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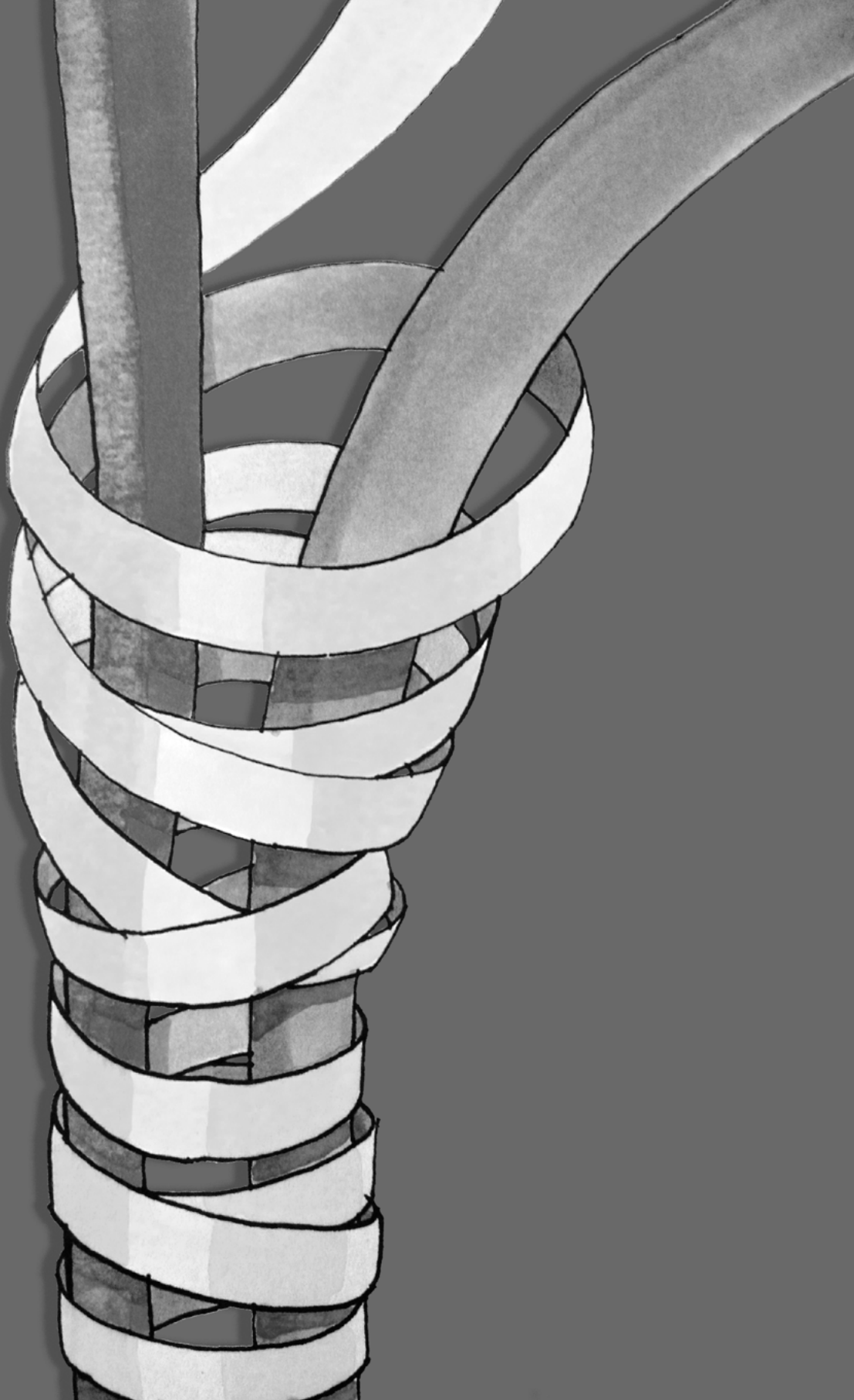


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**Quality indicators for  
physiotherapy care in hip and  
knee osteoarthritis:  
*development and  
clinimetric properties***

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## Abstract

**Objective:** The aim of the present study was to develop process quality indicators for physiotherapy care based on key recommendations of the Dutch physiotherapy guideline on hip and knee osteoarthritis (OA).

**Methods:** Guideline recommendations were rated for their relevance by an expert panel, transformed into potential indicators and incorporated into a questionnaire, the Quality Indicators for Physiotherapy in Hip and Knee Osteoarthritis (QIP-HKOA). Adherence with each indicator was rated on a Likert scale (0 = never to 4 = always). The QIP-HKOA was administered to groups of expert (n = 51) and general (n = 134) physiotherapists (PTs) to test its discriminative power. Reliability was tested in a subgroup of 118 PTs by computing the intraclass correlation coefficient (ICC). QIP-HKOA items were included if they were considered to be related to the cornerstones of physiotherapy in hip and knee OA (exercises and education), had discriminative power and/or if they were followed by <75% of PTs in both groups.

**Results:** Nineteen indicators were derived from 41 recommendations. Twelve indicators were considered to be the cornerstones of physiotherapy care; six indicators had discriminative power and/or were followed by <75% PTs in both groups, resulting in an 18-item QIP-HKOA. The QIP-HKOA score was significantly higher with expert (60.73; standard deviation (SD) 5.67) than with general PTs (54.65; SD 6.17) ( $p < 0.001$ ). The ICC of the QIP-HKOA among 46/118 PTs was 0.89.

**Conclusion:** The QIP-HKOA, based on 18 process indicators derived from a physiotherapy guideline on hip and knee OA was found to be reliable and discriminated between expert and general PTs. Its ability to measure improvement in the quality of the process of physiotherapy care needs to be further examined.

## Introduction

Osteoarthritis (OA) affects 9.6% of men and 18.0% of women older than 60 years of age.<sup>1</sup> OA occurs most commonly in the hip and knee. According to registrations at general practitioners' practices, in 2007 6.7% of the Dutch population was affected by hip or knee OA. Physiotherapy plays an important role in the management of patients with hip and knee OA and is recommended in a number of international multidisciplinary guidelines<sup>2,3</sup> and physiotherapy guidelines.<sup>4,5</sup> In 2010, an evidence-based update of the Dutch guideline for physiotherapy in hip and knee OA was developed.<sup>6</sup> The update was done according to standardized, international criteria<sup>7</sup> and based on the International Classification of Functioning, Disability and Health (ICF).<sup>8</sup> The updated guideline was distributed among members of the Royal Dutch Society for Physiotherapy (KNGF) and is freely accessible through the internet. (<http://www.fysionet-evidencebased.nl/index.php/kngf-guidelines-in-english>)

Concerning the implementation of guidelines in healthcare in general<sup>9,10</sup>, and in physiotherapy in particular<sup>11,12,13</sup>, several studies have demonstrated that guideline adherence is poor after dissemination by regular mail or through the website alone. To enhance their usage, implementation strategies, in addition to the aforementioned distribution methods, have been suggested, including educational meetings, group discussions and role playing.<sup>14,15,16</sup> To measure the effect of these strategies, a limited number of valid instruments are currently available. The use of quality indicators has been suggested as an appropriate method to estimate guideline adherence.<sup>17</sup> There are three different types of quality indicators; process indicators (e.g. applying a specific treatment modality), structure indicators (e.g. the availability of equipment or appointment systems) and outcome indicators (e.g. levels of functional disability, pain and satisfaction). Quality indicators should preferably be systematically derived from guidelines.<sup>17,18</sup>

For OA, only a limited number of sets of quality indicators for the multidisciplinary management of OA are available.<sup>19,20</sup> Currently, most sets of healthcare quality indicators for multidisciplinary management of OA and other rheumatic conditions use process indicators to assess quality of care.<sup>21,22</sup> Recently, a set of both process and outcome indicators specifically for the physiotherapy management of hip and knee OA was published.<sup>23</sup> However, this latter set pertained to the previous version of the Dutch physiotherapy hip and knee OA guideline and was not developed according to international recommendations.<sup>17,18</sup>

In the absence of an updated set of quality indicators for physiotherapy care in hip and knee OA, the aim of the present study was systematically to develop process indicators for quality physiotherapy care in hip and knee OA and to evaluate their reliability and discriminative power.

## Methods

### Study design

The development of the process quality indicators to assess guideline adherence was performed according to international criteria for the development of healthcare quality indicators.<sup>17,18</sup> The developmental process was part of a study to compare the effectiveness of two educational courses as an implementation strategy for a Dutch physiotherapy guideline on hip and knee OA. The study was conducted in accordance with the Good Clinical Practices protocol and Declaration of Helsinki principles (<http://www.wma.net/en/30publications/10policies/b3/>). According to Dutch law, the anonymous completion of a questionnaire to evaluate an educational intervention, as employed in the present study, does not fulfil the definition of medical scientific research. To ensure ethical conduct in the study, we followed the procedure that had been used in a similar study performed by our group in medical students.<sup>24</sup> This procedure had been developed in agreement with the academic hospital's medical ethics adviser. In line with this procedure, in the current study the physiotherapists (PTs) who filled in the questionnaires were informed that their data would be made anonymous and then used for a study on the effectiveness of education on the Dutch physiotherapy guideline on hip and knee OA. They were invited to express any disagreement with this procedure and given the assurance that, if they disagreed, their data would be removed from the database. Following this procedure, no disagreement was expressed by any of the PTs in the present study. The process indicators were developed from April to August 2010 (steps 1–4), whereas the examination of their clinimetric properties was executed from September to December 2010 (step 5).

**Table 1.** Steps in the development process of quality indicators for physiotherapy in hip and knee osteoarthritis

<b>Step 1.</b>	Deriving potential indicators from the guideline
<b>Step 2.</b>	Prioritization of indicators by an expert panel (potential contribution to quality of care, acceptability and measurability for daily practice)
<b>Step 3.</b>	Operationalization of prioritized indicators into a questionnaire “Quality Indicator for Physiotherapy in Hip and Knee Osteoarthritis” (QIP-HKOA)
<b>Step 4.</b>	Pilot testing the initial QIP-HKOA by physiotherapy experts and experts in development tests (clarity and completeness)
<b>Step 5.</b>	Testing the adjusted QIP-HKOA on relevant clinimetric properties (internal consistency, reliability and discriminative power)

### Development of the process indicators

The development was carried out according to five consecutive steps (see Table 1).

#### Step 1. Deriving potential indicators from the guideline

All recommendations in the guideline were listed and transformed into potential process indicators. For this purpose, the recommendations were reformulated into more concise items. This was done by the lead author of the guideline (WP), with feedback from all co-authors of the revised guideline<sup>6</sup> (Peter et al., 2011).

#### Step 2. Prioritization of indicators by an expert panel

An expert panel of 16 PTs experienced in the treatment of hip and knee OA patients and working in primary (n = 9) or secondary (n = 7) care was formed. These PTs had more than ten years' experience in treating OA patients and followed advanced training courses concerning arthritis management. They were asked by email to rate the relevance of each recommendation with respect to its potential contribution to quality of care, acceptability and measurability for daily practice. For each recommendation there were four categories to rate relevancy, ranging from 'not relevant' to 'very relevant'. Recommendations were considered relevant if at least 12 of the 16 experts (≥75%) had rated the item as 'relevant' or 'very relevant'. In this step, the decision was made to select only recommended items concerning diagnosis, treatment or evaluation, whereas items that were neither recommended nor advised against or were not recommended, were excluded.

#### Step 3. Operationalization of prioritized indicators

In the third step, the initial set of Quality Indicators for Physiotherapy in Hip and Knee Osteoarthritis (QIP-HKOA) questionnaire was developed. Relevant recommendations (from step 2) were translated into questions by an expert PT (WP). For each item, adherence was measured using a five-point Likert scale: 0 = never, 1 = seldom, 2 = sometimes, 3 = generally and 4 = always.

#### Step 4. Testing the initial QIP-HKOA

The fourth step was for the draft questionnaire to be pilot tested with respect to clarity and completeness by 15 PTs working in primary care and three experts in the development of tests (JV, ZJ and LBV). The three experts were all involved in educational courses for medical and healthcare professionals, and the development of tests or examinations to assess the results of the educational courses. Inconsistencies in the questionnaire were resolved. Finally, the adjusted QIP-HKOA was converted into an online version.

### Step 5. Testing the clinimetric properties of the adjusted and final versions of the QIP-HKOA

To be able to determine the clinimetric properties of the adjusted QIP-HKOA, a distinction was made between expert and general PTs, based on their level of advanced practice education regarding arthritis management (including OA). We hypothesized that adherence to quality indicators would increase with the level of advanced education in arthritis management. For the purpose of the present study, PTs who completed the only postgraduate advanced arthritis course available in the Netherlands (i.e. the 10-days certified Dutch arthritis education provided by the Dutch Institute of Allied Health Care), were regarded as experts.<sup>25</sup> PTs who did not complete any additional course in arthritis care were considered as general PTs. Those who did follow some kind of additional course in arthritis care, but not to the level of the advanced course, were designated as PTs who met neither expert nor general PT criteria. Their data were used to compare the results of the final QIP-HKOA with those of both expert and general PTs.

To obtain sufficient numbers of expert PTs as compared with general PTs, participants were recruited from three samples:

#### A. Regional physiotherapy rheumatology networks

From three Dutch networks<sup>25</sup>, expert PTs (N= 98) with a special interest and/or specific knowledge and skills regarding the treatment of patients with rheumatic diseases in the Netherlands were selected.

#### B. PTs who subscribed to an educational course on hip and knee OA

One hundred and eighteen PTs, who subscribed to a single, three-hour educational course organized in the context of the publication of the Dutch physiotherapy guideline on hip and knee OA, were selected.

#### C. A national registry of PTs

A random sample from the nationwide KNGF registry system of 200 PTs was taken by means of digital number allocation, with the highest 200 numbers subsequently being selected. To develop the final version of the QIP-HKOA, items were included if they were considered to be the cornerstone of physiotherapy management in hip and knee OA (exercise and patient education) and/or the proportion of PTs who generally or always applied them was statistically significantly different between expert and general PT groups, and/or were followed by <75% of them in both groups.

#### *Procedure regarding the administration of questionnaires*

All participating PTs were sent a hyperlink to the online version of the questionnaire by email. Participants of sample B were invited to complete the questionnaire at two

different time points, within seven days, to determine the test-retest reliability.

In addition to the questionnaire and the information on arthritis education, the following information was gathered from all participating PTs: age, gender, work setting, years of physiotherapy experience, and number of patients with hip and/or knee OA treated during the previous three months. To optimize the level of response, two reminders were sent by email after three and five weeks to those who did not respond.

#### *Data analysis*

The sociodemographic characteristics of all participants in the study were compared between the three groups by of analysis of variance (ANOVA) or Chi-square tests, where appropriate. In cases where there was a statistically significant difference, pairwise comparisons between different combinations of two groups were done by means of unpaired t-tests or Mann-Whitney U tests, and Chi-square tests, where appropriate. Statistical comparisons of the proportions of PTs generally or always applying a specific procedure between general and expert PTs were done per item of the adjusted QIP-HKOA by means of the Chi-square test, as part of the development of the QIP-HKOA (step 5). Finally, to test the discriminative power of the final QIP-HKOA, the total mean score of the final QIP-HKOA was compared among expert and general PTs, as well as the PTs who did not meet either criterion by means of an ANOVA using the same procedure as described above. To examine the test-retest reliability, the ICC (average measures) was calculated. Cronbach's  $\alpha$  was computed for internal consistency. According to Kline<sup>26</sup>, Cronbach's  $\alpha \geq 0.9$  = excellent;  $0.8 \leq \alpha < 0.9$  = good;  $0.7 \leq \alpha < 0.8$  = acceptable;  $0.6 \leq \alpha < 0.7$  = questionable;  $0.5 \leq \alpha < 0.6$  = poor;  $\alpha < 0.5$  = unacceptable.

Data were analysed using the SPSS statistical package (version 18.0, SPSS, Chicago, IL, USA). The level of statistical significance was set at  $p \leq 0.05$  for all the analyses.

## Results

In total, 243 PTs participated in the present study. There were no differences in baseline characteristics between expert PTs (N= 51), general PTs (N=134) and the PTs who met neither expert nor general PT criteria (N=58) (see Table 2).

#### *Deriving potential indicators from the guideline (step 1)*

Forty-one recommendations were identified in the Dutch physiotherapy guideline in hip and knee OA<sup>6</sup> (Peter et al., 2011), and translated into concise items if necessary.

#### *Prioritization and operationalization of indicators (steps 2 and 3)*

Based on lack of relevance, 12 recommendations concerning interventions were excluded by the expert panel. These recommendations concerned interventions which could

**Table 2.** Baseline characteristics of 243 physiotherapists (PTs) participating in a study on the development of quality indicators related to a physiotherapy guideline on hip and knee OA

	Expert physiotherapist (N=51)	Neither Expert nor General physiotherapist (N=58)	General physiotherapists (N=134)	P-value
<b>Age, years (mean, SD)</b>	45.3 (9.7)	43.1 (11.7)	43.7 (10.7)	0.57#
<b>Gender, Females (%)</b>	32 (62.7%)	40 (69.0%)	81 (60.4%)	0.53*
<b>Work setting</b>				
primary care	38 (74.5%)	36 (62.1%)	97 (72.4%)	0.27*
hospital/rehabilitation center/nursing home	13 (25.5%)	22 (37.9%)	37 (27.6%)	
<b>Experience</b>				
0-10 years	18 (35.3%)	20 (34.5%)	57 (42.5%)	0.47*
more than 10 years	33 (64.7%)	38 (65.5%)	77 (57.5%)	
<b>Number of OA patients treated past three months</b>				
0-10	39 (76.5%)	43 (74.1%)	106 (79.1%)	0.74*
more than 10	12 (23.5%)	15 (25.9%)	28 (20.9%)	

# One way ANOVA for 3 groups

\* Chi-square test over 3 groups

**Table 3.** Cohorts, eligible and responding physiotherapists used in testing the clinimetric properties of the QIP-HKOA

Cohorts of physiotherapist from which participants were derived	Number of physiotherapists who were asked to fill in the questionnaire	Number of physiotherapists who finally filled in the QIP-HKOA and response rate		
		Number of expert physiotherapists	Number of neither expert, nor general physiotherapists	Number of general physiotherapists
A. Regional physiotherapy rheumatology networks (N=98)	80 physiotherapists followed an advanced educational course	30 (38%)		
B. Physiotherapists who subscribed to an educational course on hip and knee OA (N=118)	118	21 (18%)	58 (49%)	39 (33%)
C. A national registry of physiotherapists (N=200)	150 physiotherapists who did not followed any educational course			95 (63%)
<b>Total number of responding physiotherapists</b>		<b>51</b>	<b>58</b>	<b>134</b>

not be recommended or advised against or should only be considered in some (small) subgroups of patients. In addition, ten other recommendations concerning measurement instruments were excluded because they were optional to use, depending on the individual patient's health status and preferences. The remaining 19 recommendations were divided into those on initial assessment (three items), therapy (12 items) and evaluation of treatment (four items), and translated into concept quality indicators for the questionnaire (initial QIP-HKOA). The 12 items concerning therapy were related to exercises, patient education and promoting adequate self-management and were all considered to form the cornerstone of physiotherapy management by the expert panel.

### Testing the initial QIP-HKOA (step 4)

After correction for clarity and completeness by 15 expert PTs and three experts in the development of tests (ZJ, JV and LB), the adjusted QIP-HKOA was constructed.

### Clinimetric properties of the adjusted and final versions of the QIP-HKOA (step 5)

In total, 51 expert PTs (30 from cohort A and 21 from cohort B), 134 general PTs (39 from cohort B and 95 from cohort C) and 58 PTs who were considered to be neither expert nor general PTs were included in the study. Table 3 shows the characteristics of the three cohorts and the response rates.

### Clinimetric properties of the adjusted version of the QIP-HKOA

Table 4 shows the proportions of PTs indicating that they frequently (regularly and always) or infrequently (sometimes, seldom and never) adhered to individual items from the adjusted QIP-HKOA. According to the results, one item was excluded (item 2: Assessing the presence of personal and environmental problems, insofar as these relate to the limitations in activities and restrictions in participation), as it was not part of the cornerstone of physiotherapy management, there was no significant difference in the proportion of PTs generally or always applying it between expert and general PTs, and it was followed by >75% in both groups. Thus, the final questionnaire contained a set of 18 quality indicators, indicated as the final QIP-HKOQ (total score range 0-72).

### Clinimetric properties of the final QIP-HKOA

The mean final QIP-HKOA total score was significantly higher for expert PTs (60.73; SD 5.67) than for general PTs (54.65; SD 6.17) ( $p < 0.001$ ), whereas the score for the group who did not meet the criteria for either expert or general PTs was intermediate (56.55; SD 6.54). The p-value of the ANOVA was  $< 0.001$ , with the pairwise comparisons of expert versus general PTs and expert PTs versus those who did not meet either criteria reaching statistical significance ( $p < 0.001$ ). The comparison of the final QIP-HKOA total score between general PTs and those who did not meet either criteria was not statistically significant ( $p = 0.14$ ).



**Table 4.** Items of the questionnaire to assess adherence to the Dutch physiotherapy guideline in patient with hip and knee osteoarthritis.

	Expert physio-therapists (N= 51)	Neither expert nor general physio-therapist (N=58)	General physio-therapist (N= 134)	P-value <sup>1</sup>
<b>A. Diagnostic Process</b>				
1. Inventory of health related problems according the ICF.*	82.4% (42)	60.3% (35)	44.8% (60)	< 0.001
2. Assessing the presence of personal and environmental problems insofar as these relate to the limitations in activities and restrictions in participations.#	96.1% (49)	93.1% (54)	95.5% (128)	0.87
3. Assessing the presence of hip and knee osteoarthritis specific “red flags”.*	98.0% (50)	96.6% (56)	88.8% (119)	0.05
<b>B. Treatment Process</b>				
4. Treating patients with strengthening of muscles.***	100.0% (51)	98.3% (57)	98.5% (132)	0.38
5. Treating patients with improving of aerobic capacity.***	80.4% (41)	82.8% (48)	77.6% (104)	0.68
6. Treating patients with walking exercises.***	88.2% (45)	87.9% (51)	83.6% (112)	0.43
7. Treating patients with functional exercises.***	96.1% (49)	98.3% (57)	94.0% (126)	0.58
8. Treating patients with postoperative exercises.***	94.1% (48)	94.8% (55)	91.8% (123)	0.59
9. Providing information concerning knowledge and understanding of osteoarthritis of hip and/or knee.***	100.0% (51)	98.3% (57)	97.8% (131)	0.28
10. Providing information concerning the consequences for the patient's functional performance in terms of movements, activities and participations.***	100.0% (51)	94.8% (55)	94.8% (127)	0.10
11. Providing information concerning the relation between burden and tolerance level.***	100.0% (51)	98.3% (57)	99.3% (133)	0.54
12. Providing information concerning the way a patient copes with health problems.***	100.0% (51)	93.1% (54)	94.8% (127)	0.10
13. Providing information concerning what constitutes an active and healthy lifestyle (in terms of exercise and nutrition/overweight.***	96.1% (49)	93.1% (54)	93.3% (125)	0.47
14. Providing information concerning behavioral change (regarding physical activity).***	96.1% (49)	89.7% (52)	93.3% (125)	0.47
15. Providing information concerning joint protection and the use of aids.** / ***	62.7% (32)	67.2% (39)	60.4% (81)	0.78
<b>C. Evaluation Process</b>				
16. Evaluating treatment with the recommended measurement instruments.*	68.6% (35)	51.7% (30)	35.8% (48)	< 0.001
17. Evaluating treatment with the combination of a questionnaire and a performance test.*	58.8% (30)	32.8% (19)	23.9% (32)	< 0.001
18. Evaluating treatment with Patient Specific Complaint list (PSK).*	78.4% (40)	62.1% (36)	52.2% (70)	0.001
19. Evaluating treatment with the Timed Up and Go test (TUG).*	45.1% (23)	27.6% (16)	15.7% (21)	< 0.001

\* Included (P &lt; 0.05)

\*\* Included based on adherence with recommendations &lt; 75%

\*\*\* Included: cornerstones of physiotherapy management in hip and knee OA

# Excluded because significant discriminative power is lacking, not being a cornerstone of physiotherapy management, and adherence with recommendation &gt; 75% in both groups

<sup>1</sup> Chi-square test between expert and general physiotherapy

Among the 46 sets of questionnaires which were completed twice by the same participant, there was a high correlation between the mean scores at the two time points [respectively, 67.15 (SD 5.28) and 67.78 (SD 5.96)], with an ICC (average measures) of 0.89 (95% confidence interval 0.80–0.94).

For internal consistency of the final QIP-HKOA, the scores from all responding PTs (N= 243) were used, with Cronbach's  $\alpha$  being 0.63, which is, according to the criteria formulated by Kline<sup>25</sup>, considered questionable.

## Discussion

The present study describes the development of process indicators for physiotherapy care from an updated Dutch evidence-based guideline for the physiotherapy management of hip and knee OA. The resulting questionnaire, the QIP-HKOA, comprised 18 process indicators and demonstrated good test–retest reliability and moderate internal consistency. A direct comparison between the present set of process indicators and similar sets is difficult. In contrast to the present set, the process indicators derived from an earlier version of the guideline<sup>23</sup> were not developed according to international standards.<sup>17,18</sup> First, there were methodological differences in the developmental process. Second, the current set of quality indicators only comprises process quality indicators, whereas the set by Jansen et al. comprised outcome indicators as well. Most likely due to these differences, both sets of indicators vary with respect to their content. An example is the provision of aftercare, pertaining to the referral of patients to regular community exercise and sports activities after a period of supervised exercises, which is recommended in both the previous and the updated versions of the guideline. This topic is included in the set by Jansen et al.<sup>23</sup>, but not in the present set, as it was removed in step 2 of the development process. The reason for exclusion was its perceived lack of relevance by the expert panel. On the other hand, the current set of indicators included the application of outcome measurement instruments which were not incorporated in the previous set, in spite of the fact that they were recommended. The differences indicate that the scope and development process of quality indicators may influence their eventual inclusion, but also suggest that the inclusion or exclusion of topics according to their relevance is a subjective process. To make the appropriate choices, feedback from a larger group of stakeholders than the expert panel involved in the present study is probably needed. The present study also tested the indicators with respect to clinimetric properties. The finding of adherence with items related to exercise and education, generally considered to be the cornerstones of physiotherapy in hip and knee OA, may indicate that the delivery of these interventions is already common practice. Other researchers have also found that this approach is generally adopted.<sup>27</sup> However, as guidelines are relatively unclear about the required contents, intensity, frequency and mode of delivery of exercise, it is



still possible that variations in quality with respect to these interventions do exist.

Until now, process indicators to assess the quality of physiotherapy care have only been systematically developed in the Netherlands for the national physiotherapy guideline on Parkinson's disease.<sup>28</sup> These indicators were incorporated into a questionnaire using a similar procedure to that employed in the present study. The development of other sets of quality indicators derived from Dutch physiotherapy guidelines and pertaining to low back pain<sup>14</sup> and ankle sprain.<sup>16</sup> The sets on ankle sprain and low back pain included process indicators and outcome indicators that were not directly derived from guideline recommendations. In both studies, a questionnaire containing quality indicators was used, but not tested with respect to their clinimetric properties.

The present study had a number of limitations. Using a questionnaire like QIP-HKOA is one way to measure adherence to guideline recommendations. Alternative methods to assess guideline adherence include assessing patient files, retrieving data from a computerized patient database, using vignettes or carrying out a script concordance test. The latter method could be more suitable when clinical reasoning plays an important role in using the guideline in daily clinical practice.<sup>29</sup>

Furthermore, the use of process indicators may not reflect the full spectrum of quality of care, which also includes structure and outcome.<sup>17</sup> However, most sets of healthcare quality indicators focus on process indicators, as data to underpin the usage of structure and outcome indicators are scarce.<sup>21,22</sup> In the process of formulating potential indicators, the expert panel did not take into account the level of evidence underlying the recommendations. As a result, recommendations based on expert opinion (level 4) were also included. It is a matter for debate whether a minimum level of evidence is required for recommendations to be included in sets of process indicators. Moreover, no statements about items which cannot be recommended were included. Another limitation was the monodisciplinary composition of the expert group. As a next step, it would be desirable to construct a group containing all relevant healthcare providers, including disciplines other than physiotherapy, and also patient representatives, according to recommendations published by Wollersheim et al<sup>18</sup> and the RAND/UCLA method ([http://www.rand.org/content/dam/rand/pubs/monograph\\_reports/2011/MR1269.pdf](http://www.rand.org/content/dam/rand/pubs/monograph_reports/2011/MR1269.pdf)).

Finally, it remains to be established the extent to which our results are generalizable to all PTs, as the present study was performed in only one country, the response rate was moderate and selection bias could have played a role. PTs willing to participate in the present study were probably more likely than a random selection of PTs to follow the guideline. In particular, the PTs from cohort B, who subscribed to an educational course on the guideline, might not have been representative of all PTs. In general, by using a questionnaire to determine adherence, there is a chance of obtaining socially desirable answers. This could probably have led to an overestimation of adherence in all groups. In addition, the distinction between expert and general PTs based on their advanced arthritis training level was arbitrary, even though it had been used in a previous study.<sup>25</sup>

## Conclusions

The present study describing the development of process indicators for the physiotherapy management of hip and knee OA contributes to the further development of quality indicators at the level of physiotherapy care because of the multidimensionality of the indicators (diagnostic, therapeutic and evaluative items). To assess the quality in physiotherapy care for hip and knee OA in general, adjustments could be made concerning aftercare or referring patients to regular community exercise.

## Clinical messages

- **Process indicators for the physiotherapy management of hip and knee OA were developed and transformed into a questionnaire (QIP-HKOA).**
- **The QIP-HKOA was found to be reliable, had discriminative power and was able to give indications about how to improve the quality of the process of physiotherapy care.**

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