

Gaps in appropriate use of treatment strategies in osteoarthritis

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Optimal management of osteoarthritis (OA) requires a combination of therapies, with behavioral (e.g., exercise and weight management) and rehabilitative components at the core, accompanied by pharmacological treatments and, in later stages, consideration of joint replacement surgery. Although multiple sets of OA treatment guidelines have been developed, there are gaps in the implementation of these recommendations. Key areas of concern include the underuse of exercise, weight management, and other behavioral and rehabilitation strategies as well as the overuse of opioid analgesics. In this review, we describe the major categories of treatment strategies for OA, including self-management, physical activity, weight management, physical therapy and other rehabilitative therapies, pharmacotherapies, and joint replacement surgery. For each category, we discuss the current evidence base to report on appropriate use, data regarding adherence to treatment recommendations, and potential approaches to optimize use.

Introduction

Osteoarthritis (OA) is one of the most prevalent chronic health conditions worldwide [1]. Lifetime risks of symptomatic knee and hip OA – two of the most common forms – have been estimated as 45%

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and 25%, respectively [2,3]. The prevalence of OA is increasing in part because of increasing rates of obesity. In the US, for example, the estimated prevalence of OA increased from 21 million in 1990 to 27 million in 2005 [4]. The prevalence of OA is projected to continue to increase, thereby increasing burden on both individuals and health care systems. For individuals, OA is often associated with substantial pain and functional limitation such as difficulty getting up from a chair or walking. Of 291 conditions assessed in the Global Burden of Disease Study, OA was ranked as the 11th highest contributor to global disability [1]. For health care systems, OA is one of the most common conditions treated in general practice settings, and projections indicate that the demand for OA-related physician services will increase substantially during the next 20 years [5]. Total joint replacement (TJR) rates have also been increasing [6], with many health care settings requiring lengthy wait times for surgery owing to insufficient institutional resources for handling the increased volume of patients requiring this surgery.

The current burden of OA and its expected increase highlight the need to provide appropriate, evidence-based care for many patients with this condition. Many organizations have developed OA treatment recommendations in an effort to guide delivery of evidence-based care [7,8]. Table 1 summarizes OA treatments based on published guidelines and clinical expertise [9]. The objective of this paper is to summarize what is known about adherence to OA treatment guidelines within real-world clinical settings. In particular, we address the following core and commonly used OA treatment strategies: self-management, physical activity, weight management, physical therapy (PT) and other rehabilitative therapies, pharmacotherapies, and joint replacement surgery. For each treatment strategy, we describe the current evidence base to report on appropriate use, data regarding adherence to treatment recommendations, and promising approaches to optimize use.

Self-management

What do we know about appropriate use?

Self-management support is a recommended component of OA care in multiple treatment guidelines including the Osteoarthritis Research Society International (OARSI) and European League Against Rheumatism (EULAR) [10,11]. The effects of self-management programs on OA-related pain and function tend to be modest [12]. However, self-management education can be viewed as a foundational aspect of care on which other treatment approaches are built. For example, self-management programs help patients to understand the roles of different treatment approaches, engage in appropriate behavioral interventions, and develop skills for communicating with health care providers about treatment options. Therefore, although self-management programs in isolation may not result in large clinical benefits, they are essential for developing prepared, proactive patients who can participate in other aspects of disease management.

What are the patterns of use?

There are a number of evidence-based self-management programs including the Arthritis Self-Management Program and the Chronic Disease Self-Management Program [13,14], which were developed in the US but have been disseminated in multiple countries. There is some evidence that self-management programs are underutilized among patients with arthritis, with one study reporting that only approximately 10% of individuals participated in a class to learn how to manage arthritis [15]. However, this may be an underestimate, as it is difficult to determine numbers of individuals who participate in all forms of these programs, including those available online or through apps [16]. Other research, however, indicates that many patients still lack a basic understanding of OA and its treatment options [17], thus indicating a need for broader dissemination of self-management programs.

Promising strategies to optimize use

Because arthritis self-management programs are widely available, efforts to enhance use should focus on increasing referrals to these programs. Health care providers can play a key role by making

Table 1

Summary of recommendations for management of osteoarthritis.

Core recommendations (always recommended):
✓ Self-management programs
✓ Education
✓ Individualized treatment plans
✓ Weight loss or maintenance
✓ Exercise (land or water-based)
Recommended for most situations (if appropriate for clinical situation, comorbidities):
✓ Intra-articular corticosteroid injection
✓ Topical non-steroidal anti-inflammatory medications (NSAIDs)
✓ Acetaminophen
✓ Oral NSAIDs or COX-2 inhibitors
✓ Walking aids and assistive devices
✓ Thermal modalities
✓ Physical or occupational therapy referral
Consider in some situations (eg, specific patient populations or presentations):
✓ Duloxetine
✓ Capsaicin
✓ Mind and body therapies (eg, yoga, Tai Chi, acupuncture)
✓ Splinting and bracing
✓ Transcutaneous electrical nerve stimulation
✓ Surgical intervention (specifically joint replacement)
Not recommended:
☒ Therapeutic ultrasound
☒ Needle lavage
☒ Arthroscopy with debridement
Controversial across guidelines, insufficient data, or not addressed:
▪ Intra-articular hyaluronic acid injection
▪ Other intra-articular treatments (eg, platelet rich plasma, stem cells)
▪ Glucosamine/chondroitin
▪ Other surgical interventions (eg, osteotomy, partial joint replacement)
▪ Herbal or botanical treatments

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patients aware of available self-management support resources and programs and by endorsing use of these programs as part of standard care for OA.

Physical activity

What do we know about appropriate use?

Physical activity is perhaps one of the most underutilized methods for addressing pain and functional limitation associated with knee OA. Physical activity is defined as any energy

expenditure above a resting level due to skeletal muscle contractions [18]. Physical activity can be unstructured, which includes daily tasks that are performed irregularly and are unplanned. Exercise, alternatively, is another type of physical activity, which is structured, planned, and reoccurs on a regular basis. Historically, people with arthritis were recommended to rest and not be physically active. In the past two decades, the management of knee OA has shifted from a prescription of rest to clinical practice guidelines recommending exercise as a first-line treatment [7,8]. The Department of Health and Human Services in 2008 recommended all adults including those with OA spend at least 150 min/week in moderate-to-vigorous physical activity (MVPA) as part of the Aerobic guidelines [18].

Walking is the most common type of physical activity employed by older adults for exercise, and people with arthritis use walking more often than any other activity to be physically active [19]. Particularly, when paired with weight loss, research shows that aerobic walking programs decrease pain and improve physical function [20]. Fear of exacerbating existing knee pain is a common barrier to adopting a physically active lifestyle [21]. However, a recent study showed that people with moderate-to-severe knee OA may tolerate walking up to 70 min/week without exacerbating their symptoms [22]. Additionally, walking at least 6000 steps/day best discriminates people with knee OA who develop functional limitation from those who did not [23].

What are the patterns of use?

Despite the benefits of physical activity, people with knee OA are generally sedentary and few meet the recommendation from the Department of Health and Human Services for physical activity, i.e., 150 min/week of MVPA. For example, using an accelerometer-enabled monitoring device, Dunlop and colleagues reported that less than 10% of people in a large OA cohort, the Osteoarthritis Initiative (OAI), met the 2008 Guidelines [24]. White et al. replicated this study using another large OA cohort, the Multicenter Osteoarthritis (MOST) study [25]. More troubling is that less than one-third of the MOST cohort would walk continuously for at least 10 min. Ten minutes of continuous activity per week is associated with a decrease in the risk of all-cause mortality by up to 30%, and this is used as an important benchmark to distinguish being sedentary from being minimally active [24].

Although OA and OA-related pain are often cited as reasons for inactivity, recent evidence does not support this claim. For example, in one study, similar proportions of people with mild and moderate-to-severe knee pain were currently meeting physical activity guidelines as those with little-to-no knee pain [25]. More recently, Thoma and colleagues compared objectively measured physical activity data in the general population to those with painful knee OA from the OAI and found similar time spent in MVPA between cohorts [26]. These data suggest that disease and pain may not be primary determinants for physical activity. Another example supporting this comes from literature examining changes following total knee replacement, which in general shows clinically important improvement in pain and physical function but no change in physical activity after surgery [27].

Promising strategies to optimize use

The first strategy to promote physical activity is to increase the frequency with which health professionals recommend their patients with knee OA to be active. Recent evidence shows that between 53% and 83% of primary care physicians recommend exercise to their patients with OA [28]. Another study found that approximately one-third of primary care physicians indicate that they would recommend exercise to their patients with knee OA [29]. Next, physical activity may best be increased with interventions that directly target daily activity levels in people with knee OA. A meta-analysis of 26 pedometer-based intervention studies reported that activity levels increased by nearly 2500 steps/day, which is approximately 25 min/day of walking [30]. Activity trackers and smart watches such as the Fitbit™ monitor and Apple Watch are examples of modern-day pedometers that can be used to increase physical activity.

Establishing a step goal (such as 6000 steps/day) can also help to meaningfully increase physical activity. White et al. previously reported that, in a large cohort study, walking at least 6000 steps/day

best discriminated between people with knee OA who developed functional limitation 2 years later from those who did not [23]. Another strategy to increase the number of bouts of MVPA may be to recommend walking 3000 steps in 30 min. This recommendation includes both a step goal, i.e., 3000 steps, and a time goal, within 30 min, which in turn has been associated with more sustained minutes in MVPA compared with a basic step goal, e.g., walk 10,000 steps/day [31].

Finally, referral to PT for exercise prescription is a practical option for patients who may be hesitant to start a physical activity program. Physical therapists are experts in exercise and see patients across multiple visits. A recent survey found that more than 90% of patients agreed that physical therapists should talk about physical activity [32]. Referral to PT may be a practical method to implement and disseminate the notion that people with OA should be active.

Physical therapy and other rehabilitative therapies

What do we know about appropriate use?

Guidelines for the management of knee, hip, and hand OA consistently recommend treatments that are offered by physical and occupational therapists, such as exercise, assistive devices, joint protection strategies, bracing, or thermal agents [7,8]. Of these rehabilitation approaches, exercise is most frequently studied and most strongly recommended as a first-line treatment for knee and hip OA, and physical therapists can provide expert instruction on how to safely perform and progress therapeutic exercises. A 2015 systematic review of 94 papers suggested that the mechanisms by which exercise reduces pain and improves function for people with OA include increasing quadriceps strength, reducing limitations in knee extension range of motion, and improving proprioception (the perception of a body part's position) [33]; therapeutic exercises that include these components may provide the greatest advantage for people with OA.

Therapeutic exercises for OA range greatly in type (aerobic, resistance, balance, or flexibility), setting (land-based or aquatic), intensity, duration, equipment needs, and number of sessions per week. The variety of therapeutic exercises provides options for meeting the individual needs and interests of patients with OA. There is some guidance from current evidence on how to optimize exercise approaches in a rehabilitation setting. Juhl et al. conducted a systematic review of 48 randomized clinical trials of exercise programs for people with knee OA to identify program components needed for reducing pain and disability in knee OA [34]. In this review, pain relief was maximized with aerobic exercise when there were a greater number of supervised sessions. Furthermore, quadriceps-specific resistance exercises reduced pain more than general lower limb exercises, and supervised single-type exercise programs performed at least three times a week resulted in greater pain reduction and less disability than those with less than two sessions per week. A single type of exercise (e.g., aerobic activity only) resulted in greater pain reduction than programs that included multiple modes (e.g., aerobic plus resistance exercise). Although this seems counter to recommendations for rehabilitation for OA, which support programs that include the three components stretching, aerobic, and resistance exercises, these results may suggest that initiation of multiple modes at the same time early in the program may not be ideal for symptom reduction. Perhaps introducing one type of exercise at program initiation and progressively adding other modes will provide greater pain benefits early in rehabilitation treatment. In turn, this approach may encourage continued participation in rehabilitation programs and exercise for a long term to manage OA.

Evidence for rehabilitation treatments other than therapeutic exercise is somewhat limited. Initial data from a 2017 systematic review of 14 studies suggested that manual therapy may relieve pain and improve physical function among patients with knee OA, but methodological quality of some studies was poor [35]. Bracing, heel wedges, and shoe insoles may be second-line approaches to consider for the management of OA, although published guidelines vary in their strength of recommending these treatments owing to limited or lower quality evidence [8]. For hand OA, two studies support the long-term use of bracing for the thumb based on reduced pain and disability [36,37]. Two recent studies support the use of knee braces among individuals with knee OA. A systematic review of 11 studies showed that soft braces reduce pain related to knee OA and improve self-reported physical function (moderate effects and small-moderate effects, respectively) [38]. Recognizing the gap between

the evidence-based data and clinical practice, Coudeyre et al. developed a decision-making tool for recommending knee braces for knee OA based on high-level evidence, OA guidelines, and expert advice [39]. Their algorithm assists practitioners and their patients with deciding about whether a brace is appropriate, and if so, how to select the brace (e.g., elastic brace as part of initial management, more rigid brace to correct biomechanical anomalies). Results of studies conflict regarding whether lateral wedge insoles are superior to neutral placebo insoles for knee OA symptoms or function [40–42].

What are the patterns of use?

Generally, data are limited on the use of rehabilitative therapies for the management of OA, but recent studies on knee OA indicate that utilization of these treatment approaches is inadequate. Data from the Military Health System Data Repository (2008–2014) showed that 40% of patients received corticosteroid injections vs. 29% received PT during the first year of care for knee OA, with fewer than 13% receiving both treatments [43]. Within 30 days of knee OA diagnosis, 51% received corticosteroid injections, whereas 29% began PT. For a period of 1 year, PT was underutilized before knee surgeries; PT was completed before surgery for 8% of patients who had knee arthroplasty and 26% who had arthroscopy. In a recent study of participants with knee OA from clinical trials conducted at Duke University primary care, Durham Veterans Affairs Health Care System, and the University of North Carolina, 39–52% received PT, which was notably less compared to 55–60% who received knee injections and 70–82% who received oral analgesics [44].

Data from two studies published more than a decade ago show that the underuse of PT is an ongoing issue, especially before TJR, which is an important time to engage in therapeutic exercise to maximize strength and physical function to promote postsurgical recovery. In a retrospective study of patients with total hip replacement for hip OA [45], only 28% received PT before surgery, and of those, 27% did not receive therapeutic exercise as part of their treatment. Among patients with end-stage hip or knee OA who were on a wait list for TJR, only 17% received PT while on the wait list [46].

Promising strategies to optimize use

Similar to the need to promote physical activity as described above, efforts should focus on increasing provider recommendations for PT for instruction in a long-term, progressive therapeutic exercise program for OA. There are incorrect perceptions that PT and other rehabilitative approaches are not helpful as other treatments for pain relief; providers should be prepared to describe the effectiveness of therapeutic exercise and other rehabilitative treatments for pain reduction as well as for improving physical function and discuss the differences in side effects/risks between rehabilitation and pharmacological or surgical approaches [47].

Another barrier to PT participation is that it can be a sizable investment for patients in terms of time (e.g., multiple 1-h sessions for several weeks) and financial cost (e.g., high insurance copays). A potential solution is to provide Internet-based exercise for OA or telehealth approaches to complement supervised PT sessions and reduce overall costs or the number of in-person PT visits. Group PT to instruct patients with OA in therapeutic exercise is another approach to provide treatment in a way that is more time-efficient for the provider and potentially less expensive for patients and their insurance carriers [48]. Better reimbursement by insurance for PT services would assist both the patients and rehabilitation providers.

Weight management

What do we know about appropriate use?

Observational studies consistently show a strong association of overweight and obesity with negative OA-related outcomes including faster progression [49]. Further, clinical trials show that among patients with OA, weight loss is associated with improvements in pain, function, and other outcomes [20,50]. Based on this evidence, weight management is considered a core, first-line component of OA management across treatment guidelines [7,8]. To date, there is no definitive evidence that any specific dietary

approach has a differential benefit for patients with OA. However, there is evidence that weight management has greater effects on pain and function when combined with exercise [20], and in general, inclusion of exercise leads to more successful weight loss in the long term.

What are the patterns of use?

Unfortunately, despite the strong evidence to support weight management as an effective OA treatment strategy, the majority of patients (approximately 80%) with OA are overweight or obese [51]. It is difficult to accurately assess the number of patients with OA who have participated in formal weight loss programs. However, there is some evidence to indicate that weight management is often not well integrated into standard clinical care for OA. For example, in a nationally representative US sample of patients with arthritis (primarily OA) in 2014, the age-standardized prevalence of participants reporting that a health care provider “ever suggested losing weight to help your arthritis or joint symptoms” was 46%. Although this prevalence increased from 41% in 2006 [15], there is clearly still room for improvement.

Promising strategies to optimize use

There are a number of strategies that collectively hold promise to enhance the use of weight management programs and support among individuals with OA. First, as noted above, there is a need to more consistently emphasize the centrality of weight loss as an OA treatment approach, within the course of routine clinical visits. Health care provider endorsement of the importance of weight loss can be a powerful motivator for patients [52]. However, it is not realistic to expect that most health care providers will have sufficient time to engage patients in substantial weight management counseling nor is it realistic to expect that a simple recommendation to lose weight will be all that is needed for most patients to succeed in meaningful weight loss. Therefore, a second important need is to establish linkages between clinical settings and evidence-based programs and resources for weight management. One recent study showed that primary referrals to a commercial weight loss program resulted in twice the amount of weight loss compared to standard care [53]. Although there is not one “right” weight management resource for every patient, clinics can be prepared with a list of appropriate, evidence-based programs and facilitate connections of patients with those programs. There is some evidence that point-of-care reminders can help to increase physician referrals of patients with OA to weight management programs [54]. A third strategy for enhancing use of weight management programs is addressing cost-related barriers. More intensive weight management programs are also typically more effective, but they are also costlier; this can be a particular barrier to patients with low socioeconomic status, who bear a greater burden of OA. There have been movements for some health care systems and insurers to cover weight management programs and resources, such as the US Medicare coverage of the Diabetes Prevention Program for individuals meeting certain criteria. OA researchers should continue to build a case for the cost-effectiveness of evidence-based weight management programs to inform policy-makers and insurers regarding the value of covering these interventions.

Pharmacotherapies

What do we know about appropriate use?

Pharmacotherapies with the broadest consensus for effectiveness in OA management include acetaminophen, oral nonsteroidal anti-inflammatory drugs (NSAIDs), COX-2 inhibitors, topical NSAIDs, capsaicin, weak opioids (e.g., tramadol) for short-term use, and intra-articular corticosteroids [7–9]. Some guidelines recommend acetaminophen as a first-line therapy (in part owing to its relatively low risk for short-term use), although its efficacy is limited in many patients. NICE guidelines recommend using acetaminophen and topical NSAIDs before other oral medications [55]. However, there is no single, universally accepted pathway for the order of pharmacotherapies, and selection is in part based on patients' response and risk factors. This presents a challenge for defining appropriate use. However, some quality indicators have been developed to assess specific aspects of appropriate pharmacological OA management [28,56]; examples include an initial trial of acetaminophen and provision of information

about medication side effects. Another metric of inappropriate pharmacotherapy for OA is long-term opioid use, which has clear risks without clear benefit; this has been a major focus of recent research [57].

What are the patterns of use?

Overall, pharmacotherapies are the most commonly used treatments for OA; the vast majority of patients with symptomatic OA utilize some type of pain medication, whether regularly or intermittently. Although these treatments as a whole are not underutilized, studies indicate that there are specific aspects of pharmacological management of OA that can be improved. In a recent meta-analysis, the overall quality indicator pass rate for pharmacological OA management was 37.5, with a range of 18.0–79.2 across studies [56]. Topical creams may be one specific area of underuse [44,58]. For example, in a recent study of patients with OA in three US-based health care systems, proportions of patients reporting use of topical creams ranged from approximately 35%–55% [44]. Because topical agents are recommended as first-line pharmacotherapies for OA and given their low side effect profile, these data suggest that the use of these therapies could be improved. The most concerning aspect of pharmacotherapy for OA is the high prevalence of long-term opioid use [57,59]. Rates of opioid use are high globally, as they are associated with adverse events including overdose-related hospitalizations and deaths [57,60]. The benefits of opioids for OA are controversial, but the risks are well established, and long-term use is not recommended. Yet prescription of opioids for OA is still common. In a recent study from Australia, approximately one in five patients with hip OA and one in ten with knee OA received opioids for OA management [61]. A US-based study found that among older adults with knee OA, 40% were prescribed opioids in 2009, an increase from 31% in 2004 [62]. In addition to the general risks of opioids, studies have shown that the use of opioids before TJR is associated with worse postsurgical outcomes including in-hospital complications and early revision surgery [63,64]. Also concerning is the high rate of persistent opioid use following TJR surgery [65]. Prolonged opioid use following TJR has been associated with a greater risk of revision surgery [63,65]; although mechanisms for this association are unclear and likely multifactorial, one potential explanation is that long-term opioid use can result in hyperalgesia [66], thus contributing to an experience of prolonged or heightened pain even after surgery.

Promising strategies to optimize use

A key strategy for optimizing pharmacotherapy for OA is to increase the emphasis of concomitant nonpharmacological therapies, according to treatment guidelines [7,8]; this may result in both improved pain control and reduction in medication use (and associated side effects). A number of recent studies have focused on interventions for opioid dose reduction and discontinuation [67]; although results suggest that several different types of interventions can decrease opioid use, there have been limitations in study quality, and additional rigorous trials are needed. In the context of OA, opioids are most often prescribed when there is perception that all other effective options for pain control have been exhausted. Yet nonpharmacological therapies with an evidence base for improving pain control, including mindfulness and cognitive behavioral therapy, continue to be underutilized. For example, studies of primary care and community-based samples found that among individuals with chronic pain, only 3–4% report using cognitive methods for managing pain [68,69]. Recent evidence specifically suggests that these psychological therapies can improve pain-related outcomes among individuals using opioids [70].

Joint replacement surgery

What do we know about appropriate use?

TJR surgery results in meaningful improvements in pain, function, and other outcomes for the majority of patients [71]. However, the magnitude of benefit varies considerably across patients, and a subset (approximately 15–30% of those undergoing knee replacement) do not experience a clinically meaningful improvement [72,73]. Because of this variation, there has been great interest in developing appropriateness criteria to identify patients most likely to benefit from TJR. Although several sets of appropriateness criteria have been developed [74–76], there is no universally accepted set, and concerns

have been raised about the utility of existing sets [77,78]. Therefore, establishment of widely accepted set of validated appropriateness criteria remains a key challenge for this aspect of OA management. This continues to be a very active area of research, with both quantitative and qualitative studies aimed at understanding predictors of TJR response and perspectives of patients and clinicians regarding appropriateness criteria [79–81]. Results of these studies should provide practical information to guide development and refinement of TJR appropriateness criteria and decision-making tools.

What are the patterns of use?

Owing to the lack of definitive appropriateness criteria, it is difficult to define whether TJR is being used in a manner that maximizes clinical benefits and best utilizes surgical resources. Rates of TJR have been increasing dramatically [82]. Although this is likely driven in part by increasing rates of OA, there are questions regarding whether utilization overall is very high [83]. In addition, rates of TJR have been increasing most rapidly among younger patients (e.g., under the age of 60 years) [84], possibly signaling greater use of TJR at earlier disease stages when conservative management would be appropriate. An interesting recent study classified individuals with OA in two large US-based cohorts based on TJR appropriateness criteria by Escobar et al. [76]; 24% were classified as appropriate users of TJR, 65% as potential underusers, and 10% as potential overusers [85]. Of the potential underusers, 44% were deemed likely to receive substantial benefit. Although there may be limitations to the generalizability of these findings, they illustrate a complex picture, in which both underuse and overuse are likely issues in real-world clinical settings. Another important finding of this study was that African Americans were at the greatest risk for the underuse of TJR [85]. This confirms prior studies showing that African Americans utilize TJR at lower rates than Caucasians and have worse functional status when they receive TJR [86]. Similar patterns have been observed for women compared to men [87].

Promising strategies to optimize use

As noted above, establishment and acceptance of validated appropriateness criteria for TJR will facilitate identification of patients most likely to experience a clinically meaningful benefit. Likewise, increased use of point-of-care tools may facilitate communication of appropriateness, risks, and benefits [81,88]. However, best practices for the use of such tools and decision aids are still emerging. One recent study found that the effectiveness of patient decision aids differed across clinical sites, with greater effectiveness occurring when combined with longer presurgical consultations and verbal education [89]. A more intensive shared decision-making process requires additional personnel resources and costs. However, a recent randomized controlled trial found that the use of patient decision aids resulted in fewer lower health care costs and similar outcomes [90]; these results should encourage clinicians and health care systems to implement comprehensive shared decision-making processes before TJR. There are also certain subgroups of patients who may particularly benefit from decision-making support regarding TJR. In particular, African Americans, on average, expect poorer outcomes and greater risks from TJR than Caucasians, and this is associated with lower willingness to undergo TJR [91]. In a recent study, African American patients who viewed a decision aid (a 40-min video describing the risks and benefits of TJR) received TJR at approximately twice the rate of those in a control group, within a 1-year period [92]. Another demographic group who may particularly benefit from TJR decision support is younger patients. This group has not been well studied, but younger age may be an independent risk factor for poor outcomes [84], and this is important because this age group is experiencing the greatest increase in TJR rates.

Role of shared decision-making in optimizing OA treatments

In the context of chronic conditions such as OA, for which there are many possible pharmacological and nonpharmacological treatment approaches, shared decision-making is essential for optimizing care and outcomes. The shared decision-making process is important for identifying treatment options and combinations that best fit patients' symptoms and preferences, as well as for maximizing patient engagement in the treatment plan during the long term. The most well-studied aspect of decision-

making for OA management has been in the context of TJR, with studies supporting the value of decision aids and providing examples of tools that can be integrated into clinical settings [88,93]. There has been less work in the area of decision-making for nonsurgical OA management, but these studies are emerging. There is early support for the feasibility and acceptability of online decision aids, option grids, and a stepped decision aid comparing treatment benefits and risks [94–96]. However, to date, there have not been any large effectiveness or implementation trials of decision aids or processes in the nonsurgical management of OA, and this is a critical area for further research.

Summary

Studies have identified a number of areas in which OA management can be improved; key among these are the underuse of physical activity, weight management programs, and rehabilitative therapies, along with overuse of opioids. Improving the quality of OA care is complex, as recommended treatments involve different clinical disciplines, along with community-based and other resources to support behavioral strategies. In response to this complexity and the need to address gaps in appropriate OA management, a number of groups internationally have been developing different models of OA care [97]. There has also been recent work to formally test the effectiveness of some models [98–100]. These example models can be springboards for health care systems to develop care pathways that ensure patients with OA are adequately informed about evidence-based treatment options, referred to appropriate resources, and supported by multidisciplinary teams that provide comprehensive, individualized care.

Practice Points

- Exercise such as aerobic walking and weight management are core, first-line treatments for OA. Health care providers should emphasize these behavioral strategies for OA and connect patients with supportive resources.
- Physical therapy and other rehabilitative therapies are also important, evidence-based components of OA treatment, but they are underutilized. Primary care providers can increase referrals to physical therapists and other rehabilitation specialists, particularly when patients with OA have functional limitations or need instruction in an appropriate long-term home exercise program.
- Long-term opioid use is not recommended for OA management, but this practice continues. For patients with persistent, limiting pain, cognitive behavioral therapy, mindfulness, and other psychological interventions can help to reduce pain and reduce opioid use.

Research Agenda

- There is a great need for implementation studies of care models and pathways that promote guideline-concordant, comprehensive OA management in health care systems.
- More data on cost-effectiveness of OA interventions (particularly behavioral and rehabilitative ones) are needed to bolster the case for reimbursement of these key services.
- Shared decision-making can enhance quality of care and patient satisfaction; there is a need to develop and evaluate shared decision-making interventions and processes that span the entire course of OA care.

Conflict of interest

None of the authors have any conflicts of interest to declare related to this manuscript.

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