separately from opioid analgesics because the central analgesic effect of tramadol is thought to be mediated not only by a weak opioid receptor agonist effect but also through modulation of serotonin and norepinephrine levels. Literature searches were not performed for medications that are not commercially available in the US and Canada. The initial searches were conducted in Medline (1950–2009), Embase (1980–2009), and The Cochrane Library (issue 3, 2009) by applying database subject headings and relevant keywords (see Supplementary Appendix A for the search strategy employed for exercise, available in the online version of this article at http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2151-4658). Published search filters were modified and used to limit the search to specific high-quality study designs (15–17). The initial searches for pharmacologic modalities were conducted during the third and fourth quarters of 2008, while those for the nonpharmacologic modalities were conducted during the second and third quarters of 2009.

The goal of the literature search was to identify the most current systematic review(s) and meta-analysis(es) that would provide reliable estimates of benefits of the inter-

vention for the prespecified clinically relevant outcomes of pain and function as well as providing data on safety of the intervention; clinically relevant safety outcomes differed by type of intervention. If no systematic review or meta-analysis was available, the search results were screened for randomized controlled trials (RCTs). If more than 1 systematic review or RCT was identified for the modality and outcomes of interest, the quality of the systematic review or RCT was assessed in order to select the best-quality evidence. Observational studies on safety of interventions were included if there were no RCTs. Data from the Food and Drug Administration (FDA) Adverse Event Reporting System and unpublished data from product manufacturers or investigators were not solicited, as adequate denominator populations are often not available to allow the calculation of numbers needed to harm.

Forming the Technical Expert Panel (TEP) and developing clinical scenarios. While the initial literature review was being completed, a TEP was convened (members of the TEP are shown in Appendix A). The TEP included nationally recognized academic and practicing rheumatologists, primary care physicians, physiatrists, geriatricians, orthopedic surgeons, and occupational and physical therapists. The TEP was asked initially to develop a series of clinical scenarios representing patients with hand, hip, or knee OA who presented for management decisions. The scenarios included a base case of a patient with symptomatic hand, hip, or knee OA; clinical variations of the base case scenario depended on specific joint groups involved for hand OA and the lack of a satisfactory response and/or the presence of comorbidities for hip and knee OA. The scenarios were collated and then submitted to the ACR Board of Directors for review.

Recommendation development. Once the literature review was completed, the TEP was asked to evaluate the evidence and formulate recommendations for OA treatment in the situations outlined in the clinical scenarios. First, the TEP was provided with summaries of the best available evidence for all interventions, including evidence profiles for each intervention for the prespecified clinically important outcomes, which provided summary data on the benefits and safety of each modality. These summaries also included, for each modality examined, the percentage of patients who clinically improved in both control and treatment groups, estimated effect size, number needed to treat, number needed to harm, and a complete quality assessment of the evidence. In addition, the TEP received the final set of clinical scenarios; instructions on the use of the GRADE process (10–13); the ACR White Paper on the use of nonsteroidal antiinflammatory drugs (NSAIDs) (18); AHRQ reports on the use of nonopioid analgesics for OA (19) and treatment of primary and secondary knee OA (20); the EULAR recommendations for the management of OA of the hand, hip, and knee (4–6); the AAOS recommendations for the management of knee OA (8); the OARSI recommendations for the management of OA of the hip and knee (7); the American Heart Association Scientific Statement on the use of NSAIDs (21); and the American College of Cardiology Foundation consensus recommendations on reducing the risk of gastrointestinal (GI) adverse events in patients using antiplatelet and NSAID therapy (22). The TEP also considered drug-specific indications, contraindications, and warnings from product information labels from the US FDA.

Next, using a 5-point Likert scale, panelists were asked to use the evidence reports to make a recommendation for each pharmacologic modality as applied to each clinical scenario; nonpharmacologic modalities were evaluated for the base cases of hand, hip, and knee OA, as well as hand OA with involvement of the trapeziometacarpal joint. The scale provided to panelists included the following choices: strong recommendation to use, weak (or conditional) recommendation to use, no recommendation, weak (or conditional) recommendation not to use, and strong recommendation not to use. The strength of a recommendation reflects the quality of the evidence supporting the use of the modality as well as the extent to which one can be confident that desirable effects (i.e., benefits) of an intervention outweigh undesirable effects (i.e., harms). Strong recommendations mean that most informed patients would choose the recommended management and that clinicians can structure their interactions with patients accordingly. Conditional recommendations mean that the majority of informed patients would choose the recommended management but many would not, so clinicians must ensure that patients' care is in keeping with their values and preferences. Based on this initial TEP member feedback, an initial set of recommendations was drafted.

Initial voting was done privately with votes submitted electronically using Excel spreadsheets (Microsoft). The TEP met in person in December 2008 to complete the pharmacologic recommendations for hand, hip, and knee OA and the nonpharmacologic recommendations for hand OA. If consensus was not achieved with private voting, further discussion of the modality was conducted at the meeting with open voting and group discussion until consensus was achieved. Subsequently, the TEP met by conference call in September 2009 to complete the nonpharmacologic recommendations for hip and knee OA. Prior to the conference call, the TEP members were provided with summary data on the benefits and safety of each nonpharmacologic modality reviewed. Again, initial voting was done privately with votes submitted electronically using Excel spreadsheets. If consensus was not achieved with private voting, further discussion of the modality was conducted at the meeting with open voting and group discussion until consensus was achieved. Throughout the voting process, if one or more members of the TEP reported a conflict of interest concerning any specific modality, they were encouraged to recuse themselves from the discussion and voting on that modality.

The summary data from the systematic literature review that were provided to the TEP before its meetings are available as supplementary files in the online version of this article at http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2151-4658. These data include not only the citations for the most relevant systematic reviews and/or randomized clinical trials and how to interpret them (in the OA guideline development process document), but also the summary of findings tables indicating the efficacy and safety/tolerability of pharmacologic modalities for hip and knee OA, duloxetine, nonpharmacologic modalities

for hip and knee OA, and updated tai chi. In addition, the top-line citations for each treatment modality that were used for the development of the summary of findings tables are included in Supplementary Appendix B (available in the online version of this article at http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2151-4658).

The final set of recommendations was drafted after discussion of the evidence at each TEP meeting. Consensus was defined as 75% or more of the members of the TEP voting to either strongly or conditionally recommend using a modality, either strongly or conditionally recommend not using a modality, or choosing not to make a recommendation on the use of a modality (23). A strong recommendation for using a modality required high-quality evidence and evidence of a large gradient of difference between desirable and undesirable effects of the treatment (i.e., benefits compared to harms). A conditional recommendation for using a modality was based on absence of high-quality evidence and/or evidence of only a small gradient of difference between desirable and undesirable effects of the treatment. In addition, when there was more uncertainty and/or variability in the values and preferences of the TEP members for a specific modality, this more likely resulted in a conditional recommendation. The lack of data from appropriate RCTs resulted in either not making a recommendation or making a recommendation not to use a modality, depending on the harms of the modality in other conditions and/or the values and preferences of TEP members. The recommendations of the TEP focus on the initiation of treatments for OA of the hand, hip, and knee. Costs of care were not considered in formulating these recommendations.

Updating the literature review and finalizing the recommendations. The initial literature searches were updated during the first quarter of 2011 with a cutoff date of December 31, 2010 by the ACR staff using the identical methodology and search filters as in the original searches. The results of the updated literature search of pharmacologic agents were reviewed by physician members of the project's Steering Committee (RDA, MCH, TT, PT) to identify studies that might provide information on new treatments or new information on the efficacy or safety/tolerability of existing treatments. The results of the updated literature search for nonpharmacologic modalities were reviewed by the rheumatology health professionals who were members of a TEP to identify studies that might provide new information on the efficacy or safety/tolerability of existing modalities. Selected key articles that were used to generate the evidence profiles for each of the nonpharmacologic and pharmacologic modalities are listed in Supplementary Appendix B (available in the online version of this article at http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2151-4658).

In the second quarter of 2011, the TEP reviewed the information obtained from the updated literature search and voted electronically on the need for making any changes in the original recommendations as well as providing recommendations for any new therapeutic modalities. Conference calls were conducted in order to reach consensus, as necessary. These updated votes are included in the recommendations in this manuscript.

ACR peer review of recommendations. Following manuscript development, a draft was submitted to the ACR Guideline Subcommittee, ACR Quality of Care Committee, and ACR Board of Directors for their comments and votes in regard to approval. These comments were incorporated into the final recommendations to the extent possible.

RESULTS

Hand OA. *Base case.* An adult with symptomatic hand OA without cardiovascular comorbidities, current or past upper GI problems, or chronic kidney disease presents to her primary care provider for treatment. She has pain in several finger joints for several months. Over-the-counter (OTC) acetaminophen at dosages up to 3 gm/day was of minimal value. Radiographs revealed osteophytes at several distal and proximal interphalangeal joints with joint space narrowing but no erosions.

The evidence base for hand OA was developed in collaboration with one of the authors (TT); this report has subsequently been published in part (24). There were relatively few high-quality RCTs of interventions for hand OA published in the peer-reviewed literature. Therefore, there were no strong recommendations made by the TEP for this indication. There are, however, several conditional recommendations that are discussed in the following sections.

Nonpharmacologic modalities. The TEP conditionally recommends that all patients with hand OA should be evaluated by a health professional, either their primary care provider or an occupational or physical therapist, for their ability to perform activities of daily living and receive assistive devices as necessary, instruction in joint protection techniques, and the use of thermal agents for relief of pain and stiffness (Table 1). The TEP conditionally recommends that patients with OA involving the trapeziometacarpal joint should be provided with splints, as they may benefit from this device.

Pharmacologic modalities. The TEP conditionally recommends that patients with hand OA should be treated

Table 1. Nonpharmacologic recommendations for the management of hand OA*

We conditionally recommend that health professionals should do the following:
Evaluate the ability to perform activities of daily living (ADLs)
Instruct in joint protection techniques
Provide assistive devices, as needed, to help patients perform ADLs
Instruct in use of thermal modalities
Provide splints for patients with trapeziometacarpal joint OA

* No strong recommendations were made for the nonpharmacologic management of hand osteoarthritis (OA). The evidence supporting these interventions demonstrated only a small to moderate effect size (see supplementary bibliography for hand OA in Supplementary Appendix B, available in the online version of this article at http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2151-4658).

Table 2. Pharmacologic recommendations for the initial management of hand OA*

We conditionally recommend that health professionals should use one or more of the following:
Topical capsaicin
Topical NSAIDs, including trolamine salicylate
Oral NSAIDs, including COX-2 selective inhibitors
Tramadol
We conditionally recommend that health professionals should not use the following:
Intraarticular therapies
Opioid analgesics
We conditionally recommend that persons age ≥75 years should use topical rather than oral NSAIDs. In persons age <75 years, the TEP expressed no preference for using topical rather than oral NSAIDs.

* No strong recommendations were made for the pharmacologic management of hand osteoarthritis (OA). For patients who have an inadequate response to initial pharmacologic management, please see the Results for alternative strategies. NSAIDs = nonsteroidal antiinflammatory drugs; COX-2 = cyclooxygenase 2; TEP = Technical Expert Panel.

with either topical or oral NSAIDs, topical capsaicin, or tramadol (Table 2). The TEP conditionally recommends that such patients not be treated with opioid analgesics or intraarticular therapies.

For patients with involvement of the trapeziometacarpal joint who request an intraarticular injection, the TEP conditionally recommends not using either intraarticular corticosteroids or hyaluronates and, furthermore, provided no recommendation on the choice between corticosteroids and hyaluronates, if a provider decides to give an injection. For patients with erosive and/or inflammatory interphalangeal OA, the TEP conditionally recommends not using either oral methotrexate or sulfasalazine and voted not to provide a recommendation either for or against the use of hydroxychloroquine. The recommendations not to use modalities were based largely on the absence of evidence from RCTs to support the benefits of use of these modalities and the potential for harm from these agents and/or procedures.

Knee OA. *Base case.* An adult with symptomatic knee OA without cardiovascular comorbidities, current or past upper GI problems, or chronic kidney disease presents to her primary care provider for treatment. She experiences pain in and/or around her knee(s) and has not had an adequate response to either intermittent dosing of OTC acetaminophen, OTC NSAIDs, or OTC nutritional supplements (e.g., chondroitin sulfate, glucosamine).

Nonpharmacologic modalities. The TEP strongly recommends that all patients with symptomatic knee OA be enrolled in an exercise program commensurate with their ability to perform these activities (25,26) (Table 3). The TEP expressed no preference for aquatic exercises as opposed to land-based exercises based on benefits or safety; the decision should be individualized and based on patient preferences and ability to perform exercises. For example, a patient who is aerobically deconditioned should initially participate in an aquatic exercise program in order to improve their aerobic capacity. Once this is accomplished, they can progress to a land-based program and choose, in conjunction with their health care provider, an aerobic conditioning or strengthening program or both. The TEP also strongly recommends that all patients with symptomatic knee OA who are overweight be counseled regarding weight loss (27).

The TEP conditionally recommends that patients with knee OA should 1) participate in self-management programs that may include psychosocial interventions, 2) use thermal agents and manual therapy in combination with exercise supervised by a physical therapist, 3) use medially directed patellar taping, 4) participate in tai chi programs, and 5) use walking aids, if necessary. Patients with lateral compartment OA are conditionally recommended to wear medially wedged insoles, while those with medial compartment OA are conditionally recommended to wear laterally wedged subtalar strapped insoles.

Pharmacologic modalities. For the base case failing to obtain adequate pain relief with intermittent dosing of OTC acetaminophen, OTC NSAIDs, and/or OTC nutritional supplements (e.g., chondroitin sulfate, glucosamine), the TEP conditionally recommends that health

Table 3. Nonpharmacologic recommendations for the management of knee OA

We strongly recommend that patients with knee OA should do the following:
Participate in cardiovascular (aerobic) and/or resistance land-based exercise
Participate in aquatic exercise
Lose weight (for persons who are overweight)
We conditionally recommend that patients with knee OA should do the following:
Participate in self-management programs
Receive manual therapy in combination with supervised exercise
Receive psychosocial interventions
Use medially directed patellar taping
Wear medially wedged insoles if they have lateral compartment OA
Wear laterally wedged subtalar strapped insoles if they have medial compartment OA
Be instructed in the use of thermal agents
Receive walking aids, as needed
Participate in tai chi programs
Be treated with traditional Chinese acupuncture*
Be instructed in the use of transcutaneous electrical stimulation*
We have no recommendations regarding the following:
Participation in balance exercises, either alone or in combination with strengthening exercises
Wearing laterally wedged insoles
Receiving manual therapy alone
Wearing knee braces
Using laterally directed patellar taping

* These modalities are conditionally recommended only when the patient with knee osteoarthritis (OA) has chronic moderate to severe pain and is a candidate for total knee arthroplasty but either is unwilling to undergo the procedure, has comorbid medical conditions, or is taking concomitant medications that lead to a relative or absolute contraindication to surgery or a decision by the surgeon not to recommend the procedure.

Table 4. Pharmacologic recommendations for the initial management of knee OA*

We conditionally recommend that patients with knee OA should use one of the following:
Acetaminophen
Oral NSAIDs
Topical NSAIDs
Tramadol
Intraarticular corticosteroid injections
We conditionally recommend that patients with knee OA should not use the following:
Chondroitin sulfate
Glucosamine
Topical capsaicin
We have no recommendations regarding the use of intraarticular hyaluronates, duloxetine, and opioid analgesics

* No strong recommendations were made for the initial pharmacologic management of knee osteoarthritis (OA). For patients who have an inadequate response to initial pharmacologic management, please see the Results for alternative strategies. NSAIDs = nonsteroidal antiinflammatory drugs.

care providers can use acetaminophen, oral or topical NSAIDs, tramadol, or intraarticular corticosteroid injections (Table 4). The TEP conditionally recommends that health care providers do not use nutritional supplements (e.g., chondroitin sulfate, glucosamine) or topical capsaicin. If the health care provider chooses to initiate acetaminophen in the full dosage up to 4,000 mg/day, the patient should be counseled to avoid all other products that contain acetaminophen, including OTC cold remedies as well as combination products with opioid analgesics.

If the patient does not have a satisfactory clinical response to full-dose acetaminophen, then the TEP strongly recommends the use of oral or topical NSAIDs or intraarticular corticosteroid injections (18,19). Health care providers should not use oral NSAIDs in patients with contraindications to these agents and should be aware of the warnings and precautions associated with the use of these agents. Furthermore, for persons age ≥75 years, the TEP strongly recommends the use of topical rather than oral NSAIDs (28). In this scenario, the TEP conditionally recommends the use of tramadol, duloxetine, or intraarticular hyaluronan injections. If the patient has a history of a symptomatic or complicated upper GI ulcer but has not had an upper GI bleed in the past year and the practitioner chooses to use an oral NSAID, the TEP strongly recommends using either a cyclooxygenase 2 (COX-2) selective inhibitor or a nonselective NSAID in combination with a proton-pump inhibitor; there was no preference expressed between these choices (29). In the clinical scenario where the above patient has had an upper GI bleed within the past year and the practitioner still chooses to use an oral NSAID, the TEP strongly recommends using a COX-2 selective inhibitor in combination with a proton-pump inhibitor. Subsequent to the initial meeting of the TEP, Latimer and colleagues reported that the addition of a proton-pump inhibitor to either a nonselective or COX-2 selective NSAID is cost effective given the evolving evidence base for efficacy and reductions in price (30). Therefore, whenever an NSAID is used for the chronic management of patients with knee or hip OA, the practitioner should consider adding a proton-pump inhibitor to reduce the risk of development of symptomatic or complicated upper GI events.

In the clinical scenario where the patient with OA is taking low-dose aspirin (≤325 mg per day) for cardioprotection and the practitioner chooses to use an oral NSAID, the TEP strongly recommends using a nonselective NSAID other than ibuprofen in combination with a proton-pump inhibitor. This recommendation is based, in part, on the FDA warning that the concomitant use of ibuprofen and low-dose aspirin may render aspirin less effective when used for cardioprotection and stroke prevention because of a recognized pharmacodynamic interaction (31,32). Studies have not demonstrated this same type of pharmacodynamic interaction with diclofenac or celecoxib (33,34); nonetheless, the TEP strongly recommends that a COX-2 selective inhibitor should not be used in the above situation. No specific recommendation was made regarding other individual NSAIDs.

Based on good clinical practice, oral NSAIDs should not be used in patients with chronic kidney disease stage IV or V (estimated glomerular filtration rate below 30 cc/minute); the decision to use an oral NSAID in patients with chronic kidney disease stage III (estimated glomerular filtration rate between 30 and 59 cc/minute) should be made by the practitioner on an individual basis after consideration of the benefits and risks.

Finally, for patients with symptomatic knee OA who have not had an adequate response to both nonpharmacologic and pharmacologic modalities and are either unwilling to undergo or are not candidates for total joint arthroplasty, the TEP strongly recommends the use of opioid analgesics and conditionally recommends the use of duloxetine. The authors suggest that practitioners follow the recommendations of the American Pain Society/American Academy of Pain Medicine for the use of opioid analgesics in the management of their chronic noncancer pain (35). These recommendations provide guidance on 1) patient selection and risk stratification, 2) informed consent and opioid management plans, 3) initiation and titration of chronic opioid therapy, 4) monitoring of patients on chronic opioid therapy, including dose escalations, high-dose opioid therapy, opioid rotation, and indications for discontinuation of therapy, 5) prevention and management of opioid-related adverse effects, and 6) management of breakthrough pain.

Treatment with traditional Chinese acupuncture or instruction in the use of transcutaneous electrical stimulation are conditionally recommended only when the patient with knee OA has chronic moderate to severe pain and is a candidate for total knee arthroplasty but either is unwilling to undergo the procedure, has comorbid medical conditions, or is taking concomitant medications that lead to a relative or absolute contraindication to surgery or a decision by the surgeon not to recommend the procedure (Table 3).

Hip OA. *Base case.* An adult with symptomatic hip OA without cardiovascular comorbidities, current or past up-

per GI problems, or chronic kidney disease presents to her primary care provider for treatment. As few trials have been performed in patients with symptomatic hip OA, the TEP considered that patients with hip OA should be treated in a similar fashion to those with knee OA except for selected differences.

Nonpharmacologic modalities. The TEP strongly recommends that all patients with symptomatic hip OA be enrolled in an exercise program commensurate with their ability to perform these activities (Table 5). The TEP expressed no preference for aquatic exercises as opposed to land-based exercises based on benefits or safety; the decision should be individualized and based on patient preferences and the ability to perform exercises. The TEP strongly recommends that all patients with symptomatic hip OA who are overweight be counseled regarding weight loss.

The TEP conditionally recommends that patients with hip OA should 1) participate in self-management programs that may include psychosocial interventions, 2) use thermal agents and manual therapy in combination with exercise supervised by a physical therapist, and 3) use walking aids, if necessary. Interventions for which data are available only for knee OA and not hip OA were not considered for patients with only hip OA (e.g., insoles, patellar taping, acupuncture, transcutaneous electrical stimulation, tai chi).

Pharmacologic modalities. The approach to pharmacologic therapy for the patient with hip OA is similar to that for the patient with knee OA except that no recommendations were made for intraarticular hyaluronates, duloxetine, or topical NSAIDs because of the lack of data from RCTs on either benefit or safety at the time of the TEP meeting in December 2008 (Table 6). Again, opioid analgesics are strongly recommended only for patients with symptomatic hip OA who have not had an adequate response to both nonpharmacologic and pharmacologic modalities and are either unwilling to undergo or are not candidates for total joint arthroplasty.

Table 5. Nonpharmacologic recommendations for the management of hip osteoarthritis (OA)

We strongly recommend that patients with hip OA should do the following:
Participate in cardiovascular and/or resistance land-based exercise
Participate in aquatic exercise
Lose weight (for persons who are overweight)
We conditionally recommend that patients with hip OA should do the following:
Participate in self-management programs
Receive manual therapy in combination with supervised exercise
Receive psychosocial interventions
Be instructed in the use of thermal agents
Receive walking aids, as needed
We have no recommendations regarding the following:
Participation in balance exercises, either alone or in combination with strengthening exercises
Participation in tai chi
Receiving manual therapy alone

Table 6. Pharmacologic recommendations for the initial management of hip OA*

We conditionally recommend that patients with hip OA should use one of the following:
Acetaminophen
Oral NSAIDs
Tramadol
Intraarticular corticosteroid injections
We conditionally recommend that patients with hip OA should not use the following:
Chondroitin sulfate
Glucosamine
We have no recommendation regarding the use of the following:
Topical NSAIDs
Intraarticular hyaluronate injections
Duloxetine
Opioid analgesics

* No strong recommendations were made for the initial pharmacologic management of hip osteoarthritis (OA). For patients who have an inadequate response to initial pharmacologic management, please see the Results for alternative strategies. NSAIDs = nonsteroidal antiinflammatory drugs.

DISCUSSION

These ACR 2012 recommendations for the management of patients with hand, hip, and knee OA are based on the best available evidence of benefit and safety/tolerability of both nonpharmacologic and pharmacologic interventions as well as the consensus judgment of clinical experts from a wide range of disciplines balancing the benefits and harms of these treatments and incorporating their preferences and values. We used the GRADE approach, which provides a comprehensive, explicit, and transparent methodology for developing recommendations for the management of patients (10–14,23,36). We included modalities that had been reviewed by other groups of experts in their recommendations published during the last decade (4–7,37) as well as modalities that have been investigated since the publication of these recommendations. The TEP was provided with a series of documents including not only the results of literature reviews, which provided the best available evidence to support the benefit and safety of pharmacologic and nonpharmacologic modalities, but also published recommendations from other professional societies (see above) prior to their voting. In addition, the TEP received documentation and formal instruction on implementation of the methodology. Therefore, these recommendations represent evidence- and expert consensus–based recommendations that should serve as a guide to health care providers in their approach to the management of patients with symptomatic OA. It is hoped that they may also be useful for the development and/or modification of quality measures for OA (38,39). As new evidence continues to be developed, it is likely that these recommendations will need to be updated and/or revised; such revisions will be posted, as appropriate, on the ACR web site (http://www.rheumatology.org/).

The authors acknowledge that, while most of the recommendations will not be controversial, some may be met

with disagreement by health care practitioners. One example is that of conditionally recommending against the use of glucosamine and chondroitin sulfate for patients with knee OA. The TEP relied initially on the results of the Glucosamine/Chondroitin Arthritis Intervention Trial (40) and meta-analyses that demonstrated significant heterogeneity in effect size (41–43) coupled with the lack of availability of prescription-quality preparations evaluated and approved for the indication of OA by the FDA. This original decision was reaffirmed after reviewing the results of a more recent network meta-analysis that also failed to demonstrate clinically important efficacy for these agents (44).

There have been many developments in the scientific and clinical understanding of OA in the past decade since the publication of the 2000 revised ACR recommendations (45,46). One of these developments is the publication of recommendations for the management of OA by numerous professional societies. These 2012 ACR OA guidelines improve upon these other recommendations in several ways. First, they are based on evidence available through the end of 2010. Second, they include recommendations for the management of hand OA as well as knee and hip OA. Third, they were developed using a rigorous transparent guideline development methodology that has been increasingly used by guideline developers in recent years. Finally, participants included the broadest group of experts to date on an OA guideline development project, representing several disciplines of health care providers with an interest in OA management.

When comparing these ACR guidelines to recent EULAR and OARSI guidelines, all rely on consensus recommendations based on the evidence. The EULAR recommendations are based on commissioned systematic reviews of the literature on both nonpharmacologic and pharmacologic modalities for OA of the hand, hip, and knee. OARSI commissioned a systematic review of the literature that updated those conducted for EULAR for OA of the hip and knee. Herein, literature reviews were conducted to identify the best available systematic review(s) and meta-analysis(es) for each of the modalities and, if these were not available, then the best available RCTs were selected.

All of the groups used a form of expert panel to provide the consensus recommendations. For the recommendations on hip and knee OA, the EULAR panel consisted of only rheumatologists and orthopedic surgeons; for the hand OA recommendations, EULAR added a physiatrist and 2 allied health professionals. The OARSI panel included 2 primary care physicians in addition to rheumatologists and an orthopedic surgeon. The ACR is the only professional society to include primary care physicians, physiatrists, and geriatricians along with rheumatologists (both academic and private practice), an orthopedic surgeon, and both physical and occupational therapists. Furthermore, the TEP had both sex and ethnic representations from constituencies within the ACR as well as members from both the US and Canada.

Both EULAR and OARSI used modifications of the Delphi technique to generate lists of propositions. This process required members of the Steering and Guideline Development Committees to amalgamate and rewrite or reword individual propositions submitted by members of the individual expert committees in order to reach consensus. The current ACR recommendations were developed using the GRADE process, a comprehensive, explicit, and transparent methodology that does not include the use of propositions; rather, the TEP used the best available evidence for the benefits and safety of each modality to produce specific recommendations, either strong, conditional, or none, for the use of each modality relative to a specific clinical scenario. These ACR recommendations acknowledge the values and preferences of the panel members for the desirable and undesirable outcomes of each modality.

It is hoped that with appropriate dissemination, these revised ACR guidelines will be utilized by health care providers in the management of their patients with OA.

Addendum. Therapies that were approved after the literature reviews are not included in these recommendations.

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AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Hochberg had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Hochberg, Altman, April, McGowan, Towheed, Welch, Wells, Tugwell.

Acquisition of data. Altman, April, Benkhalti, McGowan, Towheed, Welch, Wells, Tugwell.

Analysis and interpretation of data. Hochberg, Altman, April, Benkhalti, Guyatt, McGowan, Towheed, Welch, Wells, Tugwell.

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APPENDIX A: MEMBERS OF THE TECHNICAL EXPERT PANEL

Members of the Technical Expert Panel are as follows: Roy D. Altman, MD (Chair): David Geffen School of Medicine, University of California, Los Angeles; Catherine L. Backman, PhD, OT: University of British Columbia, Vancouver, British Columbia, Canada; Lee I. Blecher, MD: Virginia Commonwealth University School of Medicine, Richmond, and Private Practice, Fairfax, Virginia; G. Kelley Fitzgerald, PhD, PT, C. Kent Kwoh, MD: University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania; F. Michael Gloth, MD: The Johns Hopkins University School of Medicine, Baltimore, Maryland; Victor Goldberg, MD: Case Western Reserve University School of Medicine, Cleveland, Ohio; William McCarberg, MD: Kaiser Permanente, San Diego, California; Stephanie McGann, MD: University of Maryland School of Medicine, Baltimore (current address: Private Practice, Laurel, Maryland); Carol A. Oatis, PhD, PT: Arcadia University, Glenside, Pennsylvania; Robert Pallay, MD: Private Practice, Savannah, Georgia; Thomas J. Schnitzer, MD, PhD: Rehabilitation Institute of Chicago and Northwestern University, Chicago, Illinois; Radames Sierra-Zorita, MD: Private Practice, San Juan, Puerto Rico; Todd Stitik, MD: University of Medicine and Dentistry of New Jersey–New Jersey Medical School, Newark.