

# Development of Quality Indicators for an Integrated Approach of Knee Osteoarthritis

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**ABSTRACT. Objective.** Osteoarthritis (OA) is a common cause of disability worldwide. Knee OA care is often suboptimal. A first necessary step in quality improvement is to gain a clear insight into usual care. We developed a set of evidence-based quality indicators for multidisciplinary high-quality knee OA care.

**Methods.** A Rand-modified Delphi method was used to develop quality indicators for knee OA diagnosis, therapy, and followup. Recommendations were extracted from international guidelines as well as existing sets of quality indicators and scored by a multidisciplinary expert panel. Based on median score, prioritization, and agreement, recommendations were labeled as having a high, uncertain, or low potential to measure quality of care and were discussed in a consensus meeting for inclusion or exclusion. Two final validation rounds yielded a core set of recommendations, which were translated into quality indicators.

**Results.** From a total of 86 recommendations and existing indicators, a core set of 29 recommendations was derived that allowed us to define high-quality knee OA care. From this core set, 22 recommendations were considered to be measurable in clinical practice and were transformed into a final set of 21 quality indicators regarding diagnosis, lifestyle/education/devices, therapy, and followup.

**Conclusion.** Our study provides a robust set of 21 quality indicators for high-quality knee OA care, measurable in clinical practice. These process indicators may be used to measure usual care and evaluate quality improvement interventions across the entire spectrum of disciplines involved in knee OA care. (First Release April 15 2014; *J Rheumatol* 2014;41:1155–62; doi:10.3899/jrheum.130680)

## Key Indexing Terms:

KNEE OSTEOARTHRITIS  
QUALITY INDICATORS

QUALITY OF CARE  
EVIDENCE-BASED PRACTICE

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Osteoarthritis (OA) is a common cause of disability worldwide<sup>1,2</sup>. Owing to aging and obesity, it is expected to become the fourth leading cause of disability by 2020<sup>3,4</sup>. Knee OA contributes substantially to the burden of this disease<sup>2</sup>. Treatment of this condition involves a wide range of caregivers, such as orthopedic surgeons, rheumatologists, general practitioners, specialists in physical and rehabilitation medicine, and physiotherapists. Consequently, fine-tuning healthcare for this subgroup of patients poses a considerable challenge.

Multiple (inter)national guidelines on knee OA care<sup>5,6,7,8,9,10,11,12</sup> are available. Nevertheless, many of these guidelines fail to be implemented. Guideline adherence in France hardly reaches 54%<sup>13</sup>, and knee OA care seems to be suboptimal both in the UK<sup>14</sup> and the United States<sup>15</sup>. Important criteria such as education about the condition, advice on the side effects of nonsteroidal antiinflammatory drugs (NSAID), and annual assessment of functional status and pain are not fulfilled<sup>14,15</sup>. Exercise therapy appears to be underadvised by general practitioners<sup>16</sup>. Arthroscopic surgery, on the other hand, is frequently used<sup>17</sup>, although in many cases it offers no additional benefits<sup>18</sup>. The lack of guideline adherence seems to be a widespread phenomenon.

As stated by GroL, “guidelines do not implement themselves”<sup>19,20</sup>. However, a study by Jansen, *et al* shows that efforts to enhance guideline adherence can result in clinical improvements in pain and physical function<sup>21</sup>.

The first step in the delivery of high-quality care is to assess to what extent current care adheres to recommended care. An up-to-date set of quality indicators that could be used to audit the extent of delivering high-quality knee OA care among multiple disciplines and across different countries is needed. Quality indicators are measurable tools to assess the quality of care, including outcome-, process- and patient-oriented indicators. Our study focused on process indicators. Existing sets of process indicators for OA care, such as the indicators of the Assessing Care of Vulnerable Elders (ACOVE) study<sup>15,22,23</sup>, those of the Arthritis Foundation<sup>24,25</sup>, and those of Broadbent<sup>14</sup> have the disadvantage of considering a limited number of guidelines, missing information of recent guidelines, not including multiple disciplines, or just considering a subgroup of vulnerable elders. The aim of the study was, therefore, to develop a set of evidence-based quality indicators for high-quality multidisciplinary knee OA care, applicable to the entire spectrum of patients with knee OA. This set of indicators facilitates a multidisciplinary audit of knee OA care across different countries and future research to evaluate guideline implementation strategies.

## MATERIALS AND METHODS

Our study was performed between August 2011 and February 2012. A systematic, evidence-based approach was followed, using the RAND-modified Delphi method, to develop quality indicators for knee OA in 5 steps (A-E). This method, including an expert panel of 10–15 members, affords a set of quality indicators that is face and content valid<sup>26,27,28,29,30,31,32</sup>.

### a. Extraction of Recommendations

First, literature was searched in PubMed and Embase for existing guidelines and sets of quality indicators with search terms: “Osteoarthritis,” “Knee AND Recommendations,” “Osteoarthritis, Knee AND “Guidelines,” “Quality Indicators AND Osteoarthritis.” The search for guidelines was extended to the World Wide Web (English and Dutch) because guidelines are not always indexed in medical databases. Only guidelines and quality indicators published after 2003 were considered. They had to be evidence-based, whether or not combined with expert opinion, and applicable to a broad spectrum of patients with knee OA.

Seven existing guidelines about knee OA diagnosis and therapy that met the eligibility criteria<sup>5,6,7,8,9,10,11,12</sup> were screened. Recommendations were extracted from those guidelines by 1 researcher (LG) (see Supplementary Appendix A, available at [jrheum.org](#)). Besides the guidelines, existing quality indicators of Broadbent and the Arthritis Foundation completed the list for topics that were not fully covered by the guidelines<sup>14,24,25</sup>. ACOVE-3 quality indicators were not considered further, because of the focus on vulnerable elders. The recommendations and quality indicators were indexed into a written questionnaire. For each recommendation the supporting guidelines were mentioned, if possible with the Level of Evidence (LoE; see Supplementary Appendix A, available at [jrheum.org](#)). In case of contrasting messages or minor differences, the varying statements were described as “comments.”

To evaluate the recommendations in the questionnaire, a balanced

multidisciplinary expert panel (n = 15) was assembled of professionals routinely involved in knee OA care. These rheumatologists, orthopedic surgeons, specialists in physical and rehabilitation medicine, general practitioners, and physiotherapists originated from different university and regional hospitals and general practices, distributed across Flanders (see Supplementary Appendix B, available at [jrheum.org](#)).

### b. Written Questionnaire Round

The written questionnaire was finalized by 14 out of 15 experts. The panel members received a manual by e-mail (see Supplementary Appendix A, available at [jrheum.org](#)). They were asked to score the recommendations anonymously on a 9-point Likert scale, keeping in mind health gain and overall efficacy. For diagnosis, lifestyle/education/devices, and followup the 3 most relevant recommendations had to be prioritized. For therapy the 9 most relevant recommendations had to be prioritized (see Supplementary Appendix A, available at [jrheum.org](#)). Further, panel members were allowed to add new recommendations and make suggestions. Both affirmative and negative formulations were accepted. The use of treatment modalities out of negatively formulated recommendations could be considered as a negative indicator of high-quality care. Panel members lacking the required proficiency to judge particular recommendations (e.g., physiotherapists judging pharmacological treatments), could denote it as “impossible to judge.”

Recommendations were rated as high-potential or low-potential, or recommendations with an uncertain potential to measure quality of care, according to median score, priority (top-3 percentage), and agreement among panel members (see Supplementary Appendix C, available at [jrheum.org](#)). The selection included 2 steps:

*Preselection.* Preselection was based on median score and priority. Priority was defined as follows: A recommendation that was first mentioned in the top 3 received 3 points, the second 2 points, and the third 1 point. These points were converted into percentages, taking into account the number of experts that scored that particular recommendation and the corresponding maximum score.

Items with a median score  $\geq 7$  and a high priority (top-3 percentage  $> 20\%$ ) were preselected. Items with a median score  $< 7$  and a high priority, as well as items with a median score  $\geq 7$  and medium priority (top-3 percentage between 1 and 20%) were considered to be questionable. Other items were not preselected.

*Agreement.* Agreement was reached if  $> 70\%$  of the panel members scored 7 or more. Disagreement was reached if  $> 30\%$  of panel members scored 7 or more AND  $> 30\%$  scored 3 or less.

*Final selection.* Recommendations that were preselected and in which agreement was reached were considered high-potential items. Recommendations that were not preselected and without agreement, as well as recommendations that were considered to be questionable in the preselection and without (dis)agreement, were considered to be low-potential recommendations. The other recommendations were considered to have an uncertain potential to measure high quality of care.

### c. Consensus Meeting Round

Subsequently, a face-to-face consensus meeting was organized. Thirteen panel members participated. Each panel member received a feedback form to compare personal ratings with those of the group. New recommendations resulting from the first round and suggestions to modify completed the report. High-potential recommendations were discussed for inclusion, low-potential recommendations for rejection. Recommendations with an uncertain potential and new recommendations were discussed for inclusion or rejection. Panel members were instructed to keep in mind applicability. Some items were modified because of inconsistency between guidelines, or refined to improve measurability. The discussion was moderated by 1 of the researchers (PV). Two other researchers (LG and RH) passively observed the discussion. In case of lack of proficiency on particular domains, panel members could decide not to take part in the discussion.

#### d. Final Appraisal

After the consensus meeting, the set of included recommendations was sent by e-mail to the expert panel for final approval by 2 additional written consultations. Fourteen panel members finally appraised the core set of recommendations.

#### e. Transformation into Quality Indicators

High-quality knee OA care was defined by this core set of recommendations. The set was appraised by 3 researchers who have a clear insight into measurability. To be measurable, the recommendations had to be transformable into numerators and denominators; e.g., “If a person has knee osteoarthritis, he/she should take acetaminophen” can be transformed into “the percentage of persons with knee osteoarthritis that take acetaminophen.” If a recommendation is formulated in a permissive way, no measurable quality indicator can be produced; e.g., “If a person has knee osteoarthritis, corticosteroid injections can be used.” Corticosteroid injections are in this case an option, and not using corticosteroids is not an indication of insufficient care. The final selection of transformed recommendations was approved by all the authors.

### RESULTS

Initially, 86 recommendations were extracted from the guidelines and sets of existing quality indicators (Figure 1). Recommendations for followup were inadequately described in the available guidelines and were primarily derived from existing quality indicators.

Based on median score, prioritization, agreement, and discussion, 50 recommendations were excluded by the expert panel. The remaining 36 recommendations and new

recommendations were modified and combined to result in a core set of 29 recommendations that define high-quality knee OA care. This core set of recommendations was screened on overall measurability. Seven recommendations were considered not to be measurable and excluded for translation into quality indicators. The remaining 22 recommendations were finally translated into 21 quality indicators (2 recommendations were merged). The final set of quality indicators was made up of 2 diagnostic indicators, 4 indicators on education, lifestyle, and the use of devices, 14 indicators on therapy, and 1 indicator on followup. The selection process is detailed in Supplementary Appendix D-E, available at [jrheum.org](http://jrheum.org).

#### Diagnosis (Table 1)

Radiographs were considered not to be required in knee OA diagnosis. The European League Against Rheumatism (EULAR) and the Dutch Institute for Healthcare Improvement (CBO) both promote a clinical diagnosis of knee OA in the presence of a combination of well-defined symptoms<sup>6,9</sup>. However, in case of pain resistant to conservative treatment, the panel decided that a radiograph was indicated to define further disease management. An example is when examining unicompartamental knee OA, for which treatment options may differ (e.g., unicompartamental knee replacement, brace). Also, CBO supports the use of

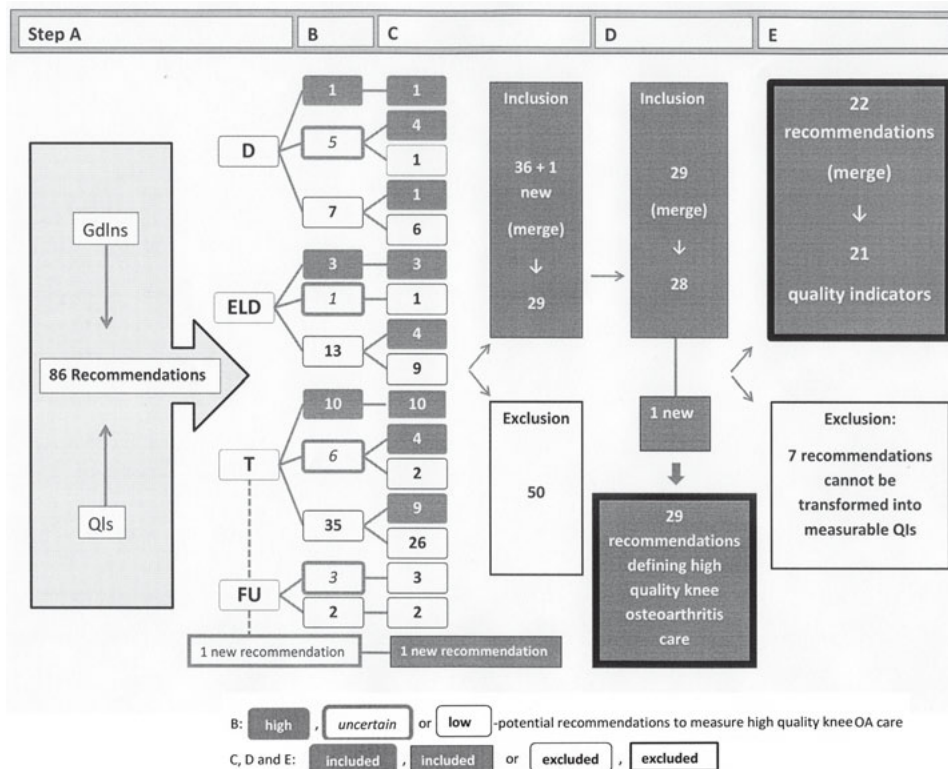


Figure 1. Development of knee osteoarthritis quality indicators by the RAND-modified Delphi method. QI: quality indicators; Gdlns: guidelines; D: diagnosis; ELD: education/lifestyle/devices; T: therapy; FU: followup.

Table 1. Recommendations on knee OA care, transformable into quality indicators.

Recommendation
<b>Diagnosis</b>
1. If a patient is clinically diagnosed with knee OA and suffering from pain resistant to conservative treatment with acetaminophen and/or NSAID, then a radiography (weight-bearing, semiflexed PA, plus lateral and skyline view) of the symptomatic knee should be taken for the morphological assessment and grading of knee OA (especially to detect unicompartmental OA, for which treatment modalities may differ). CT and MRI scan should not be used.
2. If a patient with knee OA has a recurrent clinically evident effusion, then he/she should be further assessed (with aspiration and analysis of synovial fluid) in order to differentiate from inflammation caused by other arthritis.
<b>Lifestyle/education/devices</b>
3. If a patient has knee OA, he/she should be given information access and education about the objectives of treatment and the importance of changes in lifestyle, exercise, pacing of activities, weight reduction, and other measures to unload the damaged joints.
4. If a patient with knee OA is overweight, then he/she should be encouraged to lose weight and maintain his/her weight at a lower level.
5. If a patient with knee OA is following exercise therapy, then the exercise therapy should be combined with education/self-management interventions to improve patients' mental and physical performance and to alleviate pain.
6. If a patient has knee OA, then a brace should not be prescribed (except in unicompartmental knee OA with axial deviation).
<b>Therapy</b>
7. If a patient has knee OA, then exercise therapy should be prescribed, including at least muscle strengthening, aerobic exercises and functional exercises, and combined with range of motion exercises in case of range of motion restrictions.
8. If a patient has symptomatic knee OA, then he/she has to be referred to a physical therapist for instruction of the patient in appropriate exercises, for motivation of the patient to implement exercise and adhere to exercise, and to evaluate performance.
9. If a patient with knee OA is following exercise therapy, then the content and intensity of the exercise program should be tailored to the patient's individual goals in terms of limitations of activity and restrictions of participation.
10. If a patient with knee OA is following exercise therapy, then the treatment sessions should be spread over longer periods with lower frequencies in the later stages of the exercise program to facilitate the transition from exercise therapy to independent exercising and maintaining sufficient level of physical activity.
11. If a patient with knee OA is following exercise therapy, then he/she should be referred to regular community exercise and sports activities after a period of supervised exercise.
12. If a patient has knee OA, then acetaminophen up to 3 g/day should be used as the initial oral analgesic.
13. If a patient has knee OA and there is no adequate response on acetaminophen, or there is severe pain and/or inflammation, then oral NSAID should be used.
14. If a patient has knee OA, then chondroitin and glucosamine-chondroitin combination products should not be used.
15. If NSAID are used in a patient with knee OA, then they should be used intermittently (max 3 weeks sustained use) and at the lowest effective dose.
16. If a patient with knee OA and a history of bleeding gastric ulcers has a need for NSAID, then either a COX-2 selective agent or a non-selective NSAID with coprescription of a proton pump inhibitor/misoprostol should be used instead of a non-selective NSAID.
17. If a patient with knee OA has heart failure grade 2–4, ischemic heart disease, or renal insufficiency with a GFR < 40 ml/min, then NSAID should not be used. In case of other cardiovascular risk factors (e.g., hypertension, ...), NSAID should be used with caution.
18. If a patient has knee OA, then strong opioids (oxymorphone, oxycodone, fentanyl, morphine sulfate) should not be used.
19. If a patient has knee OA, then arthroscopic interventions are not recommended. Coexisting meniscal lesions should not be treated. Only in case of locking of the knee from a large meniscal fragment or a loose body or an extension loss from an anterior anvil osteophyte is arthroscopic treatment indicated.
20a. If a patient with knee OA is not obtaining adequate pain relief and functional improvement, then he/she should be considered for joint replacement.
b. If a patient has unicompartmental knee OA, then a unicompartmental knee replacement should be considered.
<b>Followup</b>
21. If a patient with knee OA is following exercise therapy, then regular evaluations by the physiotherapist are necessary. To make the switchover from a supervised to an autonomous program, an evaluation session should be performed every 3 months in the first year, every 6 months in the second year, and once per year afterward.

OA: osteoarthritis; NSAID: nonsteroidal antiinflammatory drug; PA: posteroanterior; CT: computerized tomography; COX-2: cyclooxygenase-2; GFR: glomerular filtration rate; MRI: magnetic resonance imaging.

radiographs if the outcome determines therapy<sup>9</sup>. Radiography was specified as a weight-bearing, semiflexed posteroanterior view, and a lateral and skyline view, according to the EULAR guideline, and supported by cross-sectional studies<sup>6</sup>. The expert panel did not assess excess value in examination of both knees, and limited the application of radiographs to the affected knee(s). Analysis of synovial fluid in patients with recurrent, clinically evident effusion of the knee, to exclude inflammatory disease and

identify urate and calcium pyrophosphate crystals, was considered an important indicator as well, following the EULAR guideline<sup>6</sup>.

#### Lifestyle/Education/Devices (Table 1)

Access to information and education about the objectives of treatment and lifestyle were highlighted. Also, the combination of exercise therapy with education and self-management interventions and the encouragement of patients to

lose weight were considered indicators of high-quality care. Recommendations on these topics were in line with each other in the corresponding guidelines. Use of a knee brace was considered a negative indicator of quality of care, except for unicompartmental knee OA with axial deviation. Recommendations on the use of braces in existing guidelines were not consistent. The Osteoarthritis Research Society International (OARSI) and the National Institute for Health and Care Excellence (NICE) recommended the use of braces in cases of mild or moderate varus or valgus instability; the American Academy of Orthopedic Surgery (AAOS) and CBO guidelines judged it impossible to recommend for or against the use of a brace; and according to the Royal Australian College of General Practitioners (RACGP), a knee brace should not be used<sup>7,8,9,10,11</sup>. The decision of the panel was partly based on underlying evidence, supplemented with their own experience.

### Therapy (Table 1)

Prescribing exercise therapy for each patient with knee OA was considered to be a quality indicator, as strongly supported by all the guidelines concerning therapy<sup>7,8,9,10,11,12</sup>. The panel decided to follow the OARSI, NICE, and AAOS guidelines in which patients are encouraged to undertake both aerobic and muscle-strengthening exercises<sup>7,8,10</sup>. Concerning range of motion exercises, the panel refined the recommendation to patients with restrictions in range of motion. Functional exercises were added to the recommendation, according to the Royal Dutch Society for Physiotherapy (KNGF)<sup>12</sup>. Tailoring the exercise program to patients' individual goals was considered a quality indicator as well. An individualized approach is recommended in the KNGF guideline and noted in the RACGP and NICE guidelines<sup>8,11,12</sup>. Because few patients meet physical activity guidelines, and because among the patients who do exercise, only a minority performs these exercises regularly and correctly, the panel decided it was useful to refer patients with knee OA to a physical therapist, as supported by the OARSI and KNGF guidelines<sup>10,12</sup>. Also, referral to regular community exercises and sports activities was accepted to be a quality indicator<sup>12</sup>. Transition to independent exercises was considered to be facilitated by spreading treatment sessions over longer periods with lower frequencies in the later stages of the exercise program<sup>12</sup>.

The use of acetaminophen up to 3 g/day was set as a quality indicator for medication use<sup>7,8,9,10,11</sup>. Because of the narrow dose range of hepatotoxicity, the panel agreed to withhold a value of less than 4 g/day, as described in OARSI III<sup>5</sup>. NSAID were considered necessary in case of lack of response to acetaminophen, severe pain, and/or inflammation. Three indicators were selected concerning medication safety: the intermittent character of using NSAID at the lowest effective dose; use of cyclooxygenase-2 selective agents or nonselective NSAID with co-prescription of

misoprostol or proton pump inhibitors in patients with a history of bleeding gastric ulcers; and use of NSAID in patients with heart failure, ischemic heart disease, or renal insufficiency as a negative indicator. The use of chondroitin and glucosamine-chondroitin combination products was considered a negative indicator, according to the NICE, AAOS, and RACGP guidelines<sup>7,8,11</sup>. Also, OARSI III noted a decrease in evidence for their use<sup>5</sup>. Strong opioids (oxycodone, oxycodone, fentanyl, morphine sulfate) were judged to be contraindicated as well, in contrast with OARSI, RACGP, and NICE, in which an exception was made for particular circumstances<sup>8,10,11</sup>. Considering joint replacement and/or unicompartmental knee replacement were set as indicators of high quality of care in patients not obtaining adequate pain relief and functional improvement<sup>8,10</sup>. Arthroscopic surgery, instead, was considered a negative quality indicator and supposed to be indicated only in the case of locking of the knee from a large meniscal fragment, a loose body, or an extension loss from an anterior anvil osteophyte, according to the guidelines and refined by the panel, referring to Howell<sup>5,7,8,9,10,33</sup>.

### Followup (Table 1)

No recommendations for followup, derived from existing guidelines or quality indicators, were retained after the consensus meeting. However, the importance of followup in clinical practice was recognized by the panel members. In a new recommendation and corresponding quality indicator the panel judged the followup of patients by the physiotherapist in the switchover from a supervised to an autonomous program.

### Recommendations Not Selected As Indicators (Table 2)

Ultimately, 7 recommendations were excluded. Six recommendations were considered not to be measurable because of the permissive character of the recommendations (Table 2, Recommendations 1–6). This concerned recommendations about diagnosing knee OA without the need of technical support; use of topical NSAID; use of intra-articular corticoids and hyaluronic acid in case of failure of oral analgesics/NSAID and nonpharmacological treatment; use of weak opioids (tramadol, codeine) in patients with refractory pain and contraindication for joint replacement; and the application of realignment osteotomy in young, physically active patients. One recommendation on the use of glucosamine-only products was considered not to be measurable because the recommendation does not declare itself in favor of or against glucosamine (Table 2, Recommendation 7).

### DISCUSSION

Our study proposes an up-to-date multidisciplinary set of 21 quality indicators that can be used to audit knee OA care and to evaluate guideline implementation strategies across

Table 2. Recommendations on knee osteoarthritis (OA) care, belonging to the core set of recommendations as defined by the expert panel, but rejected on measurability for translation into quality indicators.

Recommendation
1. If adults aged > 40 years have usage-related knee pain, only short-lived morning stiffness (< 30 min), functional limitation, and 1 or more typical clinical findings (crepitus, restricted movement, bony enlargement), then the diagnosis of knee OA can be made without a radiographic examination, CT, or MRI, and without laboratory tests.
2. If a patient has knee OA, then topical NSAID can be used as monotherapy or as an adjunct to oral analgesics.
3. If a patient with knee OA has moderate to severe pain, not responding satisfactorily to oral analgesics/antiinflammatory agents, then an intraarticular injection with corticosteroids can be used for pain relief.
4. If a patient with knee OA has moderate to severe pain, not responding satisfactorily to oral analgesics/antiinflammatory agents and nonpharmacological therapy, then an intraarticular injection with hyaluronate can be used.
5. If a patient has knee OA and other pharmacological agents are ineffective or contraindicated and joint replacement is contraindicated, then weak opioids (tramadol, codeine) can be used in treatment of refractory pain.
6. If a young and physically active patient with significant symptoms has unicompartmental knee OA, then realignment osteotomy could be applied.
7. There is insufficient evidence to recommend in favor or against the use of glucosamine products in knee OA treatment. If a physician decides to use a glucosamine product, then preferentially drug registered products have to be used.

CT: computerized tomography; MRI: magnetic resonance imaging; NSAID: nonsteroidal antiinflammatory drug.

different countries. These are based on 7 major international guidelines and fine-tuned by a balanced, multidisciplinary expert team. High-quality knee OA care is defined by these 21 quality indicators, together with 7 recommendations that were selected by the expert panel but are not transferable into measurable quality indicators.

Taking specific radiographs in case of persistent pain and analysis of synovial fluid in patients with recurrent swelling of the knee were considered important diagnostic indicators. Informing patients, encouragement to lose weight, and self-management were highlighted for “education, lifestyle, devices.” Exercise therapy and its specific modalities were considered important therapeutic indicators, as well as the use of acetaminophen as a first-line medicine. Further, patient-safety when using NSAID was prioritized. Joint replacement was considered the gold standard in patients not obtaining adequate pain relief and functional improvement, despite appropriate conservative management. A prominent role in the followup of patients with knee OA was assigned to physiotherapists.

Our set of knee OA quality indicators differs on some points from those of the ACOVE-3 study<sup>23</sup>, the Arthritis Foundation<sup>24</sup>, and Broadbent<sup>14</sup>. Our set was developed for a broad spectrum of caregivers and patients and included all aspects of the medical process.

During the consensus meeting, no recommendations on followup were selected out of the guidelines and existing sets of indicators and only 1 new recommendation and corresponding quality indicator was introduced. Recommendations on followup were inadequately described in the international guidelines, so the initial set of recommendations on that topic was already limited and mainly derived from existing quality indicators. Moreover, little evidence is available on the effectiveness of followup in knee OA care. However, this does not mean followup would not be important.

On the other hand, the new set of indicators is more detailed concerning exercise therapy and its patient-centeredness, with coaching of the patient by a physiotherapist, tailoring of the exercise program to the individual goals and combining it with self-management. Further, self-management, a spread of the exercise therapy over longer periods with lower frequencies in the later stages of the program, as well as referral to regular community exercise activities put the emphasis on adherence to prolonged exercises.

Finally, there were some minor differences with respect to prophylaxis of gastrointestinal adverse events when using NSAID. Mainly, the indicators of the ACOVE-3 study were much more extensive, because patient safety was a particular part of the study. Topics on patient safety were included in our set of therapeutic indicators.

### Strengths and Weaknesses

In the multidisciplinary expert panel, all disciplines involved in knee OA care were represented: general practitioners, rheumatologists, specialists in physical and rehabilitation medicine, orthopedic surgeons, and physiotherapists. Both regional and university hospitals were involved. Participation of the panel members was very high, with 14 out of 15 panel members completing the written questionnaire, 13 out of 14 panel members participating in the consensus meeting, and 14 out of 15 panel members finally appraising the set of recommendations. Further, the development of quality indicators was based on 7 international guidelines. Therefore, the final set of quality indicators seems to be generalizable to other countries and among all patients and caregivers involved in knee OA care.

The prominent role of physiotherapists may exclude people from optimal healthcare in countries in which access to physiotherapy is not covered by national or other health benefits. Yet, that set of quality indicators may guide governments' decisions on funding.

The patient's viewpoint is lacking in our study, as in most other studies describing the development of quality indicators<sup>32</sup>. In the development of process indicators, clinical evidence has to be scored, which seems to be problematic for the layperson. However, if knee OA care is measured in real practice, patient-oriented quality indicators and outcome indicators also have to be considered. Patients' ratings of care seem not to be associated with technical quality of care<sup>34</sup>, so assessment of overall quality of healthcare should include both ratings by patients and by professionals.

The lack of indicators on followup may be a shortcoming in mapping overall quality of care. This shortcoming may be induced by the general lack of evidence on this topic. Extensive research in this domain is necessary to generate valuable quality indicators.

Seven recommendations could not be translated into quality indicators. Unfortunately, they are at risk of being regarded as inappropriate. Especially in case of persistent pain, 1 or more of these treatment options should be considered.

Finally, measurement of the final set of quality indicators may be restricted by the availability of sources to map usual care: e.g., the combination of databases and rigorous registration in patient files may allow measurement of the whole spectrum of knee OA care in future research.

Our study provides a set of 21 measurable quality indicators for multidisciplinary high-quality knee OA care. These process indicators, complemented with questionnaires on patient-oriented topics of care, may allow measuring care and evaluating quality improvement interventions across the entire spectrum of disciplines involved in knee OA care.

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## ONLINE SUPPLEMENT

Supplementary data for this article are available online at [jrheum.org](http://jrheum.org).

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