Royal Dutch Society for Physical Therapy

the exercise therapist CESAR-MENSENDIECK

VvOCM Vereniging van Oefentherapeuten Cesar en Mensendieck

Justification

KNGF guideline

Osteoarthritis of the hip-knee

Conservative, pre-operative and post-operative treatment

KNGF guideline Osteoarthritis of the hip-knee

Conservative, pre-operative and post-operative treatment

Justification

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The KNGF aims to create the conditions in which high-quality physiotherapeutic care can be provided that is accessible to the entire Dutch population, whilst recognising the professional expertise of the physical therapist. The KNGF represents the professional, social and economic interests of over 19,000 registered physical therapists.

All sections of the guideline are available via www.kngf.nl/kennisplatform

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Development of the guideline Osteoarthritis of the hip-knee

The Royal Dutch Society for Physical Therapy (KNGF) develops guidelines in accordance with its "KNGF guideline methodology".[1] This methodology meets the requirements – among others – as formulated by the Healthcare Institute of the Netherlands in the document "Evaluation framework on the state of science and practice" [2] and the "Guideline for guidelines" by the Management Board for Quality of Care.[3]
The experts involved (Leiden University Medical Centre (LUMC) and KNGF) evaluate on a yearly basis whether the contextual and/or policy developments necessitate a revision of the guideline. If this is the case, revision will take place.

The revision of the KNGF guideline Osteoarthritis of the hip-knee from 2010 started in 2016.[4]
To achieve this, the authors of the guideline Osteoarthritis of the hip-knee and an independent chairman agreed to offer guidance to a working group and an advisory group, which had been duly appointed. The working group held four meetings about the revision, the advisory group met once and the working group and advisory group submitted input via e-mail on three occasions. The entire guideline revision was completed in accordance with the KNGF guideline methodology.[1]

All the working group and advisory group members have signed the Declaration of Interests form, which was developed by the KNGF in the context of the guideline revision and which is based on the "Code for the prevention of undue influence as a result of a conflict of interests" by the Royal Dutch Academy of Sciences (KNAW).[5]

The members of the working group and advisory group all represented a professional group or organisation that is relevant in the context of this guideline revision.

Sources

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Reading guide

This justification describes how the recommendations were determined – or the description per topic – during the guideline development process, including the literature that supports these recommendations or descriptions.

This justification includes the process description per topic of all steps performed according to the GRADE system: initial question, PICO query, search strategy, literature found, description of the studies, quality of the evidence, the effectiveness and how the recommendation was determined based on the evidence.

Note 1. The clinical presentation of osteoarthritis in the Netherlands

The following literature was used to answer the initial question:

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Note 2. Clinical presentation and progression

The following literature was used to answer the initial question:

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Note 3. Prognostic factors for the progression of physical functioning and pain and the effect of co-morbidity

Initial question

Which prognostic factors play a role in the progression of the physical functioning of people with hip and knee osteoarthritis and should be recommended for quantification and description in the education materials given to patients?

Literature found

- The literature search relating to the prognostic factors for unfavourable progression of physical functioning and pain in people with osteoarthritis of the hip and/or knee yielded two systematic literature studies [1,2] of a reasonable quality (AMSTAR score 7/11) and a cohort study [3]. The results are summarised in note 3 of the Practice guideline.
- In order to estimate the progression of pain and physical functioning in people who have undergone joint replacement surgery of the hip and/or knee, four systematic reviews were used, each of a reasonable quality (AMSTAR score 6/11 [4-6] and 5/11 [7]). The outcome at least six months after surgery was examined here. The results were supplemented by the outcome of a review about patient characteristics, the predictive value [8], an observational study that was performed in the Netherlands [9] and two studies into the predictive value of a score > 11 on the Timed Up & Go test (TUG) for a poorer post-operative outcome [10-12].
- A systematic review of reasonable methodological quality (AMSTAR score 6/11) by Hofstede et al. reveals that – for people undergoing joint replacement surgery of the hip – there is an association between "a poorer pre-operative physical functioning" and "more severe radiological abnormalities" on the one hand and improved post-operative recovery on the other hand.[13]

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Note 4. Stepped care and the role of the therapist

The following literature was used to answer the initial question:

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Note 5. Clinical diagnosis

The following literature was used to answer the initial question:

1 Altman R, Alarcon G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum. 1991;34(5):505-14.
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clinical guideline 177. London: Royal College of Physicians; 2014.
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5 Bijlsma JWJ, van Laar JM. Osteoarthritis. Teaching manual rheumatology and clinical immunology. Houten: Bohn Stafleu van Loghum; 2013.
6 Doherty M, Hunter DJ, Bijlsma H, et al. Oxford textbook of osteoarthritis and crystal arthropathy. 3rd edition. Oxford: Oxford University Press; 2016.

Note 6. Medical history

The following literature was used to answer the initial question:

1 Altman R, Alarcon G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum. 1991;34(5):505-14.
2 Altman R, Asch E, Bloch D, et al. Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis Rheum. 1986;29(8):1039-49.
3 Dreinhöfer K, Stucki G, Ewert T, et al. ICF core sets for osteoarthritis. J Rehabil Med. 2004;(44 Suppl):75-80.
4 Bossmann T, Kirchberger I, Glaessel A, et al. Validation of the comprehensive ICF core set for osteoarthritis: the perspective of physical therapists. Physiotherapy. 2011;97(1):3-16.

Note 7. Physical examination

The following literature was used to answer the initial question:

1 Altman R, Alarcon G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum. 1991;34(5):505-14.
2 Altman R, Asch E, Bloch D, et al. Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis Rheum. 1986;29(8):1039-49.
3 van der Esch M, Steultjens M, Knol DL, et al. Joint laxity and the relationship between muscle strength and functional ability in patients with osteoarthritis of the knee. Arthritis Rheum. 2006;55(6):953-9.
4 van der Esch M, Steultjens M, Harlaar J, et al. Joint proprioception, muscle strength, and functional ability in patients with osteoarthritis of the knee. Arthritis Rheum. 2007;57(5):787-93.
5 Felson DT, Lawrence RC, Dieppe PA, et al. Osteoarthritis: new insights. Part 1: the disease and its risk factors. Ann Intern Med. 2000;133(8):635-46.
6 van der Esch M, Knoop J, van der Leeden M, et al. Self-reported knee instability and activity limitations in patients with knee osteoarthritis: results of the Amsterdam osteoarthritis cohort. Clin Rheumatol. 2012;31(10):1505-10.
7 Sanchez-Ramirez DC, van der Leeden M, Knol DL, et al. Association of postural control with muscle strength, proprioception, self-reported knee instability and activity limitations in patients with knee osteoarthritis. J Rehabil Med. 2013;45(2):192-7.
8 Bijlsma JWJ, van Laar JM (ed). Osteoarthritis. In: Teaching manual rheumatology and clinical immunology. Houten: Bohn Stafleu van Loghum; 2013.
9 Sellam J, Berenbaum F. The role of synovitis in pathophysiology and clinical symptoms of osteoarthritis. Nat Rev Rheumatol. 2010;6:625-35.
10 Oosting E, Hoogeboom TJ, Dronkers JJ, et al. The influence of muscle weakness on the association between obesity and inpatient recovery from total hip arthroplasty. J Arthroplasty. 2017;32(6):1918-22.

Note 8. Measurement instruments

Initial question

Which measurement instruments are recommended during the diagnostic phase and the evaluation of patients with osteoarthritis of the hip and/or knee?

Search strategy

A search for measurement instruments was performed on the website of the Osteoarthritis Research Society International (OARSI; https://www.oarsi.org/) and on http://www.meetinstrumentenzorg.nl/ for all relevant mea-

sures of outcome within the diagnostic process during the treatment of patients with osteoarthritis of the hip or knee. Relevant measurement instruments were first selected and then assessed to determine which parts of the ICF would be analysed. These were then divided, based on relevance, into recommended measurement instruments and optional measurement instruments. All measurement instruments included in this guideline meet the criteria as described in the "Framework on Clinimetrics for evidence-based products" of the KNGF.

Sources

1 Measurement instruments in Healthcare. Available via: http://www.meetinstrumentenzorg.nl/ Consulted on 2 January 2018.

2 Salaffi F, Stancati A, Silvestri CA, et al. Minimal clinically important changes in chronic musculoskeletal pain intensity measured on a numerical rating scale. Eur J Pain. 2004;8(4):283-91.

3 Singh JA, Luo R, Landon GC, et al. Reliability and clinically important improvement thresholds for osteoarthritis pain and function scales: a multicenter study. J Rheumatol. 2014;41(3):509-15.

4 Collins NJ, Misra D, Felson DT, et al. Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee EvaluationForm, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Outcome Survey Activities of Daily Living Scale (KOS-ADL), Lysholm Knee Scoring Scale, Oxford Knee Score (OKS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Activity Rating Scale (ARS), and Tegner Activity Score (TAS). Arthritis Care Res (Hoboken). 2011;63 Suppl 11:S208-28.

5 Mahler E, Cuperus N, Bijlsma J, et al. Responsiveness of four patient-reported outcome measures to assess physical function in patients with knee osteoarthritis. Scand J Rheumatol. 2016;45(6):518-27.

6 Fiona Dobson, Kim L. Bennell Rana S. Hinman et al. Recommended performance-based tests to assess physical function in people diagnosed with hip or knee osteoarthritis. Victoria, Australia: OARSI. Available via https://www.oarsi.org/sites/default/files/docs/2013/manual.pdf.

7 Springer BA, Marin R, Cyhan T, et al. Normative values for the unipedal stance test with eyes open and closed. J Geriatr Phys Ther. 2007;30(1):8-15.

8 Bohannon RW. Responsiveness of the single-limb stance test. Gait Posture 2012;35(1):173.

9 Wright AA, Cook CE, Baxter GD, et al. A comparison of 3 methodological approaches to defining major clinically important improvement of 4 performance measures in patients with hip osteoarthritis. J Orthop Sports Phys Ther. 2011;41:319-27

10 Peter WF, Loos M, de Vet HCW, et al. Development and preliminary testing of a computerized Animated Activity Questionnaire (AAQ) in patients with hip and knee osteoarthritis. Arthritis Care Res (Hoboken). 2015;67(1):32-9.

11 Peter WF, de Vet HCW, Boers M, et al. Cross-cultural and construct validity of the Animated Activity Questionnaire. Arthritis Care Res (Hoboken). 2016.

12 Peter W, de Vet H, Boer M, et al. An innovating measurement instrument to assess activity limitations in hip and knee osteoarthritis: the computerized animated activity questionnaire (AAQ) and its psychometric properties. Annals of the Rheumatic Diseases. 2017;76(2):111.

13 Jesudason C, Stiller K. Are bed exercises necessary following hip arthroplasty? Aust J Physiother. 2002;48:73-81.

14 Elings J, van der Sluis G, Goldbohm RA, et al. Development of a risk stratification model for delayed inpatient recovery of physical activities in patients undergoing total hip replacement. J Orthop Sports Phys Ther. 2016;46(3):135-43.

15 Soh SE, Stuart L, Raymond M, et al. The validity, reliability, and responsiveness of the modified Iowa Level of Assistance scale in hospitalized older adults in subacute care. Disabil Rehabil. 2017;1-7.

16 Morree JJ, Jongert MWA, van der Poel G. Inspanningsfysiologie, oefentherapie en training. (Exercise physiology, exercise therapy and training) Houten: Bohn Stafleu van Loghum; 2006.

17 McCurdy K, Langford G, Jenkerson D, et al. The validity and reliability of the 1RM bench press using chain-loaded resistance. J Strength Cond Res. 2008;22(3):678-83.

18 Verdijk LB, van Loon L, Meijer K, et al. One-repetition maximum strength test represents a valid means to assess leg strength in vivo in humans. J Sports Sci. 2009;27(1):59-68.

19 Jongert T, Benedictus J, Dijkgraaf J, et al. Het gebruik van de Borgschaal bij bewegingsactiviteiten voor hartpatiënten. (The use of the Borg scale for movement activities for cardiac patients) Maarssen: Elsevier healthcare; 2004.

20 Borg GA. Psychophysical bases of perceived exertion Med Sci Sports Exerc. 1982;14(5):377-81.

21 Davis AM, Perruccio AV, Canizares M, et al. Comparative validity and responsiveness of the HOOS-PS to the WOMAC physical function subscale in total joint replacement for osteoarthritis. Osteoarthritis and Cartilage 2009;17:7.

22 Singh JA, Luo R, Landon GC, et al. Reliability and clinically important improvement thresholds for osteoarthritis pain and function scales: a multicenter study. J Rheumatol. 2014;41(3):509-15.
23 Mahler E, Cuperus N, Bijlsma J, et al. Responsiveness of four patient-reported outcome measures to assess physical function in patients with knee osteoarthritis. Scand J Rheumatol. 2016;45(6):518-27.
24 Wittink H, Rogers W, Sukiennik A, et al. Physical functioning: self-report and performance measures are related but distinct. Spine (Phila Pa 1976). 2003;28(20):2407-13.
25 Gandhi R, Tsvetkov D, Davey JR, et al. Relationship between self-reported and performance-based tests in a hip and knee joint replacement population. Clin Rheumatol. 2009;28(3):253-7.

Note 9. Determining the indication

The following literature was used to answer the initial question:

1 Belo JN, Berg HF, Klein Ikkink AJ, et al. NHG-Standaard Niet-traumatische knieklachten. (NHG Clinical practice guideline on Non-traumatic knee problems) Utrecht: Dutch Association of General Practitioners; 2016.
2 Peter WFH, Jansen MJ, Bloo H, et al. KNGF-richtlijn Artrose heup-knie. (KNGF guideline Osteoarthritis of the hip-knee) Amersfoort: KNGF; 2010
3 Fernandes L, Hagen KB, Bijlsma JW, et al. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. Ann Rheum Dis. 2013;72:1125-35.
4 McAlindon TE, Bannuru RR, Sullivan MC, et al. OARSI guidelines for the nonsurgical management of knee osteoarthritis. Osteoarthritis Cartilage. 2014;22:363-88.
5 Hochberg MC, Altman RD, April KT, et al. American College of Rheumatology 2012 recommendations for the use of non-pharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. Arthritis Care Res. 2012;64:465-74.
6 National Institute for Health and Clinical Excellence. Osteoarthritis: national clinical guideline for care and management in adults. London: Royal College of Physicians; 2014.
7 Driving musculoskeletal health for Europe. Standards of care for people with osteoarthritis. Available via: http://www.eumusc.net/myUploadData/files/OA_Full_draft_FINAL[1].pdf.
8 Westby MD, Brittain A, Backman CL. Expert consensus on best practices for post-acute rehabilitation after total hip and knee arthroplasty: a Canada and United States Delphi study. Arthritis Care Res (Hoboken). 2014;66(3):411-23.
9 Westby MD, Marshall DA, Jones CA. Development of Quality Indicators for Hip and Knee Arthroplasty Rehabilitation. Osteoarthritis Cartilage. 2017.
10 Mistry JB, Elmallah RD, Bhave A, et al. Rehabilitative guidelines after total knee arthroplasty: a review. J Knee Surg. 2016;29(3):201-17.
11 de Rooij M, van der Leeden M, Cheung J, et al. Efficacy of tailored exercise therapy on physical functioning in patients with knee osteoarthritis and comorbidity: A randomized controlled trial. Arthritis Care Res (Hoboken). 2016.
12 Aanbeveling Werkwijze behandeling Prothese Infecties Orthopedie. (Recommendation for working practice in the treatment of prosthetic infections in orthopaedics) Available via: https://www.orthopeden.org/base/downloads/aanbeveling-werkwijze-behandeling-prothese-infecties-orthopedie.pdf
13 Online LROI Report 2015. Outcomes at a glance. Available via: http://www.lroi-rapportage.nl/media/pdf/PDF%20Online%20LROI-Rapportage%202015.pdf

Note 10. Education and advice

The following literature was used to answer the initial question:

1 Fernandes L, Hagen KB, Bijlsma JW, et al. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. Ann Rheum Dis. 2013;72:1125-35.
2 National Institute for Health and Care Excellence. Osteoarthritis: care and management in adults. NICE clinical guideline 177. London: Royal College of Physicians; 2014.
3 French SD, Bennell KL, Nicolson PJ, et al. What do people with knee or hip osteoarthritis need to know? An international consensus list of essential statements for osteoarthritis. Arthritis Care Res (Hoboken). 2015;67(6):809-16.
4 Jordan KP, Edwards JJ, Porcheret M, et al. Effect of a model consultation informed by guidelines on recorded quality of care of osteoarthritis (MOSAICS): a cluster randomised controlled trial in primary care. Osteoarthritis Cartilage. 2017;25(10):1588-97.

5 Standards of Care for People with Osteoarthritis. Available via: http://www.eumusc.net/myUploadData/files/Standards%200f%20Care%20Full%20report.pdf.
6 Zorgwijzer artrose. (healthcare directory for osteoarthritis) Available via: https://www.maartenskliniek.nl/artikelen/zorgwijzer-artrose. Consulted on 2 February 2018.
7 Voorlichting artrose (education on osteoarthritis); KNGF 2018. In development.
8 Mijn heupprothese (my hip prosthesis). Available via: http://www.mijnheupprothese.nl/. Consulted on 2 February 2018.
9 Zorg voor beweging, totale heupprothese (THP). (Care for movement, total hip prosthesis (THP)) Available via: https://www.zorgvoorbeweging.nl/totale-heupprothese-thp. Consulted on 2 February 2018.
10 Zorg voor beweging, totale knieprothese (TKP). (Care for movement, total knee prosthesis (THP)) Available via: https://www.zorgvoorbeweging.nl/de-knieprothese. Consulted on 2 February 2018.
11 van der Weegen W, Kornuijt A, Das D. Do lifestyle restrictions and precautions prevent dislocation after total hip arthroplasty? A systematic review and meta-analysis of the literature. Clin Rehabil. 2016 Apr;30(4):329-39.

Note 11. General considerations of the working group in the formulation of the recommendation for exercise therapy

Results based on the literature study
In general, the literature demonstrates a moderate effect of exercise therapy on the physical functioning of people with hip or knee osteoarthritis, or before or after joint replacement surgery for hip or knee osteoarthritis, compared to treatment without exercise therapy. The quality of evidence varies between the different patient groups.
In addition, the effect of exercise therapy in the conservative phase has also been demonstrated for pain (moderate to large effect, for hip and knee osteoarthritis respectively), the quality of life (no to small effect, for hip and knee osteoarthritis respectively) and cost-effectiveness (evidence of greater health gain per invested euro for both hip and knee osteoarthritis).

Balance between desired and undesirable effects
The desired effects (such as reduction of symptoms, improvement in daily functioning) of exercise therapy appear to be present in general, whilst the undesirable effects (such as a worsening of symptoms) appear to be rare and not very severe. Based on this, the working group estimates that the desired effects outweigh the undesirable effects.

Values and preferences of patients
The values and preferences will probably differ between patients. The working group estimates that the majority of patients will feel positive about exercise therapy, due to the effect on symptoms and daily functioning that they will experience and the extent to which they can implement exercise therapy in their daily lives.

Costs
There are few to no costs associated with exercise therapy, based on the assumption that the required exercise equipment is already present. An analysis of cost-effectiveness demonstrates that exercise therapy in the conservative phase results in a greater health gain per invested euro than when exercise therapy is not offered.

Acceptability/feasibility
The working group deems that the implementation of the intervention in daily practice, particularly in the conservative phase, is acceptable and feasible, because the intervention is viewed as the most indicated treatment option and no specific resources are required. Exercise therapy is considered probably acceptable and feasible for the pre-operative and post-operative phase, with a greater degree of uncertainty.

Note 12. Exercise therapy for osteoarthritis of the hip in the conservative phase

Initial question
Is exercise therapy recommended for people with hip osteoarthritis?

Complete initial question according to PICO
Are exercise therapy interventions (I), compared to no exercise therapy interventions (C), recommended for the treatment of people with hip osteoarthritis (P) to improve their physical functioning, pain and quality of life (O)?

Search strategy

In the autumn of 2016, the Erasmus Medical Centre (MC) Rotterdam performed a systematic review (SR) on behalf of the Healthcare Institute of the Netherlands, to evaluate the effectiveness of supervised exercise therapy for hip osteoarthritis.[1] The research question of this SR corresponds to the aforementioned initial question. In consultation with the Erasmus MC and the Healthcare Institute of the Netherlands, the collected results were adopted in full in the answering of this initial question. The SR by the Erasmus MC included studies up to August 2016. The KNGF supplemented this search action with the inclusion of studies up to 19 December 2016. (tables 12.1 and 12.2)

Table 12.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of hip or knee osteoarthritis*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	pain, physical functioning and quality of life (patient-reported outcomes).

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 12.2. Search terms.

Search date	19 December 2016
Consulted databases	PPubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw] OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search by the Erasmus MC yielded 2,420 summaries, of which 15 RCTs (*n* = 1402) were ultimately deemed to meet the selection criteria listed with the initial question of the KNGF.[2-16] Three of the 15 RCTs were not included, because these studies looked at pre-operative care instead of conservative care.[7,11,16] However, the results of the studies did concur with the results of the other 12 RCTs regarding conservative care. Based on this finding, the statistical pooling was not repeated for this initial question.

The literature search by the KNGF to find studies published between 1 August 2016 and 19 December 2016 did not yield any new RCTs that met the selection criteria.

Refer to flow chart 12.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 15 RCTs)

The studies include male and female patients with osteoarthritis of the hip.

The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In one study, the patients received "water-based" exercise therapy (group intervention supervised by a physical therapist) lasting 30 minutes per session, twice a week for five weeks.[11] In all other studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The sessions varied in duration from 30 to 90 minutes (median 60 minutes), the frequency varied from one to three times per week (median one time per week) and the duration varied from 6 to 12 weeks (median 8 weeks). The maximum treatment duration was 12 weeks. Follow-up varied from 1 to 24 months.

Quality of the evidence

- Measure of outcome "physical functioning" (patient-reported outcomes). Virtually all studies have a low risk of bias and studies were not down-graded based on design, but were down-graded based on inconsistency. The degree of indirectness was not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "reasonable" for outcomes immediately after the intervention and "high" for outcomes after six months. (table 12.3)
- Measure of outcome "pain" (patient-reported outcomes). Virtually all studies have a low risk of bias and studies were not down-graded based on design. Studies were down-graded based on inconsistency. The degree of indirectness was not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "reasonable" for outcomes immediately after the intervention and "high" for outcomes after six months. (table 12.3)
- Measure of outcome "quality of life" (patient-reported outcomes). Although two of the included studies have a high RoB, they were not down-graded based on design.[11,13] They were down-graded based on inconsistency. The outcomes after six months were also down-graded due to inaccuracy. The degree of indirectness was not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "reasonable" for outcomes immediately after the intervention and "low" for outcomes after six months. (table 12.3)

Table 12.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Abbott et al., 2013 [2]	+	+	-	-	+	+	?
Bieler et al., 2016 [3]	+	+	+	+	+	+	+
Fernandes et al., 2010 [4]	+	+	-	-	+	+	+
Foley et al., 2003 [5]	+	+	-	-	+	?	?

French et al., 2013 [6]	+	+	–	–	+	+	+
Herman et al., 2016 [7]	+	+	–	–	+	+	?
Hopman-Rock et al., 2000 [8]	?	?	–	–	?	?	+
Juhakoski et al., 2011 [9]	+	+	–	–	+	?	+
Kraus et al., 2014 [10]	+	+	–	–	+	+	+
Stener-Victorin et al., 2004 [11]	+	?	–	–	–	+	+
Svege et al., 2015 [12]	+	+	–	–	+	+	+
Tak et al., 2005 [13]	+	?	–	–	+	?	+
Teirlinck et al., 2016 [14]	+	+	–	–	+	+	+
van Baar et al., 1988 [15]	+	+	–	–	+	?	+
Villadsen et al., 2014 [16]	+	+	–	–	+	+	+

Effectiveness

- Measure of outcome "physical functioning" (patient-reported outcomes) comparing exercise therapy to no exercise therapy. Immediately after the intervention, 12 studies concluded that for people with hip osteoarthritis exercise therapy has a moderate effect on physical functioning compared to no exercise therapy (SMD = -0.32; 95% CI = -0.52 to -0.13). After six months, five studies concluded that for people with hip osteoarthritis exercise therapy has a slight effect on physical functioning compared to no exercise therapy (SMD = -0.28; 95% CI = -0.45 to -0.10). (table 12.4)
- Measure of outcome "pain" (patient-reported outcomes) comparing exercise therapy to no exercise therapy. Immediately after the intervention, 11 studies concluded that for people with hip osteoarthritis exercise therapy has a moderate effect on pain compared to no exercise therapy (SMD = 0.38; 95% CI = 0.20 to 0.56). After six months, five studies concluded that for people with hip osteoarthritis exercise therapy has a slight effect on pain compared to no exercise therapy (SMD = 0.21; 95% CI = 0.02 to 0.39). (table 12.4)
- Measure of outcome "quality of life" (patient-reported outcomes) comparing exercise therapy to no exercise therapy. Immediately after the intervention, seven studies concluded that for people with hip osteoarthritis exercise therapy has no effect on the quality of life compared to no exercise therapy (SMD = 0.00; 95% CI = -0.27 to 0.26). Six months after the intervention, three studies concluded that for people with hip osteoarthritis exercise therapy has no effect on the quality of life compared to no exercise therapy (SMD = 0.02; 95% CI = -0.40 to 0.44). (table 12.4)

Table 12.4. Evidence table for effectiveness of exercise therapy for osteoarthritis of the hip in the conservative phase.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
12	low RoB	yes, I^2 = 56%	no	no	no	526	517	SMD = 0,32 (0,13 to 0,52)	reasonable[1]
Physical functioning – longer-term follow-up									
5	low RoB	no, I^2 = 0%	no	no	no	255	246	SMD = 0,28 (0,10 to 0,45)	high
Pain – post intervention									
11	low RoB	yes, I^2 = 46%	no	no	no	498	480	SMD = 0,38 (0,20 to 0,56)	reasonable[1]
Pain – longer-term follow-up									
5	low RoB	no, I^2 = 0%	no	no	no	228	217	SMD = 0,21 (0,02 to 0,39)	high
Quality of life – post intervention									
7	low RoB	yes, I^2 = 54%	no	no	no	377	362	SMD = 0,0 (-0,22 tot 0,22)	reasonable[1], no effect
Quality of life – longer-term follow-up									

3	low RoB	yes, I^2 = 54%	no	yes, = 285	no	148	137	SMD = 0,02 (-0,40 tot 0,44)	low[2], no effect

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for inconsistency.* ***2*** *Down-grading for inconsistency and inaccuracy.*
SMD = standardized mean difference.

Additional initial question according to PICO

What is the cost-effectiveness, expressed in health gain per invested euro (O), of exercise therapy interventions (I) for the conservative treatment of patients with hip or knee osteoarthritis (P) compared to standard care (i.e., no exercise therapy) (C)?

Search strategy

The KNGF performed a literature search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the (cost-)effectiveness of exercise therapy versus no exercise therapy in patients with hip and knee osteoarthritis (from 2008). (tables 12.5 and 12.6)

Table 12.5. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis of the hip and/or knee*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	health gain per invested euro (i.e., quality-adjusted life year; QALY)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 12.6. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR “stretching”[tw] OR “Exercise Therapy”[Mesh] OR “exercise therapy”[tw] OR exercise therap*[tw] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Muscle Stretching Exercises”[tw] OR “Muscle Stretching Exercise”[tw] OR “Static Stretching”[tw] OR “Passive Stretching”[tw] OR “Static-Passive Stretching”[tw] OR “Static Passive Stretching”[tw] OR “Isometric Stretching”[tw] OR “Active Stretching”[tw] OR “Static-Active Stretching”[tw] OR “Static Active Stretching”[tw] OR “Ballistic Stretching”[tw] OR “Dynamic Stretching”[tw] OR “PNF Stretching”[tw] OR “Plyometric Exercise”[tw] OR “Plyometric Exercises”[tw] OR Plyometric Drill*[tw] OR “Plyometric Drills”[tw] OR “Plyometric Training”[tw] OR “Plyometric Trainings”[tw] OR “Stretch-Shortening Exercise”[tw] OR “Stretch Shortening Exercise”[tw] OR “Stretch-Shortening Exercises”[tw] OR “Stretch-Shortening”[tw] OR “Stretch Shortening”[tw] OR “Stretch-Shortening Drills”[tw] OR “Stretch-Shortening Cycle Exercise”[tw] OR “Stretch Shortening Cycle Exercise”[tw] OR “Stretch-Shortening Cycle Exercises”[tw] OR “Resistance Training”[tw] OR “Strength Training”[tw] OR “Weight-Lifting”[tw] OR “Weight

General search terms#	Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))
# For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.	

Literature found

The literature search relating to the (cost-)effectiveness of exercise therapy for hip and knee osteoarthritis yielded 591 SRs and 1702 RCTs. The SR by Pinto et al. (2012) [17] forms the foundation for answering the initial question. This review included literature up to October 2010 and has a reasonable score on the AMSTAR (8/11). All RCTs that were found were assessed based on the inclusion criteria for the additional initial question. In addition, we evaluated which additional RCTs from the search met the selection criteria. In total, the literature search yielded six RCTs (*n* = 1647).[18-23]

Refer to flow chart 12.2 for a total overview of the systematic literature study (appendix).

Description of studies

- Coupé et al., 2007.[18] The RCT was performed in the Netherlands. The study included 200 patients with hip or knee arthritis. The patients were randomly assigned to two groups: one group received behaviour-based exercise therapy (*n* = 97) and the other group received standard treatment by the physical therapist (*n* = 103). Follow-up: 65 weeks. Difference in cost-effectiveness between both interventions was calculated based on a social perspective.
- Cochrane et al., 2005.[19] The RCT was performed in the United Kingdom. The study included 312 patients with hip or knee osteoarthritis. The patients were randomly assigned to two groups: one group received water-based exercise therapy (*n* = 153) and the other group received standard care (*n* = 159). Follow-up: 52 weeks. Difference in cost-effectiveness between both interventions was calculated based on a social perspective.
- Sevick et al., 2000.[20] The RCT was performed in the United States. The study included 439 patients with knee osteoarthritis. The patients were randomly assigned to three groups: one group received exercise therapy consisting of strength training (*n* = 146), one group received exercise therapy consisting of endurance training (*n* = 144) and another group received education (*n* = 149). Follow-up: 78 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.
- Richardson et al., 2006.[21] The RCT was performed in the United Kingdom. The study included 214 patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received exercise therapy (*n* = 111) and the other group received home work exercises (*n* = 103). Follow-up: 52 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.
- Jessep et al., 2009.[22] The RCT was performed in the United Kingdom. The study included 64 patients with knee problems. The patients were randomly assigned to two groups: one group received a rehabilitation programme (*n* = 29) and the other group received a standard exercise therapy programme by the physical therapist (*n* = 35). Follow-up: 52 weeks. The perspective used to calculate the difference in cost-effectiveness between both interventions is not known.
- Hurley et al., 2007.[23] The RCT was performed in the United Kingdom. The study included 418 patients with knee problems. The patients were randomly assigned to three groups: one group received an individual rehabilitation programme (*n* = 146), one group received a rehabilitation programme in a group setting (*n* = 132) and another group received standard care (*n* = 140). Follow-up: 26 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.

Quality of the evidence

Measure of outcome "QALY". Based on the CHEC quality list, virtually all studies have a moderate risk of bias and were, therefore, not down-graded based on design. The degree of inconsistency is not known, because the estimation of effect was not reported in several studies; this did result in down-grading. Indirectness and inaccuracy were not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "moderate". (table 12.7)

Table 12.7. Methodological quality of the included studies about the cost-effectiveness.

	Study population	Competing alternatives	Research question	Study design	Time horizon	Perspective	Costs identified	Costs measured	Costs valued	Outcomes identified	Outcomes measured	Outcomes valued	Incremental analysis	Discounted	Sensitivity analysis	Conclusions	Generalizability	Conflict of interest	Ethical and distributional issues	TOTAL
Coupe et al., 2007 [18]	+	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	–	+	–	16/19
Cochrane et al., 2005 [19]	+	+	–	+	+	+	+	+	+	+	+	+	–	–	–	+	–	+	–	12/19
Sevick et al., 2000 [20]	+	+	–	+	+	–	–	–	–	+	–	–	–	+	+	+	–	–	–	9/19
Richardson et al., 2006 [21]	+	+	–	+	+	–	+	+	–	–	+	+	+	–	+	–	–	–	–	10/19
Jessep et al., 2009 [22]	+	+	–	+	+	–	–	+	–	+	+	+	–	–	–	–	–	+	–	9/19
Hurley et al, 2007 [23]	+	+	–	+	+	+	+	+	+	+	+	+	+	–	+	+	+	–	–	15/19

Cost-effectiveness

Measure of outcome "QALY". Five studies reported that exercise therapy resulted in greater health gain per invested euro than standard care. Only the study by Hurley et al. demonstrated the opposite effect and reported that standard care resulted in a greater health gain per invested euro than a rehabilitation programme.[23] The incremental costs (the difference between the intervention and control groups) per QALY were only reported by Coupé et al. ($63,019; 95% CI = -128,374 to 2,040,599).[18] In summary, the results of the different cost-effectiveness analyses demonstrate that regarding the costs, exercise therapy has a greater chance, compared to standard care, of being more effective. (table 12.8)

Table 12.8. Evidence table for cost-effectiveness of exercise therapy for osteoarthritis of the hip and/or knee in the conservative phase.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Outcome QALY							
6, *n* = 1647	moderate RoB	Unknown	no	no, *n* = 1647	no	Five studies reported that exercise therapy resulted in a greater health gain per invested euro than standard care.[18-22] Only the study by Hurley et al. reported that standard care resulted in a greater health gain per invested euro compared to a	moderate[1]

						rehabilitation programme. [23] The incremental costs (the difference in costs between the intervention and control groups) per QALY were only reported by Coupé et al. ($63,019; 95% CI = 128,374 -2,040,599).[18]	

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for inconsistency.* ***2*** *Down-grading for inconsistency and inaccuracy.*
SMD = standardized mean difference.

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 12.9)

Table 12.9. GRADE Evidence to decision form.

	Exercise therapy hip osteoarthritis						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	Small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Acceptability	not	probably not	probably	yes	varies	no idea
Feasibility	not realistic	probably not realistic	probably realistic	realistic	varies	no idea

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

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Note 13. Exercise therapy for osteoarthritis of the knee in the conservative phase

Complete initial question according to PICO

Are exercise therapy interventions (I), compared to no exercise therapy interventions (C), recommended for the treatment of people with knee osteoarthritis (P) to improve their physical functioning, pain and quality of life (O)?

Search strategy

In the autumn of 2016, the Erasmus Medical Centre (MC) Rotterdam performed a systematic review (SR) on behalf of the Healthcare Institute of the Netherlands, to evaluate the effectiveness of supervised exercise therapy for knee osteoarthritis.[1] The research question of this SR corresponds to the aforementioned initial question. In consultation with the Erasmus MC and the Healthcare Institute of the Netherlands, the collected results were adopted in full in the answering of this initial question. The SR by the Erasmus MC included studies up to August 2016. The KNGF supplemented this search action with the inclusion of studies up to 19 December 2016. (tables 13.1 and 13.2)

Table 13.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of hip or knee osteoarthritis*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	pain, physical functioning and quality of life (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 13.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw]

General search terms#	OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))
# For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.	

Literature found

The literature search performed by the Erasmus MC yielded 2420 studies, of which 52 RCTs (*n* = 6863) ultimately met the selection criteria related to the initial question by the KNGF.[2-54]

The literature search by the KNGF to find studies published between 1 August 2016 and 19 December 2016 yielded one new RCT that met the selection criteria [55]. As this study demonstrates results similar to those of the other 52 RCTs found by the Erasmus MC regarding conservative care, the statistical pooling for this initial question was not repeated.

Refer to flow chart 13.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 52 RCTs)

The studies include male and female patients with osteoarthritis of the knee. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In four studies, the patients received "water-based" exercise therapy (group intervention) lasting 50 to 60 minutes per session, three times a week for 8 to 16 weeks.[28,30,36,52] In all other studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The sessions lasted 30 to 90 minutes (median 60 minutes), the frequency varied from 1 to 3 times per week (median one time per week) and the duration varied from 2 to 52 weeks (median 12 weeks). Follow-up varied from 1 to 22 months.

Quality of the evidence

- Measure of outcome "physical functioning" (patient-reported outcomes). Several studies have a high risk of bias and were down-graded based on design. Immediately after the intervention (*n* = 42) down-grading was also performed based on inconsistency (there was no inconsistency for longer-term follow-up). The degree of indirectness was not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "low" for outcomes immediately after the intervention and "moderate" for outcomes after six months. If the analysis is restricted to studies of sufficient size and good quality, the quality of the evidence increases to "moderate" immediately after the intervention (*n* = 11) and "high" after six months (*n* = 3). (table 13.3)
- Measure of outcome "pain" (patient-reported outcomes). Both immediately after the intervention and after six months, there are studies with a high risk of bias and down-grading was performed based on design. The measurements performed immediately after the intervention (*n* = 42) were also down-graded for inconsistency; there was no inconsistency after six months and down-grading was not performed. The degree of indirectness was not applicable for either measurement point and did not require down-grad-

ing. There was also no need to down-grade either measurement point for inaccuracy. Based on GRADE, the quality of the evidence was assessed as "low" for outcomes immediately after the intervention and "moderate" for outcomes after six months. If the analysis is restricted to studies of sufficient size and good quality, the quality of the evidence increases to "high" both immediately after the intervention and after six months. (table 13.3)

- Measure of outcome "quality of life" (patient-reported outcomes). Many studies have a high or unclear risk of bias, for which down-grading was performed - both immediately after the intervention and after six months - based on design. No down-grading was performed for inconsistency or inaccuracy. The degree of indirectness was also not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "low" for outcomes immediately after the intervention and "moderate" for outcomes after six months. If the analysis is restricted to studies of sufficient size and good quality, the quality of the evidence increases to "high" both immediately after the intervention (*n* = 7) and after six months (*n* = 2). (table 13.3)

Table 13.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Abbott et al., 2013 [2]	+	+	-	-	+	+	+
Ay et al., 2013 [3]	+	?	-	-	?	+	+
Bautch et al., 1997 [4]	?	?	-	-	-	-	?
Bennell et al., 2010 [5]	+	+	-	-	+	+	+
Bennell et al., 2016 [6]	+	+	-	-	+	+	+
Bruce-Brand et al., 2012 [7]	+	?	-	-	+	-	+
Christensen et al., 2015 [8]	+	+	-	-	+	+	+
Da Silva et al., 2015 [9]	+	+	-	-	-	+	+
Doi et al., 2008 [10]	+	+	-	-	?	?	+
Ettinger et al., 1997 [11]	+	+	-	-	+	+	?
Foley et al., 2003 [12]	+	+	-	-	+	+	?
Fransen et al., 2001 [13]	+	+	-	-	+	+	?
Gur et al., 2002 [14]	?	?	-	-	-	+	?
Hay et al., 2006 [15]	+	?	-	-	+	+	+
Henriksen et al., 2014 [16]	+	+	-	-	-	+	+
Hopman-Rock et al., 2000 [17]	?	?	-	-	+	-	?
Huber et al., 2015 [18]	+	+	-	-	+	+	?
Hurley et al., 2007 [19]	+	+	-	-	+	?	+
Jan et al., 2008 [20]	+	?	-	-	+	-	?
Jan et al., 2009 [21]	+	?	-	-	+	+	?
Jorge et al., 2015 [22]	+	+	-	-	+	+	+
Kao et al., 2012 [23]	-	?	-	-	?	-	?
Keefe et al., 2004 [24]	?	?	-	-	-	?	?
Kovar et al., 1992 [25]	+	?	-	-	-	?	?
Kudo et al., 2013 [26]	+	?	-	-	-	?	+
Lim et al., 2008 [27]	+	+	-	-	+	+	+

Lim et al., 2010 [28]	?	?	–	–	+	+	+
Lin et al., 2009 [29]	+	+	–	–	+	+	?
Lund et al., 2008 [30]	+	+	–	–	+	+	+
Maurer et al., 1999 [31]	+	?	–	–	+	?	?
Messier et al., 2004 [32]	+	+	–	–	+	+	?
Messier et al., 2013 [33]	+	?	–	–	+	+	+
Multanen et al., 2014/Koli 2015 [34,35]	+	?	–	–	–	+	+
Munukka et al., 2016 [36]	+	+	–	–	+	+	+
Peloquin et al., 1999 [37]	+	?	–	–	+	–	?
Quilty et al., 2003 [38]	+	+	+	+	+	+	?
Rogind et al., 1998 [39]	+	?	–	–	+	?	?
Rosedale et al., 2014 [40]	+	+	–	–	+	+	+
Salacinsky et al., 2012 [41]	+	?	–	–	–	–	+
Salli et al., 2010 [42]	?	?	–	–	+	+	?
Samut et al., 2015 [43]	?	?	–	–	?	?	?
Schilke et al., 1996 [44]	+	?	–	–	?	+	?
Segal et al., 2015 [45]	+	+	–	–	+	+	?
Simao et al., 2012 [46]	?	+	–	–	+	+	+
Thomas et al., 2002 [47]	+	+	–	–	+	+	?
Thorstensen et al., 2005 [48]	+	+	–	–	?	+	?
Topp et al., 2002 [49]	?	?	–	–	?	?	?
van Baar et al., 1998 [50]	+	+	–	–	+	+	?
Villandsen et al., 2014 [51]	+	+	–	–	+	+	+
Wang et al., 2011 [52]	+	+	–	–	+	+	?
Worthly et al., 2013 [53]	?	?	–	–	?	?	?
Yip et al., 2007 [54]	+	?	–	–	?	?	?

Effectiveness

- Measure of outcome "physical functioning" (patient-reported outcomes). Immediately after the intervention (n = 42), there is a moderate effect of exercise therapy on functioning of patients with knee osteoarthritis (SMD = 0.48; 95% CI = 0.35 to 0.61). After six months (n = 7), there is also a moderate effect of exercise therapy (SMD = 0.27; 95% CI = 0.14 to 0.41). If the analysis is restricted to studies of sufficient size and good quality, then the effect estimates are slightly higher. (table 13.4)
- Measure of outcome "pain" (patient-reported outcomes). Immediately after the intervention (n = 42), there is a large effect of exercise therapy on pain experienced by patients with knee osteoarthritis (SMD = 0.50; 95% CI = 0.37 to 0.63). After six months (n = 7), there is a slight effect of exercise therapy (SMD = 0.26; 95% CI = 0.12 to 0.40). If the analysis is restricted to studies of sufficient size and good quality, then the effect estimate immediately after the intervention (n = 11) is slightly higher (slightly lower after six months (n = 3)). (table 13.4)
- Measure of outcome "quality of life" (patient-reported outcomes). Immediately after the intervention (n = 17) there is a small effect of exercise therapy on the quality of life of patients with knee osteoarthritis (SMD = -0.25; 95% CI = -0.38 tot 0.11). After six months (n = 3), there is no effect of exercise therapy (SMD = 0.01; 95% CI = -0.18 to 0.16). If the analysis is restricted to studies of sufficient size and good quality, then the effect estimates do not change. (table 13.4)

Table 13.4. Evidence table for effectiveness of exercise therapy for osteoarthritis of the knee in the conservative phase.

Number of studies	GRADE					Number of patients		Effect estimate[d]	Quality of the evidence
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
all, *n* = 42	high RoB	yes, I^2 = 67%	no	no	no	1889	1556	SMD = 0,48 (0,35 to 0,61)	low[1]
all, *n* = 11	low RoB	yes, I^2 = 50%	no	no	no	662	467	SMD = 0,54 (0,36 to 0,72)	moderate[3]
Physical functioning – longer-term follow-up									
all, *n* = 7	high RoB	no, I^2 = 0%	no	no	no	542	352	SMD = 0,27 (0,14 to 0,41)	moderate[2]
all, *n* = 3	low RoB	no, I^2 = 0%	no	no	no	379	201	SMD = 0,30 (0,13 to 0,47)	high
Pain – post intervention									
all, *n* = 42	high RoB	yes, I^2 = 69%	no	no	no	1168	1541	SMD = 0,50 (0,37 to 0,63)	low[1]
all, *n* = 11	low RoB	no, I^2 = 17%	no	no	no	662	467	SMD = 0,55 (0,41 to 0,68)	high
Pain – longer-term follow-up									
all, n = 7	high RoB	no, I^2 = 0%	no	no	no	539	350	SMD = 0,26 (0,12 to 0,40)	moderate[2]
all, *n* = 3	low RoB	no, I^2 = 0%	no	no	no	379	201	SMD = 0,21 (0,04 to 0,38)	high
Quality of life – post intervention									
all, *n* = 17	high RoB	no, I^2 = 40%	no	no	no	916	697	SMD = 0,25 (0,11 to 0,38)	moderate[2]
all, *n* = 7	low RoB	no, I^2 = 33%	no	no	no	434	275	SMD = 0,32 (0,12 to 0,51)	high
Quality of life – longer-term follow-up									
all, *n* = 3	high RoB	no, I^2 = 0%	no	no	no	380	204	SMD = 0,01 (-0,18 to 0,16)	moderate[2], no effect
all, *n* = 2	low RoB	no, I^2 = 0%	no	no	no	350	173	SMD = 0,04 (-0,14 to 0,23)	high, no effect

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for design (RoB) and inconsistency.* ***2*** *Down-grading for design.*
SMD = standardized mean difference.

Additional initial question

What is the cost-effectiveness, expressed in health gain per invested euro (0), of exercise therapy interventions (I) for the conservative treatment of patients with hip or knee osteoarthritis (P) compared to standard care (i.e., no exercise therapy) (C)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the (cost-)effectiveness of exercise therapy versus no exercise therapy in patients with hip and knee osteoarthritis (from 2008). (tables 13.5 and 13.6)

Table 13.5. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	health gain per invested euro (i.e., quality-adjusted life year; (QALY))

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 13.6. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw] OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises" [tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical / Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to the (cost-)effectiveness of exercise therapy for hip and knee osteoarthritis yielded 591 SRs and 1702 RCTs. The SR by Pinto et al.[56] forms the basis for answering this initial question. This review included literature up to October 2010 and has a reasonable score on the AMSTAR (8/11). All RCTs from the review were tested according to the selection criteria of the initial question. In addition, we evaluated which

additional RCTs from the search met the selection criteria. In total, the literature search resulted in six RCTs (n = 1647).[57-62]

Refer to flow chart 13.2 for a total overview of the systematic literature study (appendix).

Description of studies

- Coupé et al., 2007.[57] The RCT was performed in the Netherlands. The study included 200 patients with hip or knee osteoarthritis. The patients were randomly assigned to two groups: one group received behaviour-based exercise therapy (n = 97) and the other group received standard treatment by the physical therapist (n = 103). Follow-up: 65 weeks. Difference in cost-effectiveness between both interventions was calculated based on a social perspective.
- Cochrane et al., 2005.[58] The RCT was performed in the United Kingdom. The study included 312 patients with hip or knee osteoarthritis. The patients were randomly assigned to two groups: one group received water-based exercise therapy (n = 153) and the other group received standard care (n = 159). Follow-up: 52 weeks. Difference in cost-effectiveness between both interventions was calculated based on a social perspective.
- Sevick et al., 2000.[59] The RCT was performed in the United States. The study included 439 patients with knee osteoarthritis. The patients were randomly assigned to three groups: one group received exercise therapy consisting of strength training (n = 146), one group received exercise therapy consisting of endurance training (n = 144) and another group received education (n = 149). Follow-up: 78 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.
- Richardson et al., 2006.[60] The RCT was performed in the United Kingdom. The study included 214 patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received exercise therapy (n = 111) and the other group received home work exercises (n = 103). Follow-up: 52 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.
- Jessep et al., 2009.[61] The RCT was performed in the United Kingdom. The study included 64 patients with knee problems. The patients were randomly assigned to two groups: one group received a rehabilitation programme (n = 29) and the other group received a standard exercise therapy programme by the physical therapist (n = 35). Follow-up: 52 weeks. The perspective used to calculate the difference in cost-effectiveness between both interventions is not known.
- Hurley et al., 2007.[62] The RCT was performed in the United Kingdom. The study included 418 patients with knee problems. The patients were randomly assigned to three groups: one group received an individual rehabilitation programme (n = 146), one group received a rehabilitation programme in a group setting (n = 132) and another group received standard care (n = 140). Follow-up: 26 weeks. Difference in cost-effectiveness between both interventions was calculated based on a healthcare perspective.

Quality of the evidence

- Measure of outcome "QALY'. Based on the CHEC quality list, virtually all studies have a moderate risk of bias and studies were, therefore, not down-graded based on design. The degree of inconsistency is not known, because the effect estimate was not reported in several studies, but down-grading was performed for this. Indirectness and inaccuracy were not applicable and did not require down-grading. Based on GRADE, the quality of the evidence was assessed as "moderate". (table 13.7)

Table 13.7. Evidence table for cost-effectiveness of exercise therapy for osteoarthritis of the hip and/or knee in the conservative phase.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		

Outcome QALY							
6, *n* = 1647	moderate RoB	Unknown	no	no, *n* = 1647	no	Five studies reported that exercise therapy resulted in a greater health gain per invested euro than standard care.[57-61] Only the study by Hurley et al. reported that standard care resulted in a greater health gain per invested euro than a rehabilitation programme.[62] The incremental costs (the difference in costs between the intervention and control groups) per QALY were only reported by Coupé et al. ($63,019; 95% CI = −128,374 to 2,040,599).[57]	moderate[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*
***1** Down-grading for inconsistency.*

Cost-effectiveness

- Measure of outcome "QALY'. Five studies reported that exercise therapy resulted in a greater health gain per invested euro than standard care. Only the study by Hurley et al. demonstrated the opposite effect and reported that standard care resulted in a greater health gain per invested euro than a rehabilitation programme.[62] The incremental costs (the difference in costs between the intervention and control groups) per QALY were only reported by Coupé et al. ($63,019; 95% CI = 128,374 to 2,040,599).[57] In summary, the results of the different cost-effectiveness analyses demonstrate that regarding the costs, exercise therapy has a greater chance of being cost-effective, compared to standard care. (table 13.8)

Table 13.8. Methodological quality of the included studies about the cost-effectiveness.

	Study population	Competing alternatives	Research question	Study design	Time horizon	Perspective	Costs identified	Costs measured	Costs valued	Outcomes identified	Outcomes measured	Outcomes valued	Incremental analysis	Discounted	Sensitivity analysis	Conclusions	Generalizability	Conflict of interest	Ethical and distributional issues	TOTAL
Coupe et al., 2007 [2]	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	−	16/19
Cochrane et al., 2005	+	+	−	+	+	+	+	+	+	+	+	+	−	−	−	+	−	+	−	12/19
Sevick et al., 2000 [3]	+	+	−	+	+	−	−	−	−	+	−	−	−	+	+	+	−	−	−	9/19
Richardson et al., 2006	+	+	−	+	+	−	+	+	−	−	+	+	+	−	+	−	−	−	−	10/19
Jessep et al., 2009 [4]	+	+	−	+	+	−	−	+	−	+	+	+	−	−	−	−	−	+	−	9/19
Hurley et al., 2007 [5]	+	+	−	+	+	+	+	+	+	+	+	+	+	−	+	+	+	−	−	15/19

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 13.9)

Table 13.9. GRADE Evidence to decision form.

	Exercise therapy knee osteoarthritis						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available
Acceptability	not	probably not	probably	yes	varies	no idea	
Feasibility	not realistic	probably not realistic	probably realistic	realistic	varies	no idea	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

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Note 14. Pre-operative exercise therapy prior to joint replacement for osteoarthritis of the hip

Initial question

Is exercise therapy recommended prior to joint replacement surgery for hip osteoarthritis?

Complete initial question according to PICO

Are exercise therapy interventions in the pre-operative phase (I), compared to no exercise therapy in the pre-operative phase (C), recommended for the treatment of people who are due to undergo joint replacement surgery for hip osteoarthritis (P) to improve their post-operative physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to exercise therapy in the pre-operative phase versus no exercise therapy in patients with hip osteoarthritis. (tables 14.1 and 14.2)

Table 14.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of osteoarthritis who are eligible for joint replacement surgery of the hip*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 14.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR “stretching”[tw] OR “Exercise Therapy”[Mesh] OR “exercise therapy”[tw] OR exercise therap*[tw] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Muscle Stretching Exercises”[tw] OR “Muscle Stretching Exercise”[tw] OR “Static Stretching”[tw] OR “Passive Stretching”[tw] OR “Static-Passive Stretching”[tw] OR “Static Passive Stretching”[tw] OR “Isometric Stretching”[tw] OR “Active Stretching”[tw] OR “Static-Active Stretching”[tw] OR “Static Active Stretching”[tw] OR “Ballistic Stretching”[tw] OR “Dynamic Stretching”[tw] OR “PNF Stretching”[tw] OR “Plyometric Exercise”[tw] OR “Plyometric Exercises”[tw] OR Plyometric Drill*[tw] OR “Plyometric Drills”[tw] OR “Plyometric Training”[tw] OR “Plyometric Trainings”[tw] OR “Stretch-Shortening Exercise”[tw] OR “Stretch Shortening Exercise”[tw] OR “Stretch-Shortening Exercises”[tw] OR “Stretch-Shortening”[tw] OR “Stretch Shortening”[tw] OR “Stretch-Shortening Drills”[tw] OR “Stretch-Shortening Cycle Exercise”[tw] OR “Stretch Shortening Cycle Exercise”[tw] OR “Stretch-Shortening Cycle Exercises”[tw] OR “Resistance Training”[tw] OR “Strength Training”[tw] OR “Weight-Lifting”[tw] OR “Weight Lifting”[tw] OR “Weight-Bearing”[tw] OR “Weight Bearing”[tw] OR “Exercise”[Mesh] OR “Exercise”[tw] OR “Exercises”[tw] OR “Physical Exercise”[tw] OR “Physical Exercises”[tw] OR “Isometric Exercises”[tw] OR “Isometric Exercise”[tw] OR “Aerobic Exercises”[tw] OR “Aerobic Exercise”[tw] OR “Circuit-Based Exercise”[tw] OR “Cool-Down Exercise”[tw] OR “Cool-Down Exercises”[tw] OR “Physical Conditioning”[tw] OR “Running”[tw] OR “Jogging”[tw] OR “Swimming”[tw] OR “Walking”[tw] OR “Warm-Up Exercise”[tw] OR “Warm-Up Exercises”[tw] OR “Physical Exertion”[Mesh] OR “Physical Exertion”[tw] OR “Physical Effort”[tw] OR “Physical Efforts”[tw] OR “Physical Fitness”[Mesh] OR “Physical Fitness”[tw] OR “Physical Endurance”[mesh] OR “Physical Endurance”[tw] OR “Anaerobic Threshold”[tw] OR “Exercise Tolerance”[tw] OR “Exercise Movement Techniques”[Mesh] OR “Exercise Movement”[tw] OR “Bicycling”[tw] OR “Walking”[tw] OR “Motor Activity”[Mesh] OR “Physical Activity”[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT (“Animals”[mesh] NOT “Humans”[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 591 systematic literature studies and 1702 RCTs. The SR by Wallis et al. forms the basis for answering this initial question.[1] This review included literature up to 10 August 2010 and has a high score on the AMSTAR (9/10). All RCTs from the review were tested according to the selection criteria of the initial question. In addition, we evaluated which additional RCTs from the search met the selection criteria. In total, the literature search resulted in four RCTs (*n* = 317).[2-5]

Refer to flow chart 14.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 4 RCTs)

The studies included male and female patients with osteoarthritis of the hip who were scheduled for unilateral total hip surgery. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In one study, the patients received both "water-based" and "land-based" exercise therapy, three times a week for six weeks under the supervision of a physical therapist.[4] In all other studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The treatment took place 2 to 7 times per week (ave. 4x/per week), for 4 to 8 weeks (ave. treatment duration was 5 weeks). Follow-up: 12 to 52 weeks.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; *n* = 317). The studies had a low risk of bias (RoB) and were not down-graded based on design. For the other components, down-grading was only required for "inaccuracy", due to the relatively small study population. Based on GRADE, the quality of the evidence was assessed as "reasonable". (table 14.3)

Table 14.3 Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Bitterli et al., 2011 [2]	+	?	-	-	+	?	+
Ferrera et al., 2008 [3]	+	+	-	-	+	?	+
Rooks et al., 2006 [4]	+	+	-	-	+	?	+
Villadsen et al., 2014 [5]	+	+	-	-	+	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; n = 317). A moderate post-operative effect (SMD = 0.32; 95% CI = 0.06 to 0.57) was observed for pre-operative exercise therapy offered to patients due to undergo joint replacement surgery for hip osteoarthritis. (table 14.4)

Table 14.4. Evidence table for effectiveness of exercise therapy for osteoarthritis of the hip in the pre-operative phase.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated[d]**	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – immediately after the intervention									
all, *n* = 4	low RoB	no, I^2 = 24%	no	yes, *n* = 317	no	161	156	SMD = 0,32 (95%-BI = 0,06 tot 0,57)	reasonable[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*
***1** Down-grading for inaccuracy. SMD = standardized mean difference.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 14.5)

Table 14.5. Evidence to decision form.

	Exercise therapy pre-operative hip						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available
Acceptability	not	probably not	probably	yes	varies	no idea	
Feasibility	not realistic	probably not realistic	probably realistic	realistic	varies	no idea	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

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Note 15. Pre-operative exercise therapy prior to joint replacement for osteoarthritis of the knee

Initial question

Is exercise therapy recommended prior to joint replacement surgery for knee osteoarthritis?

Complete initial question according to PICO

Are exercise therapy interventions in the pre-operative phase (I), compared to no exercise therapy in the pre-operative phase (C), recommended for the treatment of people who are due to undergo joint replacement surgery for knee osteoarthritis (P) to improve their post-operative physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to exercise therapy in the pre-operative phase versus no exercise therapy in patients with knee osteoarthritis. (tables 15.1 and 15.2)

Table 15.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of osteoarthritis who are eligible for joint replacement surgery of the knee*
Type of intervention	any form of pre-operative exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 15.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw] OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 591 SRs and 1702 RCTs. The review by Silkman-Baker forms the basis for answering this initial question.[1] This review included literature up to February 2011 and has a high score on the AMSTAR (9/10). All RCTs from the review were tested according to the selection criteria of the initial question. In addition, we evaluated which additional RCTs from the search met the selection criteria. In total, the literature search resulted in four RCTs (*n* = 375).[2-5]

Refer to flow chart 15.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 4 RCTs)

The studies included male and female patients with osteoarthritis of the knee who were scheduled for unilateral total knee surgery. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In one study, the patients received both "water-based" and "land-based" exercise therapy, three times a week for six weeks under the supervision of a physical therapist.[4] In all other studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The frequency varied from 2 to 3 times per week (median 3 times per week) and the duration varied from 4 to 8 weeks. Follow-up varied from 12 to 52 weeks after the surgery.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; *n* = 375). The studies had a low risk of bias (RoB) and were, therefore, not down-graded based on design. For the other components, down-grading was required for "inconsistency" due to differences in the outcomes of the studies and "inaccuracy" due to the relatively small study population. Based on GRADE, the quality of the evidence was assessed as "low". (table 15.3)

Table 15.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Beaupre et al., 2004 [2]	+	+	–	–	?	?	+
Calatayud et al., [3]	+	?	–	–	+	?	+
Rooks 2006 et al., [4]	+	+	–	–	+	?	+
Villadsen 2014 et al., [5]	+	+	–	–	+	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; *n* = 375). There is a moderate post-operative effect (SMD = 0.4; 95% CI = 0.09 to 0.62) of pre-operative exercise therapy for patients due to undergo joint replacement surgery as a result of knee osteoarthritis. (table 15.4)

Table 15.4. Evidence table for effectiveness of exercise therapy for knee osteoarthritis in the pre-operative phase.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
all, *n* = 4	low RoB	yes, I^2 = 95%	no	yes, *n* = 375	n	189	186	SMD = 0,4 (95%-BI = 0,09 tot 0,62	low[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*

1 *Down-grading for inconsistency and inaccuracy. SMD = standardized mean difference.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 15.5)

Table 15.5. Evidence to decision form.

	Exercise therapy pre-operative knee						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available
Acceptability	not	probably not	probably	yes	varies	no idea	
Feasibility	not realistic	probably not realistic	probably realistic	realistic	varies	no idea	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

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Note 16. Post-operative exercise therapy following joint replacement for osteoarthritis of the hip

Initial question

Is exercise therapy recommended after joint replacement surgery for hip osteoarthritis?

Complete initial question according to PICO

Are exercise therapy interventions in the post-operative phase (I), compared to no exercise therapy in the post-operative phase (C), recommended for the treatment of people who have undergone joint replacement surgery for hip osteoarthritis (P) to improve their physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e. systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of post-operative exercise therapy versus no post-operative exercise therapy in patients who have undergone joint replacement surgery for hip osteoarthritis. (table 16.1 and 16.2)

Table 16.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of osteoarthritis who are undergoing joint replacement surgery for hip osteoarthritis*
Type of intervention	any form of post-operative exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 16.2. Search terms

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR “stretching”[tw] OR “Exercise Therapy”[Mesh] OR “exercise therapy”[tw] OR exercise therap*[tw] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Muscle Stretching Exercises”[tw] OR “Muscle Stretching Exercise”[tw] OR “Static Stretching”[tw] OR “Passive Stretching”[tw] OR “Static-Passive Stretching”[tw] OR “Static Passive Stretching”[tw] OR “Isometric Stretching”[tw] OR “Active Stretching”[tw] OR “Static-Active Stretching”[tw] OR “Static Active Stretching”[tw] OR “Ballistic Stretching”[tw] OR “Dynamic Stretching”[tw] OR “PNF Stretching”[tw] OR “Plyometric Exercise”[tw] OR “Plyometric Exercises”[tw] OR

General search terms#	Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 591 SRs and 1702 RCTs. The SR by Minns-Lowe et al. forms the basis for answering this initial question.[1] This review included literature up to November 2013 and has a high score on the AMSTAR (6/10). All RCTs from the review were tested according to the selection criteria of the initial question. In addition, we evaluated which additional RCTs from the search met the selection criteria. In total, the literature search resulted in four RCTs (n = 410).[2-5]

Refer to flow chart 16.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 4 RCTs)

The studies included male and female patients with osteoarthritis of the hip who had undergone unilateral total hip surgery. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In one study, the patients received both "water-based" and "land-based" exercise therapy, three times a week for six weeks under the supervision of a physical therapist.[3] In the other three studies, the intervention consisted of "land-based" exercise therapy partially supervised by a physical therapist and partially in the form of an exercise schedule to be completed at home. The frequency varied from 2 to 7 times per week (median 3 times per week) and the duration varied from 1 to 8 weeks (median 3 weeks). Follow-up varied from 2 to 104 weeks after the surgery.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; n = 410). The studies had a low risk of bias (RoB) and were, therefore, not down-graded based on design. No down-grading was required for the other components either. Based on GRADE, the quality of the evidence was assessed as "high". (table 16.3)

Table 16.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Barker et al., 2013 [2]	+	+	–	–	+	?	+
Beaupre et al., 2015 [3]	+	+	–	–	?	?	+
Liebs et al., 2010 [4]	+	+	–	–	+	+	+
Umpierres et al., 2014 [5]	+	+	–	–	+	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes; 4 RCTs; *n* = 410). Immediately after the intervention, there is a moderate effect (SMD = 0.37; 95% CI = 0.17 to 0.56) of post-operative exercise therapy on functioning of patients who had undergone joint replacement surgery for hip osteoarthritis. (table 16.4)

Table 16.4. Evidence table for effectiveness of exercise therapy following joint replacement surgery of the hip.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
all, *n* = 4	low RoB	no, I^2 = 0%	no	no, *n* = 410	no	204	206	SMD = 0,37 (95%-BI = 0,17 tot 0,56)	high

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b** I^2 > 40%;* ***c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d** Positive: effect is in favour of exercise therapy.*
SMD = standardized mean difference.

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 16.5)

Table 16.5. Evidence to decision form.

	Exercise therapy post-operative hip						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured

Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large		no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation		no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea	
Variation in required resources (costs)	high	moderate	low	very low		no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available	
Acceptability	not	probably not	probably	yes		varies	no idea	
Feasibility	not realistic	probably not realistic	probably realistic	realistic		varies	no idea	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Lowe CJ, Davies L, Sackley CM, Barker KL. Effectiveness of land-based physiotherapy exercise following hospital discharge following hip arthroplasty for osteoarthritis: an updated systematic review. Physiotherapy. 2015 Sep;101(3):252-65.

2 Barker KL, Newman MA, Hughes T, Sackley C, Pandit H, Kiran A, Murray DW. Recovery of function following hip resurfacing arthroplasty: a randomized controlled trial comparing an accelerated vs. standard physiotherapy rehabilitation programme. Clin Rehabil. 2013 Sep;27(9):771-84.

3 Beaupre LA, Masson EC, Luckhurst BJ, Arafah O, O'Connor GJ. A randomized pilot study of a comprehensive postoperative exercise program compared with usual care following primary total hip arthroplasty in subjects less than 65 years of age: feasibility, selection of outcome measures and timing of assessment. BMC Musculoskelet. Disord. 2014 Jun 2;15:192.

4 Liebs TR, Herzberg W, Rüther W, Haasters J, Russlies M, Hassenpflug J. Ergometer cycling after hip or knee replacement surgery: a randomized controlled trial. J Bone Joint Surg Am. 2010 Apr;92(4):814-22.

5 Umpierres CS, Ribeiro TA, Marchisio ÂE, Galvão L, Borges ÍN, Macedo CA, Galia CR. Rehabilitation following total hip arthroplasty evaluation over short follow-up time: randomized clinical trial. J Rehabil Res Dev. 2014;51(10):1567-78.

Note 17. Post-operative exercise therapy following joint replacement for osteoarthritis of the knee

Initial question

Is exercise therapy recommended after joint replacement surgery for knee osteoarthritis?

Complete initial question according to PICO

Are exercise therapy interventions in the post-operative phase (I), compared to no exercise therapy in the post-operative phase (C), recommended for the treatment of people who have undergone joint replacement surgery for knee osteoarthritis (P) to improve their physical functioning (O)?

Search strategy

The KNGF performed a literature search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of post-operative exercise therapy versus no post-operative exercise therapy in patients who have undergone joint replacement surgery for knee osteoarthritis. (tables 17.1 and 17.2)

Table 17.1. Selection criteria of systematic review.

Type of study	RCT's
Type of patient	adults with a clinical diagnosis of osteoarthritis who are undergoing joint replacement surgery for knee osteoarthritis*
Type of intervention	any form of post-operative exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. RCT = randomised controlled trial.*

Table 17.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw] OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"

General search terms#	[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 591 systematic literature studies and 1702 RCTs. The systematic review by Artz et al. forms the basis for answering this initial question.[1] This review included literature up to February 2011 and has a high score on the AMSTAR (8/10). All RCTs from the review were tested according to the selection criteria of the initial question. In addition, we evaluated which additional RCTs from the search met the selection criteria. In total, the literature search resulted in seven RCTs (*n* = 1015).[2-8]

Refer to flow chart 17.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 7 RCTs)

The studies included male and female patients with osteoarthritis of the knee who had undergone unilateral total hip surgery. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In all studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The frequency varied from 1 to 3 times per week (median 2 times per week) and the duration varied from 2 to 12 weeks (median 6 weeks). Follow-up varied from 12 to 52 weeks after the surgery.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes; 7 RCTs; *n* = 1015). The studies had a low risk of bias (RoB) and were, therefore, not down-graded based on design. No down-grading was required for the other components either. Based on GRADE, the quality of the evidence was assessed as "high". (table 17.3)

Table 17.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Artz 2016 [2]	+	+	–	–	+	?	+
Bruun 2014 [3]	+	+	–	–	+	?	+
Fransen 2016 [4]	+	+	–	–	–	?	+
Hepperger 2016 [5]	+	?	–	?	+	?	+
Jakobsen 2015 [6]	+	+	–	+	+	?	+
Liebs 2010 [7]	+	+	–	+	+	+	+
Mitchell 2005 [8]	+	+	–	–	+	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes; 7 RCTs; *n* = 1015). Immediately after the intervention, there is a small effect (SMD = 0.18; 95% CI = 0.03 to 0.33) of post-operative exercise therapy on functioning of patients who had undergone joint replacement surgery for knee osteoarthritis. (table 17.4)

Table 17.4. Evidence table for effectiveness of exercise therapy following joint replacement surgery of the knee.

Number of studies	GRADE					Number of patients		Effect estimated[d]	Quality of the evidence
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
all, *n* = 7	low RoB	no, I^2 = 0%	no	no, *n* = 1015	no	508	507	SMD = 0,18 (95%-BI = 0,03 tot 0,33)	high

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*

1 *Down-grading for inconsistency. SMD = standardized mean difference.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was completed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 17.5)

Table 17.5. Evidence to decision form.

	Oefentherapie postoperatief knie						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea

Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available
Acceptability	not	probably not	probably	yes		varies	no idea
Feasibility	not realistic	probably not realistic	probably realistic	realistic		varies	no idea

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Artz N, Elvers KT, Lowe CM, et al. Effectiveness of physiotherapy exercise following total knee replacement: systematic review and meta-analysis. BMC Musculoskelet. Disord. 2015 Feb 7;16:15.

2 Artz N, Dixon S, Wylde V, Marques E, et al. Comparison of group-based outpatient physiotherapy with usual care after total knee replacement: a feasibility study for a randomized controlled trial. Clin Rehabil. 2017 Apr;31(4):487-99.

3 Bruun-Olsen V, Heiberg KE, Wahl AK, Mengshoel AM. The immediate and long-term effects of a walking-skill program compared to usual physiotherapy care in patients who have undergone total knee arthroplasty (TKA): a randomized controlled trial. Disabil Rehabil. 2013;35(23):2008-15.

4 Fransen M, Nairn L, Bridgett L, et al. Post-acute rehabilitation after total knee replacement: a multicenter randomized clinical trial comparing long-term outcomes. Arthritis Care Res (Hoboken). 2017 Feb;69(2):192-200.

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6 Jakobsen TL, Kehlet H, Husted H, et al. Early progressive strength training to enhance recovery after fast-track total knee arthroplasty: a randomized controlled trial. Arthritis Care Res (Hoboken). 2014 Dec;66(12):1856-66.

7 Liebs TR, Herzberg W, Rüther W, et al. Ergometer cycling after hip or knee replacement surgery: a randomized controlled trial. J Bone Joint Surg Am. 2010 Apr;92(4):814-22.

8 Mitchell C, Walker J, Walters S, et al. Costs and effectiveness of pre- and post-operative home physio-therapy for total knee replacement: randomized controlled trial. J Eval Clin Pract. 2005 Jun;11(3):283-92.

Note 18. FITT principles

FREQUENCY

Complete initial question according to PICO

Is a specific frequency (number of sessions per week) of exercise therapy interventions (I), compared to another frequency of exercise therapy interventions (C), recommended for the treatment of people with osteoarthritis of the hip and/or knee (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the difference in effectiveness of "low frequency" (1x per week), "medium frequency" (2 times per week) and "high frequency" (3 times per week) exercise therapy

in the conservative phase in patients with hip and/or knee osteoarthritis. This search yielded 591 SRs and 1702 RCTs, but did not contain any studies to answer the initial question about frequency.

In the autumn of 2016, the Erasmus Medical Centre (MC) Rotterdam performed a systematic literature study on behalf of the Healthcare Institute of the Netherlands, to evaluate the effectiveness of exercise therapy for hip and/or knee osteoarthritis.[1] This systematic literature study included literature up to August 2016. In consultation with the Erasmus MC and the Healthcare Institute of the Netherlands, the selected studies from this systematic literature study were used for the aforementioned initial question, to perform an additional analysis into the effectiveness of "low frequency" (1x per week), "medium frequency" (2 times per week) and "high frequency" (3 times per week) exercise therapy in the conservative phase in patients with hip and/or knee osteoarthritis.

Literature found
The literature search performed by the Erasmus MC yielded 2420 studies, of which 15 RCTs (*n* = 1402) met the selection criteria for the initial question about conservative exercise therapy for hip osteoarthritis and 52 RCTs (*n* = 6863) about conservative exercise therapy for knee osteoarthritis.[1]

Description of studies (n = 15 RCTs for hip osteoarthritis; n = 52 RCTs for knee osteoarthritis)
All studies with interventions for hip osteoarthritis evaluated exercise therapy at a frequency of 1 to 3 times per week, in which 8 studies offered an intervention at a frequency of 1 time per week, 3 studies had a frequency of 2 times per week and 1 study had a frequency of 3 times per week.[1]
All studies with interventions for knee osteoarthritis evaluated exercise therapy at a frequency of 1 to 3 times per week, in which 15 studies offered an intervention at a frequency of 1 time per week, 11 studies had a frequency of 2 times per week and 21 study had a frequency of 3 times per week.[1]

Quality of the evidence and effectiveness
- Measure of outcome "physical functioning" for hip osteoarthritis (patient-reported outcomes) 15 RCTs; *n* = 1402). Effect estimates (SMD) for "low frequency" exercise therapy immediately after the intervention is -0.23 (95% CI = -0.45 to -0.0), which is lower than the overall effect estimates (-0.32; 95% CI = -0.52 to -0.13). The quality of the evidence is reasonable (down-grading for inconsistency). Effect estimates (SMD) for "medium frequency" exercise therapy immediately after the intervention is -0.63 (95% CI = -1.01 to -0.24), which is higher than the overall effect estimates (-0.32; 95% CI = -0.52 to -0.13). The quality of the evidence is low (down-grading for inconsistency and inaccuracy).
- Measure of outcome "physical functioning" for knee osteoarthritis (patient-reported outcomes; 52 RCTs; *n* = 6863). Effect estimates (SMD) for "low frequency" exercise therapy immediately after the intervention is -0.39 (95% CI = -0.64 to -0.13), which is lower than the overall effect estimates. The quality of the evidence is reasonable (down-grading for inconsistency). The effect estimates (SMD) for "medium frequency" exercise therapy immediately after the intervention is -0.44 (95% CI = -0.61 to -0.26), which corresponds to the overall effect estimates of -0.48 (95% CI = -0.61 to -0.33). The quality of the evidence is high. Effect estimates (SMD) for "high frequency" exercise therapy immediately after the intervention is -0.56 (95% CI = -0.75 to -0.37), which is higher than the overall effect estimates (-0.48; 95% CI = -0.61 to -0.33). The quality of the evidence is reasonable (down-grading for inconsistency).

Other considerations
Additional sources were used to formulate the recommendation about the frequency of exercise therapy, namely: the "ACSM's Guidelines for Exercise Testing and Prescription" by the American College of Sports Medicine (ACSM)[2] and the "Exercise Guideline 2017"[3] by the Health Council of the Netherlands, regarding the minimum frequency for exercises performed by the patient.

The ACSM recommends the following minimum training frequency specifically for people with rheumatic disorders:
- at least 2-3 days per week muscle strengthening exercises;
- at least 5 days per week aerobic exercises lasting at least 30 minutes per session.

The Dutch Health Council recommends the following training frequency for adults and elderly:
- muscle and bone strengthening activities at least twice per week, combined with balance exercises for the elderly;
- at least 150 minutes per week of moderately intensive exercise, spread over several days.

INTENSITY

Complete initial question according to PICO

Is a specific intensity (e.g. high intensity) of exercise therapy interventions (I), compared to another intensity (e.g. low to moderate intensity) of exercise therapy interventions (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the difference in effectiveness of high intensity and low to moderate intensity exercise therapy interventions in the conservative phase in patients with hip and/or knee osteoarthritis. The literature search yielded 591 SRs and 1702 RCTs.

Literature found

Only the SR by Regnaux et al. met the selection criteria.[4] The working group decided to use the results from this review to answer the initial question. The review includes literature up to June 2014.[4] None of the six RCTs met the selection criteria with regard to the effectiveness of the interventions for hip osteoarthritis. Two RCTs (n = 113) met the selection criteria with regard to the effectiveness of the interventions for knee osteoarthritis.[5,6]

Description of studies (n = 2 RCTs)

The studies include male and female patients with osteoarthritis of the knee. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In both studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist, at a frequency of 3 sessions per week, for 8 to 24 weeks. The study by Jan et al. compared exercise therapy at an intensity of 60% of the 1RM with a progression of 5% per 2 weeks with 3 sets of 8 repetitions per exercise, to exercise therapy at an intensity of 10% of the 1RM with a progression of 5% per 2 weeks with 10 sets of 15 repetitions per exercise.[5] The study by Foroughi et al. compared exercise therapy at an intensity of 80% of the maximum individual muscle strength with a progression in resistance of 3% per session to exercise therapy using minimal resistance without progression.[6]

Quality of the evidence and effectiveness

Measure of outcome "physical functioning" for knee osteoarthritis (patient-reported outcomes; 2 RCTs; n = 113). There was no significant difference in effect (SMD = 0.18 (95% CI = -0.19 to 0.55)) between high intensity and low to moderate intensity exercise therapy interventions immediately after the intervention. The quality of the evidence is low (down-grading for design and inaccuracy).

Other considerations

An additional source was used to formulate the recommendation with regard to intensity of exercise therapy. As no evidence was found regarding the optimum intensity of exercise therapy, the working group decided to adopt the minimum training intensity from the American College of Sports Medicine (ACSM):[2]

- muscle strength training: 60-80% of 1RM (BORG score 14-17) (or 50-60% of 1RM (BORG score 12-13) for people who are not used to strength training), with 2-4 sets of 8-15 repetitions with a 30-60 second rest between the sets;
- aerobic training: > 60% of maximum heart rate (BORG score 14-17) (or 40-60% of the maximum heart rate (BORG score 12-13) for people who are not used to aerobic training).

TYPE

Complete initial question according to PICO

Is a specific type (e.g. muscle strength training, aerobic training) of exercise therapy interventions (I), compared to another type of exercise therapy interventions (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic literature studies; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of a specific type of

exercise (e.g. muscle strength training, aerobic training) for hip and/or knee osteoarthritis. This yielded 591 SRs and 1702 RCTs, but only the SR by Juhl et al. met the selection criteria for knee osteoarthritis, but not for hip osteoarthritis.[7] However, the working group decided to use the results from this review to answer this initial question for both hip and knee osteoarthritis.

Literature found
The review by Juhl et al. consisted of 35 RCTs (*n* = 2732) with physical functioning as the measure of outcome.[7]

Description of studies (n = 35 RCTs)
The studies include male and female patients with osteoarthritis of the knee. All studies evaluated exercise therapy consisting of exercises aimed at improving muscle strength (muscle strength training), stamina (aerobic training) or functional activities of the leg (functional training), or a combination of these exercises. The duration of the interventions varied from 4 to 18 times per week, at a frequency of 1 to 5 times per week.

Quality of the evidence and effectiveness
Measure of outcome "physical functioning" (patient-reported outcomes; 35 RCTs; *n* = 2732). The pooled effect estimate (SMD) for exercise therapy (irrespective of type) immediately after the intervention was 0.49 (95% CI = 0.35 to 0.63). In the stratified analyses, the effect estimate (SMD) was 0.60 for exercise therapy with muscle strength training, 0.56 for exercise therapy with aerobic training and 0.56 for exercise therapy with functional training, but there was no significant difference in effect between these types of exercise therapy (*p* = 0.968). If the exercise therapy primarily (>75% of the treatment time) focused on 1 type of training (muscle strength, stamina or functional activities) within a treatment session, then the effect estimate was significantly higher than if the exercise therapy consisted of two or more types of training per treatment session (SMD = 0.58 (95% CI = 0.40 to 0.75) versus SMD = 0.22 (95% CI = 0.08 to 0.37); *p* = 0.002). The quality of the evidence could not be determined, because an existing review was used.

Other cconsiderations
Several additional sources were used to formulate the recommendation with regard to type of exercise therapy. The consideration for use of active "range of motion" or muscle stretching exercises was formulated based on the ACSM Guideline.[2] In addition, modifications to the type of exercise therapy in the pre-operative and post-operative phase were formulated based on a study by Westby et al.[8]

TIME DURATION

Complete initial question according to PICO

Is a specific duration (e.g. short-term (up to 12 weeks), long-term (more than 12 weeks)) of exercise therapy interventions (I), compared to other durations of exercise therapy interventions (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (0)?

Search strategy
The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of a specific type of exercises (e.g. muscle strength training, aerobic training) for patients with hip and/or knee osteoarthritis. This search yielded 591 SRs and 1702 RCTs, but did not contain any studies to answer the initial question about duration.

In the autumn of 2016, the Erasmus Medical Centre (MC) Rotterdam performed a systematic literature study on behalf of the Healthcare Institute of the Netherlands, to evaluate the effectiveness of exercise therapy for hip and/or knee osteoarthritis.[1] The research questions of this systematic literature study included the sub-question relating to differences in effectiveness between short-term (up to 12 weeks) and long-term (more than 12 weeks) training interventions for hip osteoarthritis. In consultation with the Erasmus MC Rotterdam and the Healthcare Institute of the Netherlands, the collected results were adopted in full in the answering of this initial question. The systematic literature review by the Erasmus MC included studies up to August 2016.

Literature found
The literature search performed by the Erasmus MC yielded 2420 studies, of which 15 RCTs (*n* = 1402) met the selection criteria for the initial question relating to hip osteoarthritis and 52 RCTs (*n* = 6863) met the selection criteria for the initial question relating to knee osteoarthritis.[1]

Description of studies (n = 15 RCTs for hip osteoarthritis; n = 52 RCTs for knee osteoarthritis)
The studies include male and female patients with osteoarthritis of the hip. The exercise therapy interventions consisted of a combination of exercises aimed at improving mobility, muscle strength and/or stamina. In one study, the patients received "water-based" exercise therapy (group intervention supervised by a physical therapist) lasting 30 minutes per session, two times a week for five weeks. In all other studies, the intervention consisted of "land-based" exercise therapy supervised by a physical therapist. The sessions varied in duration from 30 to 90 minutes (median 60 minutes), the frequency varied from one to three times per week (median one time per week) and the duration varied from six to twelve weeks (median eight weeks).
Follow-up varied from 1 to 24 months.
All studies involving patients with hip osteoarthritis evaluated exercise therapy with a duration of 5 to 12 weeks (median 8 weeks). All studies involving patients with knee osteoarthritis evaluated exercise therapy with a duration of 2 to 52 weeks (median 12 weeks), with 6 studies where the intervention lasted longer than 12 weeks. As the measurement points of these latter studies varied over time, it is not possible to make any statements about the effectiveness of long-term training interventions.

Quality of the evidence and effectiveness
- Measure of outcome "physical functioning" for hip osteoarthritis (patient-reported outcomes; 15 RCTs; *n* = 1402). The quality of the evidence immediately after the intervention is reasonable (down-grading for inconsistency) for a moderate effect of exercise therapy on functioning of patients with hip osteoarthritis (SMD = -0.32; 95% CI = -0.52 to -0.13). The quality of the evidence after six months is high, for a slight effect of exercise therapy (SMD = -0.28; 95% CI = -0.45 to -0.10).
- Measure of outcome "physical functioning" for knee osteoarthritis (patient-reported outcomes; 52 RCTs; *n* = 6863). A reasonable to large statistically significant effect of short-term exercise therapy is observed at all measurement points. The quality of the evidence immediately after the intervention is low (down-grading for design and inconsistency) for a large effect of short-term exercise therapy (SMD = -0.51; 95% CI = -0.65 to -0.38) and the quality of the evidence after six months is reasonable (down-grading for design) for a slight effect (SMD = -0.28; 95% CI = -0.42 to -0.14).

GENERAL

Other findings from the literature research regarding the use of exercise therapy for people with osteoarthritis of the hip and/or knee are:
- Both land-based and water-based exercise therapy are effective interventions for improving the physical functioning of patients with osteoarthritis of the hip and/or knee.[1]
- Both individual and group exercise therapy are effective interventions for improving the physical functioning of patients with osteoarthritis of the hip and/or knee.[1]
- Both completely supervised and partially supervised exercise therapy are effective interventions for improving the physical functioning of patients with osteoarthritis of the hip and/or knee.[1]
- The effect of exercise therapy for people with knee osteoarthritis appears not to be affected by the severity of the joint damage, age, gender, body mass index, alignment and pain.[7]

Sources
1 Verhagen A, Reijneveld-van de Vendel E, Teirlinck CH, et al. Effectiviteit oefentherapie voor patiënten met heup- of knieartrose. (Effectiveness of exercise therapy for patients with hip or knee osteoarthritis) Final report of the Healthcare Institute of the Netherlands. 2016
2 American College of Sports Medicine. ACSM's Guidelines for exercise testing and prescription. 10th edition. Philadelphia (PA): Wolters Kluwer Health 2018.
3 Exercise guidelines 2017. Available via: https://www.gezondheidsraad.nl/sites/default/files/grpublication/samenvatting_beweegrichtlijnen_2017.pdf.
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7 Juhl C, Christensen R, Roos EM, et al. Impact of exercise type and dose on pain and disability in knee osteoarthritis: a systematic review and meta-regression analysis of randomized controlled trials. Arthritis Rheumatol. 2014;66(3):622-36.
8 Westby MD, Marshall DA, Jones CA. Development of Quality Indicators for Hip and Knee Arthroplasty Rehabilitation. Osteoarthritis Cartilage. 2018 Mar;26(3):370-382. Epub ahead of print 30 December 2017.

Note 19. Modifications to exercise therapy due to co-morbidity

Initial question

Which modifications to the exercise therapy are recommended for patients with hip or knee osteoarthritis if they have one ore more forms of co-morbidity that affect their physical functioning?

Complete initial question according to PICO

Which modifications to the frequency, intensity, type, duration and form of exercise therapy interventions (I) are recommended for patients with hip or knee osteoarthritis if they suffer from co-morbidity (P), in order to improve their physical functioning (O)?

Search strategy

The KNGF performed a literature search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic literature studies) and randomised controlled trials (RCTs) relating to the required modifications of exercise therapy due to co-morbidity in patients with hip and knee osteoarthritis (from 2008). (tables 19.1 and 19.2)

Table 19.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis and co-morbidity*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form)
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 19.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR "stretching"[tw] OR "Exercise Therapy"[Mesh] OR "exercise therapy"[tw] OR exercise therap*[tw] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Muscle Stretching Exercises"[tw] OR "Muscle Stretching Exercise"[tw] OR "Static Stretching"[tw] OR "Passive Stretching"[tw] OR "Static-Passive Stretching"[tw] OR "Static Passive Stretching"[tw] OR "Isometric Stretching"[tw] OR "Active Stretching"[tw] OR "Static-Active Stretching"[tw] OR "Static Active Stretching"[tw] OR "Ballistic Stretching"[tw] OR "Dynamic Stretching"[tw] OR "PNF Stretching"[tw] OR "Plyometric Exercise"[tw] OR "Plyometric Exercises"[tw] OR Plyometric Drill*[tw] OR "Plyometric Drills"[tw] OR "Plyometric Training"[tw] OR "Plyometric Trainings"[tw] OR "Stretch-Shortening Exercise"[tw] OR "Stretch Shortening Exercise"[tw] OR "Stretch-Shortening Exercises"[tw] OR "Stretch-Shortening"[tw] OR "Stretch Shortening"[tw] OR "Stretch-Shortening Drills"[tw] OR "Stretch-Shortening Cycle Exercise"[tw] OR "Stretch Shortening Cycle Exercise"[tw] OR "Stretch-Shortening Cycle Exercises"[tw] OR "Resistance Training"[tw] OR "Strength Training"[tw] OR "Weight-Lifting"[tw] OR "Weight Lifting"[tw] OR "Weight-Bearing"[tw] OR "Weight Bearing"[tw] OR "Exercise"[Mesh] OR "Exercise"[tw] OR "Exercises"[tw] OR "Physical Exercise"[tw] OR "Physical Exercises"[tw] OR "Isometric Exercises"[tw] OR "Isometric Exercise"[tw] OR "Aerobic Exercises"[tw] OR "Aerobic Exercise"[tw] OR "Circuit-Based Exercise"[tw] OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR

General search terms#	"Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques"[Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 591 systematic reviews and 1702 RCTs. This search did not yield any systematic reviews that focussed specifically on the required modifications of exercise therapy due to co-morbidity. However, three RCTs were found that met the selection criteria for the initial question.[1-3]

Refer to flow chart 19.1 for a total overview of the systematic literature study (appendix).

Description of studies

- de Rooij et al., 2017.[1] The RCT was performed in the Netherlands. The study included 126 patients with knee osteoarthritis and co-morbidity. The inclusion criteria for co-morbidity include the presence of one of the following conditions: cardiovascular disease, heart failure, diabetes mellitus type 2, chronic obstructive pulmonary disease (COPD) or obesity. The patients were randomly assigned to two groups: one group received exercise therapy (n = 63) with the exercises adjusted systematically according to the nature and severity of the co-morbidity and the other group received a standard treatment for osteoarthritis and the co-morbidity (n = 63). Follow-up: 32 weeks.
- Schlenk et al., 2011.[2] The RCT was performed in the United States. The study included 26 patients with knee osteoarthritis and obesity. The patients were randomly assigned to two groups: one group received exercise therapy and coaching for an active lifestyle (n = 13) and the other group received standard care (n = 13). Follow-up: 24 weeks.
- Lim et al., 2010.[3] The RCT was performed in Korea. The study included 75 patients with knee osteoarthritis and excess weight / obesity (BMI > 25 kg/m2). The patients were randomly assigned to three groups: one group received water-based exercise therapy (n = 26), another group received land-based exercise therapy (n = 25) and the other group received standard care (n = 24). Follow-up: 8 weeks.

Quality of the evidence

Measure of outcome 'physical functioning' (patient-reported outcomes). Virtually all studies have a low RoB and were, therefore, not down-graded based on design. Inconsistency was not applicable and did not require down-grading. The degree of indirectness is not known, because de Rooij et al. included various co-morbidities and Schlenk et al. and Lim et al. focused specifically on obesity; down-grading was performed for this. Inaccuracy does apply, due to the small number of participants (n = 227). The quality of the evidence is low. (table 19.3)

Table 19.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
de Rooij et al., 2017 [1]	+	+	-	-	+	?	+
Schlenk et al., 2011 [2]	+	+	-	-	+	?	+
Lim et al., 2010 [3]	+	+	-	-	+	?	+

Effectiveness

Measure of outcome 'physical functioning' (patient-reported outcomes). De Rooij et al. revealed a significant difference in effect on physical functioning between the intervention and control groups. The intervention was also found to be safe (no adverse events). De Rooij et al. is the only included study that compared an adjusted protocol for exercise therapy to standard care and therefore gives the most pure answer to this initial question. [1] (table 19.4)

The studies by Schlenk et al. and Lim et al. both focused specifically on the obese patient population with knee osteoarthritis and found no significant difference in effect on physical functioning between the intervention and control groups.[2,3] These studies demonstrate that exercise therapy is feasible for obese patients with knee osteoarthritis and that exercise therapy improves the physical functioning over time. (table 19.4)

Table 19.4. Evidence table for effectiveness of exercise therapy for osteoarthritis of the hip and/or knee and co-morbidity

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Outcome QALY							
3, *n = 227*	low RoB	no	yes	*yes, n = 227*	no	De Rooij et al. demonstrated a significant difference in effect on physical functioning between the intervention and control groups.[1] The studies by Schlenk et al.[2] and Lim et al.[3] both focused specifically on the obese patient population with knee osteoarthritis and found no significant difference in effect on physical functioning between the intervention and control groups. [2,3]	low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b** I^2 > 40%;* ***c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d** Positive: effect is in favour of exercise therapy.*

***1** Down-grading for indirectness and inaccuracy.*

Sources

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2 Schlenk EA, Lias JL, Sereika SM, et al. Improving physical activity and function in overweight and obese older adults with osteoarthritis of the knee: a feasibility study. Rehabil Nurs. 2011;36(1):32-42.
3 Lim JY, Tchai E, Jang SN, et al. Effectiveness of aquatic exercise for obese patients with knee osteoarthritis: a randomized controlled trial. PM R. 2010;2(8):723-31; quiz 793.
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Note 20. Modifications to exercise therapy due to inadequate pain coping

Initial question

Which modifications to the exercise therapy are recommended for patients with hip or knee osteoarthritis if they have inadequate pain coping?

Search strategy

The KNGF performed a search on 19 December 2016 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the required modifications to the exercise therapy due to inadequate pain coping in patients with hip and knee osteoarthritis (from 2008). (tables 20.1 and 20.2)

Table 20.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis (and inadequate pain coping)*
Type of intervention	any form of exercise therapy (irrespective of frequency, intensity, type, duration and form) that specifically takes inadequate pain coping into consideration
Types of comparisons	no exercise therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 20.2. Search terms.

Search date	19 December 2016
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (exercis*[tw] OR “stretching”[tw] OR “Exercise Therapy”[Mesh] OR “exercise therapy”[tw] OR exercise therap*[tw] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Muscle Stretching Exercises”[tw] OR “Muscle Stretching Exercise”[tw] OR “Static Stretching”[tw] OR “Passive Stretching”[tw] OR “Static-Passive Stretching”[tw] OR “Static Passive Stretching”[tw] OR “Isometric Stretching”[tw] OR “Active Stretching”[tw] OR “Static-Active Stretching”[tw] OR “Static Active Stretching”[tw] OR “Ballistic Stretching”[tw] OR “Dynamic Stretching”[tw] OR “PNF Stretching”[tw] OR “Plyometric Exercise”[tw] OR “Plyometric Exercises”[tw] OR Plyometric Drill*[tw] OR “Plyometric Drills”[tw] OR “Plyometric Training”[tw] OR “Plyometric Trainings”[tw] OR “Stretch-Shortening Exercise”[tw] OR “Stretch Shortening Exercise”[tw] OR “Stretch-Shortening Exercises”[tw] OR “Stretch-Shortening”[tw] OR “Stretch Shortening”[tw] OR “Stretch-Shortening Drills”[tw] OR “Stretch-Shortening Cycle Exercise”[tw] OR “Stretch Shortening Cycle Exercise”[tw] OR “Stretch-Shortening Cycle Exercises”[tw] OR “Resistance Training”[tw] OR “Strength Training”[tw] OR “Weight-Lifting”[tw] OR “Weight Lifting”[tw] OR “Weight-Bearing”[tw] OR “Weight Bearing”[tw] OR “Exercise”[Mesh] OR “Exercise”[tw] OR “Exercises”[tw] OR “Physical Exercise”[tw] OR “Physical Exercises”[tw] OR “Isometric Exercises”[tw] OR “Isometric Exercise”[tw OR “Aerobic Exercises”[tw] OR “Aerobic Exercise”[tw] OR “Circuit-Based Exercise”[tw]

General search terms#	OR "Cool-Down Exercise"[tw] OR "Cool-Down Exercises"[tw] OR "Physical Conditioning"[tw] OR "Running"[tw] OR "Jogging"[tw] OR "Swimming"[tw] OR "Walking"[tw] OR "Warm-Up Exercise"[tw] OR "Warm-Up Exercises"[tw] OR "Physical Exertion"[Mesh] OR "Physical Exertion"[tw] OR "Physical Effort"[tw] OR "Physical Efforts"[tw] OR "Physical Fitness"[Mesh] OR "Physical Fitness"[tw] OR "Physical Endurance"[mesh] OR "Physical Endurance"[tw] OR "Anaerobic Threshold"[tw] OR "Exercise Tolerance"[tw] OR "Exercise Movement Techniques" [Mesh] OR "Exercise Movement"[tw] OR "Bicycling"[tw] OR "Walking"[tw] OR "Motor Activity"[Mesh] OR "Physical Activity"[tw] OR exertion*[tw] OR run*[tw] OR jog*[tw] OR treadmill*[tw] OR swim*[tw] OR bicycl*[tw] OR cycle*[tw] OR cycling[tw] OR walk*[tw] OR row[tw] OR rows[tw] OR rowing[tw] OR muscle strength*[tw]) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

This search yielded 591 SRs and 1702 RCTs, but none of the SRs focused specifically on the required modifications to the exercise therapy due to inadequate pain coping. However, we did find two RCTs that met the selection criteria for the initial question.[1,2] Although these RCTs did not specifically select patients with inadequate pain coping, we decided to use these studies to answer this initial question, due to the content of the examined intervention.

Refer to flow chart 20.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Bennell et al., 2016.[1] The RCT was performed in Australia. The study included 222 patients with knee osteoarthritis. The patients were randomly assigned to three groups: one group received exercise therapy supplemented with pain education and training in cognitive and behavioural pain coping skills (*n* = 73), one group received exercise therapy only (*n* = 75) and one group received only pain education and coaching about coping with pain (*n* = 63). Follow-up: 52 weeks.
- Hunt et al., 2013.[2] This pilot RCT was performed in Canada. The study included 20 patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received exercise therapy supplemented with pain education and training in cognitive and behavioural pain coping skills (*n* = 10) and one group received exercise therapy only (*n* = 10). Follow-up: 52 weeks.

Quality of the evidence

Measure of outcome 'physical functioning' (patient-reported outcomes). Both studies have a low RoB and were, therefore, not down-graded based on design. Inconsistency and indirectness were not applicable and did not require down-grading. Inaccuracy does apply, due to the small number of participants (*n* = 242). The quality of the evidence is reasonable. (table 20.3)

Table 20.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Bennell et al., 2016 [1]	+	+	-	-	+	?	+
Hunt et al., 2013 [2]	+	+	-	-	+	?	+

Effectiveness

Measure of outcome 'physical functioning' (patient-reported outcomes). Bennell et al. demonstrated that the combined intervention had a significantly greater effect on the physical functioning of patients with knee osteoarthritis (n = 222), compared to the mono-oriented interventions (i.e., exercise therapy only or pain education and pain coping training only).[1] The secondary measures of outcome (including pain, quality of life and psychological measures of outcome such as pain coping, catastrophization, self-efficacy, depression and anxiety) also revealed added value of the combined intervention. (table 20.4) Hunt et al. demonstrated that the combined intervention with exercise therapy and pain coping training did not have a significantly greater effect on the physical functioning of patients with knee osteoarthritis in combination with chronic pain symptoms (n = 20) compared to the mono-oriented intervention consisting of exercise therapy alone.[2] However, the study by Hunt et al. included very few patients and was also set up as a pilot study. (table 20.4)

Table 20.4. Evidence table for effectiveness of exercise therapy for osteoarthritis of the hip and/or knee and inadequate pain coping.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Outcome QALY							
2, n = 242	low RoB	no	no	yes, n = 242	no	Bennell et al. demonstrated that a combined intervention, consisting of exercise therapy and pain coping training, had a significantly greater effect on the physical functioning of patients with knee osteoarthritis and chronic pain symptoms (n = 222), than the mono-oriented interventions (i.e., exercise therapy only or pain coping training only).[1] Hunt et al. demonstrated that a combined intervention, consisting of exercise therapy and pain coping training, did not have a significantly greater effect on the physical functioning of patients with knee osteoarthritis and chronic pain symptoms (n = 20), than the mono-oriented interventions with exercise therapy only.[2]	reasonable[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for inaccuracy.*

Sources

1 Bennell KL, Ahamed Y, Jull G, et al. Physical therapist-delivered pain coping skills training and exercise for knee osteoarthritis: randomized controlled trial. Arthritis Care Res (Hoboken). 2016;68(5):590-602.
2 Hunt MA, Keefe FJ, Bryant C, et al. A physiotherapist-delivered, combined exercise and pain coping skills training intervention for individuals with knee osteoarthritis: a pilot study. Knee. 2013;20(2):106-12.

Note 21. General considerations for recommendations regarding non-exercise therapeutic interventions

- Summary of results of literature study: The literature about the effectiveness of the various non-exercise therapy interventions is generally limited (low to very low quality of evidence) and mostly shows that

there is no to little effect compared to a treatment without this intervention or in comparison to exercise therapy.

- Balance between desired and undesirable effects: The desired effects (such as reduction of symptoms, improvement in daily functioning) are unclear, whilst the undesirable effects (such as a worsening of symptoms) - if reported - appear to be rare and not very severe. Based on this, the working group estimates that the desired effects and the undesirable effects are probably equal.
- Values and preferences of patients: The values and preferences will probably differ between patients. The working group estimates that the majority of the patients are not positive about the majority of non-exercise therapy interventions, due to a lack of perceived effect on the symptoms and on daily functioning.
- Costs: Equipment is required for most non-exercise therapy interventions, resulting in purchasing and maintenance costs for the physical therapist/exercise therapist. There are no cost-effectiveness analyses for any of the non-exercise therapy interventions.
- Acceptability/feasibility: According to the GRADE method, this is only applicable if there are arguments to support a positive recommendation. This is not the case for any of the non-exercise therapy interventions.

Note 22. Massage

Initial question

Is massage therapy recommended in addition to the exercise therapy intervention for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is massage therapy (I), compared to no treatment with massage therapy (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of massage therapy with regard to physical functioning in patients with hip and knee osteoarthritis. (tables 22.1 and 22.2)

Table 22.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of massage therapy
Types of comparisons	no massage therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 22.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND ("Motion Therapy, Continuous Passive"[Mesh] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Passive Stretching"[tw] OR "PNF Stretching"[tw] OR "musculoskeletal manipulations"[Mesh] OR "musculoskeletal manipulations"[tw] OR "Applied Kinesiology"[tw] OR "Chiropractic Manipulation"[tw] OR "Osteopathic Manipulation"[tw] OR "Soft Tissue Therapy"[tw] OR "Acupressure"[tw] OR "Massage"

General search terms#	[Mesh] OR "massage"[tw] OR massag*[tw] OR "Zone Therapy"[tw] OR "Reflexology"[tw] OR "Rolfing"[tw] OR "Bodywork"[tw] OR Bodywork*[tw] OR "Electric stimulation therapy"[Mesh:NoExp] OR "electric stimulation therapy"[tw] OR "electrical stimulation therapy"[tw] OR "therapeutic electric stimulation"[tw] OR "therapeutic electrical stimulation"[tw] OR "electrotherapy"[tw] OR electrotherap*[tw] OR "interferential current electrotherapy"[tw] OR "electrical stimulation"[tw] OR "electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation"[Mesh:NoExp] OR "TENS"[tw] OR "transcutaneous electric nerve stimulation"[tw] OR "Ultrasonic Therapy"[Mesh] OR "therapeutic ultrasound"[tw] OR ultrasound therap*[tw] OR "ultrasonic therapy"[tw] OR "electromagnetic therapy"[tw] OR "Electromagnetic Radiation/therapeutic use"[Mesh] OR "Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "IIIt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to non-exercise therapy interventions, including massage therapy, for patients with hip and knee osteoarthritis yielded 478 systematic literature studies and 1157 RCTs.

The systematic review by Bervoets et al. forms the basis for answering this initial question.[1] This review included literature up to October 2014 and has a good score on the AMSTAR (8/10). Ultimately, two RCTs (n = 193) from the review met the selection criteria for the initial question.[2,3] An additional search in all the originally found RCTs did not reveal any other RCTs that met the selection criteria.

Refer to flow chart 22.1 for a total overview of the systematic literature study (appendix).

In order to formulate the recommendation regarding this initial question based on the correct argumentation, for this specific intervention and at the request of the working group, pain was added as a secondary measure of outcome. Therefore, an additional narrative evaluation (without weighing of the evidence) was performed for the included systematic review into the effect of massage on the measure of outcome "pain".

Description of studies

- Perlman et al., 2011.[2] The RCT was performed in the United States. The study included 125 male and female patients with knee osteoarthritis. The patients were randomly assigned to four groups (n = 25). Three groups received massage therapy (30 or 60 minutes, weekly or fortnightly) in addition to the exercise therapy and one group received exercise therapy only (n = 63). The massage therapy consisted of massage (i.e., stroking, kneading, friction, vibration and tapping) of the lower and upper extremity, with emphasis on the lower extremity. Follow-up: 24 weeks.
- Perlman et al., 2006.[3] The RCT was performed in the United States. The study included 68 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received exercise therapy supplemented with massage therapy (30 or 60 minutes, weekly or fortnightly) (n = 34) and one group received exercise therapy only (n = 34). The massage therapy consisted of massage (i.e., stroking, kneading, friction, vibration and tapping) of the lower and upper extremity, with emphasis on the lower extremity. Follow-up: 16 weeks.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing massage therapy plus exercise therapy versus exercise therapy only: Both studies have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy does apply, due to the small number of participants in total (n = 118). There appears to be a real risk of publication bias and the study was therefore down-graded for this. Based on GRADE, the quality of the evidence was assessed as "very low". (table 22.3)

Table 22.3 Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Abbott et al., 2013 [2]	+	+	-	-	?	?	+
Bieler et al., 2016 [3]	+	+	-	-	?	?	+

Effectiveness

- Measure of outcome "physical functioning" (patient-reported outcomes) when comparing massage therapy plus exercise therapy to exercise therapy only. Both Perlman et al. and Perlman et al. demonstrated that there is a small difference in effect regarding physical functioning, in favour of massage therapy plus exercise therapy compared to exercise therapy only.[2,3] (table 22.4)
- Measure of outcome "pain" (patient-reported outcomes) when comparing massage therapy plus exercise therapy to exercise therapy only. The SR by Bervoets et al., which formed the foundation for answering the initial question with physical functioning as a measure of outcome, concluded that - for patients with knee osteoarthritis - massage therapy may also have an effect on pain.[1] (table 22.4)

Table 22.4. Evidence table for effectiveness of massage therapy for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		

Outcome QALY							
2, *n* = 118	reasonable RoB	no	no	yes, *n* = 193	yes	Both studies, Perlman et al.[2] and Perlman et al.[3], reveal a significant difference in effect on physical functioning in favour of massage therapy plus exercise therapy compared to exercise therapy only.	very low[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for inaccuracy and publication bias*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 22.5)

Table 22.5 Evidence to decision form.

	Massage						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Bervoets DC, Luijsterburg PA, Alessie JJ, et al. Massage therapy has short-term benefits for people with common musculoskeletal disorders compared to no treatment: a systematic review. J Physiother. 2015;61(3):106-16.

2 Perlman AI, Ali A, Njike VY, et al. Massage therapy for osteoarthritis of the knee: a randomized dose-finding trial. PLoS One. 2012;7(2):e30248.

3 Perlman AI, Sabina A, Williams AL, et al. Massage therapy for osteoarthritis of the knee: a randomized controlled trial. Arch Intern Med. 2006;166(22):2533-8.

Note 23. TENS

Initial question

Is treatment with TENS recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with TENS (I), compared to no treatment with TENS (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with transcutaneous electrical nerve stimulation (TENS) in patients with hip and knee osteoarthritis. (tables 23.1 and 23.2)

Table 23.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with TENS
Types of comparisons	no treatment with TENS
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 23.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND ("Motion Therapy, Continuous Passive"[Mesh] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Passive Stretching"[tw] OR "PNF Stretching"[tw] OR "musculoskeletal manipulations"[Mesh] OR "musculoskeletal manipulations"[tw]

General search terms#	OR "Applied Kinesiology"[tw] OR "Chiropractic Manipulation"[tw] OR "Osteopathic Manipulation"[tw] OR "Soft Tissue Therapy"[tw] OR "Acupressure"[tw] OR "Massage"[Mesh] OR "massage"[tw] OR massag*[tw] OR "Zone Therapy"[tw] OR "Reflexology"[tw] OR "Rolfing"[tw] OR "Bodywork"[tw] OR Bodywork*[tw] OR "Electric stimulation therapy"[Mesh:NoExp] OR "electric stimulation therapy"[tw] OR "electrical stimulation therapy"[tw] OR "therapeutic electric stimulation"[tw] OR "therapeutic electrical stimulation"[tw] OR "electrotherapy"[tw] OR electrotherap*[tw] OR "interferential current electrotherapy"[tw] OR "electrical stimulation"[tw] OR "electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation" OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "lllt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))
# For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.	

Literature found

The literature search relating to non-exercise therapy interventions, including treatment with TENS, for patients with hip and knee osteoarthritis yielded 478 systematic literature studies and 1157 RCTs.

The SR by Chen et al. forms the basis for answering this initial question.[1] This review included literature up to June 2014 and has a good score on the AMSTAR (10/10). The KNGF complemented the review by Chen et al. by performing a search for RCTs up to 14 August 2017. Ultimately, two RCTs (n = 193) met the selection criteria for the initial question.[2,3]

Refer to flow chart 23.1 for a total overview of the systematic literature study (appendix).

In order to formulate the recommendation regarding this initial question based on the correct argumentation, for this specific intervention and at the request of the working group, pain was added as a secondary measure of outcome.

An additional narrative evaluation (without weighing of the evidence) was performed for the included systematic review into the effect of TENS on the measure of outcome "pain".[1]

Description of studies

- Palmer et al., 2014.[2] The RCT was performed in the United Kingdom. The study included 224 male and female patients with knee osteoarthritis. The patients were randomly assigned to three groups: one group received TENS (110 Hz) in addition to exercise therapy (n = 73), one group received placebo TENS in addition to exercise therapy (n = 74) and one group received exercise therapy only (n = 77). The interventions lasted 6 weeks. The frequency of the treatment with TENS in the home situation was determined by the patient. Follow-up: 24 weeks.

- Law, 2004.[3] The RCT was performed in China. The study included 39 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received TENS (100 Hz) (*n* = 22) and one group received placebo TENS (*n* = 17). The sessions lasted 40 minutes and took place five times per week for two weeks. Follow-up: 2 weeks.

Quality of the evidence

- Measure of outcome "physical functioning" (patient-reported outcomes) when comparing TENS plus exercise therapy to exercise therapy only. The study by Palmer et al. has a reasonable RoB; so down-grading was performed based on design.[2] Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (*n* = 224). There appears to be a real risk of publication bias and the study was therefore down-graded for this. Based on GRADE, the quality of the evidence was assessed as "very low". (table 23.3)
- Measure of outcome "physical functioning" (patient-reported outcomes) comparing TENS to no TENS: The study by Law et al. has a reasonable RoB; so down-grading was performed based on design.[3] Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (*n* = 39). There appears to be a real risk of publication bias and the study was therefore down-graded for this. Based on GRADE, the quality of the evidence was assessed as "very low". (table 23.3)

Table 23.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Palmer et al., 2014 [2]	+	+	-	-	?	?	+
Law et al., 2004 [3]	+	+	-	-	?	?	+

Effectiveness

- Measure of outcome "physical functioning" (patient-reported outcomes). Both studies revealed no difference in effect on physical functioning between the intervention and control groups.[2,3] (table 23.4)
- Measure of outcome "pain" (based on previously included literature). The SR by Chen et al., which formed the foundation for answering the initial question with physical functioning as a measure of outcome, concluded that - for patients with knee osteoarthritis - TENS may have an effect on pain compared to no TENS.[1] (table 23.4)

Table 23.4. Evidence table for effectiveness of TENS for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Outcome QALY							
1, *n* = 224	reasonable RoB	no	no	yes, *n* = 224	yes	Palmer et al. revealed no significant difference in effect on physical functioning for treatment with TENS as a supplement to exercise therapy.[2]	very low[1]
1, *n* = 39	reasonable RoB	no	no	yes, *n* = 39	yes	Law et al. revealed no significant difference in effect on physical functioning for treatment with TENS.[3]	very low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*
***1** Down-grading for design, inaccuracy and publication bias.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 23.5)

Table 23.5 Evidence to decision form.

	TENS						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available
Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion	

Sources

1 Chen LX, Zhou ZR, Li YL, et al. Transcutaneous electrical nerve stimulation in patients with knee osteoarthritis: evidence rom randomized-controlled trials. Clin J Pain. 2016;32(2):146-54.

2 Palmer S, Domaille M, Cramp F, et al. Transcutaneous electrical nerve stimulation as an adjunct to education and exercise for knee osteoarthritis: a randomized controlled trial. Arthritis Care Res (Hoboken). 2014;66(3):387-94.

3 Law PP, Cheing GL, Tsui AY. Does transcutaneous electrical nerve stimulation improve the physical performance of people with knee osteoarthritis? J Clin Rheumatol. 2004;10(6):295-9.

Note 24. Continuous passive motion

Initial question

Is continuous passive motion (CPM) therapy recommended after joint replacement surgery for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is CPM therapy (I) compared to no continuous passive motion therapy (C) recommended after joint replacement surgery for patients with osteoarthritis of the hip and/or knee (P) in order to improve their physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of continuous passive motion (CPM) therapy after joint replacement surgery in patients with hip and/or knee osteoarthritis. (tables 24.1 and 24.2)

Table 24.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults after or with an indication for a joint replacing prosthesis for osteoarthritis*
Type of intervention	any form of continuous passive motion therapy
Types of comparisons	no continuous passive motion therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 24.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee” [MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro* [tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (“Motion Therapy, Continuous Passive”[Mesh] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Passive Stretching”[tw] OR “PNF Stretching”[tw] OR “musculoskeletal manipulations”[Mesh] OR “musculoskeletal manipulations”[tw] OR “Applied Kinesiology”[tw] OR “Chiropractic Manipulation”[tw] OR “Osteopathic Manipulation”[tw] OR “Soft Tissue Therapy”[tw] OR “Acupressure”[tw] OR “Massage” [Mesh] OR “massage”[tw] OR massag*[tw] OR “Zone Therapy”[tw] OR “Reflexology” [tw] OR “Rolfing”[tw] OR “Bodywork”[tw] OR Bodywork*[tw] OR “Electric stimulation therapy”[Mesh:NoExp] OR “electric stimulation therapy”[tw] OR “electrical stimulation therapy”[tw] OR “therapeutic electric stimulation”[tw] OR “therapeutic electrical stimulation”[tw] OR “electrotherapy”[tw] OR electrotherap*[tw] OR “interferential current electrotherapy”[tw] OR “electrical stimulation”[tw] OR

General search terms#	"electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation" [Mesh:NoExp] OR "TENS"[tw] OR "transcutaneous electric nerve stimulation"[tw] OR "Ultrasonic Therapy"[Mesh] OR "therapeutic ultrasound"[tw] OR ultrasound therap*[tw] OR "ultrasonic therapy"[tw] OR "electromagnetic therapy"[tw] OR "Electromagnetic Radiation/therapeutic use"[Mesh] OR "Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced" [mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser" [tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser" [tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers" [tw] OR "IIIt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages" [mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing" [tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy" [mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to non-exercise therapy interventions, including CPM therapy, for patients with hip and knee osteoarthritis yielded 478 SRs and 1157 RCTs. The SR by Harvey et al. forms the basis for answering this initial question.[1] This review included literature up to January 2013 and has a good score on the AMSTAR (9/10). The KNGF complemented the review by Harvey et al. by performing a search for RCTs up to 14 August 2017. Ultimately, two RCTs (n = 116) met the selection criteria for the initial question.[2,3]

Refer to flow chart 24.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Lenssen et al., 2008.[2] The RCT was performed in the Netherlands. The study included 40 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received post-operative CPM therapy as a supplement to standard physical therapy care (n = 20) and the other group received standard physical therapy care without CPM therapy. CPM consisted of four hours of mobilisation daily, with the range of motion of the knee being increased by a machine. Follow-up: 17 days.
- Maniar et al., 2012.[3] The RCT was performed in India. The study included 56 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received post-operative CPM therapy as a supplement to standard physical therapy care (n = 28) and the other group received standard physical therapy care only (n = 28). CPM consisted of 15 minutes of mobilisation daily, with the range of motion of the knee being increased by a machine. Follow-up: 90 days.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing CPM plus

exercise therapy to exercise therapy only. Both studies have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (n = 116). There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is very low. (table 24.3)

Table 24.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Lenssen et al., 2008 [2]	+	+	-	-	+	?	+
Maniar et al., 2012 [3]	+	+	-	-	?	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing CPM plus exercise therapy to exercise therapy only. Lenssen et al. revealed a small difference in effect on physical functioning in favour of CPM plus standard physical therapy care, compared to standard physical therapy care only (table 24.4).[2] Maniar et al. could not demonstrate any difference in effect on physical functioning between the intervention and control groups.[3] (table 24.4)

Table 24.4. Evidence table for effectiveness of continuous passive motion therapy following joint replacement surgery of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsis-tency[b]	Indirect-ness	Inaccuracy[c]	Other		
Measure of outcome "physical functioning"							
2, n = 118	reason-able RoB	no	no	yes, n = 118	yes	Lenssen et al. demonstrated a small difference in effect on physical functioning in favour of CPM therapy compared to no CPM as a supplement to the physical therapy care.[2] Ma-niar et. al found no difference in effect on physical function-ing between CPM therapy and no CPM as a supplement to the standard physical therapy care.[3]	very low[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** I^2 > 40%; ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*

1 *Down-grading for design, inaccuracy and publication bias.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/pref-erences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the

existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 24.5)

Table 24.5 Evidence to decision form.

	CPM						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Harvey LA, Brosseau L, Herbert RD. Continuous passive motion following total knee arthroplasty in people with osteoarthritis. Cochrane Database Syst Rev. 2014;(2):CD004260.

2 Lenssen TA, van Steyn MJ, Crijns YH, et al. Effectiveness of prolonged use of continuous passive motion (CPM), as an adjunct to physiotherapy, after total knee arthroplasty. BMC Musculoskelet. Disord. 2008;29;9:60.

3 Maniar RN, Baviskar JV, Singhi T, et al. To use or not to use continuous passive motion post-total knee arthroplasty presenting functional assessment results in early recovery. J Arthroplasty. 2012;27(2):193-200.

Note 25. Electromagnetic field

Initial question

Is treatment with an electromagnetic field recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with an electromagnetic field (I), compared to no treatment with an electromagnetic field (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with an electromagnetic field in patients with hip and knee osteoarthritis. (tables 25.1 and 25.2)

Table 25.1. Selection criteria of systematic review

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with an electromagnetic field
Types of comparisons	no treatment with an electromagnetic field
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 25.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND ("Motion Therapy, Continuous Passive"[Mesh] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Passive Stretching"[tw] OR "PNF Stretching"[tw] OR "musculoskeletal manipulations"[Mesh] OR "musculoskeletal manipulations"[tw] OR "Applied Kinesiology"[tw] OR "Chiropractic Manipulation"[tw] OR "Osteopathic Manipulation"[tw] OR "Soft Tissue Therapy"[tw] OR "Acupressure"[tw] OR "Massage"[Mesh] OR "massage"[tw] OR massag*[tw] OR "Zone Therapy"[tw] OR "Reflexology"[tw] OR "Rolfing"[tw] OR "Bodywork"[tw] OR Bodywork*[tw] OR "Electric stimulation therapy"[Mesh:NoExp] OR "electric stimulation therapy"[tw] OR "electrical stimulation therapy"[tw] OR "therapeutic electric stimulation"[tw] OR "therapeutic electrical stimulation"[tw] OR "electrotherapy"[tw] OR electrotherap*[tw] OR "interferential current electrotherapy"[tw] OR "electrical stimulation"[tw] OR "electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation"[Mesh:NoExp] OR "TENS"[tw] OR "transcutaneous electric nerve stimulation"[tw] OR "Ultrasonic Therapy"[Mesh] OR "therapeutic ultrasound"[tw] OR ultrasound therap*[tw] OR "ultrasonic therapy"[tw] OR "electromagnetic therapy"[tw] OR "Electromagnetic Radiation/therapeutic use"[Mesh] OR "Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic

General search terms#	Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "lllt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))
# For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.	

Literature found

The literature search relating to non-exercise therapy interventions, including treatment with an electromagnetic field, for patients with hip and knee osteoarthritis yielded 478 SRs and 1157 RCTs. The systematic review by Li et al. forms the basis for answering this initial question.[1] This review included literature up to October 2013 and has a good score on the AMSTAR (10/10). The KNGF complemented the review by Li et al. by performing a search for RCTs up to 14 August 2017. Ultimately, two RCTs (n = 158) met the selection criteria for the initial question.[2,3]

Refer to flow chart 25.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Thamsborg et al., 2005.[2] The RCT was performed in Denmark. The study included 83 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with an electromagnetic field (50V/50Hz) (n = 42) and the other group received treatment with a placebo electromagnetic field (n = 41). Treatment was performed five times per week in sessions lasting 120 minutes, for 6 weeks. Follow-up: 12 weeks.
- Pipitone and Scott, 2001.[3] The RCT was performed in the United Kingdom. The study included 75 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with an electromagnetic field (9V/3 - 7.8Hz) (n = 39) and the other group received treatment with a placebo electromagnetic field (n = 36). Treatment was performed 7 times per week in sessions lasting 30 minutes, for 6 weeks. Follow-up: 6 weeks.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing an electromagnetic field to a placebo. Both studies have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (n = 158).
There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is very low. (table 25.3)

Table 25.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Thamsborg et al., 2005 [2]	+	+	-	-	-	?	+
Pipitone en Scott, 2001 [3]	+	+	-	-	-	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing an electromagnetic field to a placebo. Thamsborg et al. concluded that there was no difference in effect on physical functioning between the intervention and control groups.[2] (table 25.4)

However, Pipitone and Scott demonstrated a small difference in effect on physical functioning in favour of treatment with an electromagnetic field compared to a placebo.[3] (table 25.4)

Table 25.4. Evidence table for effectiveness of an electromagnetic field for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsis-tency[b]	Indirect-ness	Inaccuracy[c]	Other		
Outcome QALY							
2, *n* = 158	reason-able RoB	no	no	yes, *n* = 158	yes	Thamsborg et al. found no difference in effect on physical functioning between treat-ment with an electromagnetic field and placebo.[2] Pipitone and Scott demon-strated a small difference in effect on physical functioning in favour of treatment with an electromagnetic field com-pared to a placebo.[3]	very low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b** I^2 > 40%;* ***c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d** Positive: effect is in favour of exercise therapy.*

***1** Down-grading for design, inaccuracy and publication bias.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/pref-erences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 25.5)

Table 25.5. Evidence to decision form.

	EMF						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Li S. Yu B, Zhou D, et al. Electromagnetic fields for treating osteoarthritis. Cochrane Database of Systematic Reviews. 2013;(12).

2 Thamsborg G, Florescu A, Oturai P, et al. Treatment of knee osteoarthritis with pulsed electromagnetic fields: a randomized, double-blind, placebo-controlled study. Osteoarthritis Cartilage. 2005;13(7):575-81.

3 Pipitone N, Scott DL. Magnetic pulse treatment for knee osteoarthritis: a randomised, double-blind, placebo-controlled study. Curr Med Res Opin. 2001;17(3):190-6.

Note 26. Low level laser therapy

Initial question

Is treatment with low level laser therapy (LLLT) recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with low level laser therapy (LLLT) (I), compared to no treatment with low level laser therapy (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with LLLT in patients with hip and knee osteoarthritis. (tables 26.1 and 26.2)

Table 26.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with low level laser therapy
Types of comparisons	no treatment with low level laser therapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 26.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (“Motion Therapy, Continuous Passive”[Mesh] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Passive Stretching”[tw] OR “PNF Stretching”[tw] OR “musculoskeletal manipulations”[Mesh] OR “musculoskeletal manipulations”[tw] OR “Applied Kinesiology”[tw] OR “Chiropractic Manipulation”[tw] OR “Osteopathic Manipulation”[tw] OR “Soft Tissue Therapy”[tw] OR “Acupressure”[tw] OR “Massage”[Mesh] OR “massage”[tw] OR massag*[tw] OR “Zone Therapy”[tw] OR “Reflexology”[tw] OR “Rolfing”[tw] OR “Bodywork”[tw] OR Bodywork*[tw] OR “Electric stimulation therapy”[Mesh:NoExp] OR “electric stimulation therapy”[tw] OR “electrical stimulation therapy”[tw] OR “therapeutic electric stimulation”[tw] OR “therapeutic electrical stimulation”[tw] OR “electrotherapy”[tw] OR electrotherap*[tw] OR “interferential current electrotherapy”[tw] OR “electrical stimulation”[tw] OR “electrical nerve stimulation”[tw] OR “transcutaneous electric nerve stimulation”[Mesh:NoExp] OR “TENS”[tw] OR “transcutaneous electric nerve stimulation”[tw] OR “Ultrasonic Therapy”[Mesh] OR “therapeutic ultrasound”[tw] OR ultrasound therap*[tw] OR “ultrasonic therapy”[tw] OR “electromagnetic therapy”[tw] OR “Electromagnetic Radiation/therapeutic use”[Mesh] OR “Electromagnetic Phenomena/therapeutic use”[Mesh] OR “thermotherapy”[tw] OR “hot pack”[tw] OR “hot packs”[tw] OR hot pack*[tw] OR hotpack*[tw] OR “cold pack”[tw] OR “cold packs”[tw] OR cold pack*[tw] OR coldpack*[tw] OR “cold treatment”[tw] OR “heat treatment”[tw] OR “Hyperthermia, Induced”[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR “Induced Hyperthermia”[tw] OR Thermotherap*[tw] OR “Therapeutic Hyperthermia”[tw] OR “Local Hyperthermia”[tw] OR “Hot Temperature”[mesh] OR

General search terms#	"Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced" [mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "lllt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves" [mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))
# *For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.*	

Literature found

The literature search yielded 478 SRs and 1157 RCTs. The SR by Huang et al. forms the basis for answering this initial question.[1] The review included literature up to November 2014 and has a good score on the AMSTAR (8/10). The KNGF complemented the review by Huang et al. by performing a search for RCTs up to 14 August 2017. Ultimately, three RCTs (n = 103) met the selection criteria for the initial question.[2-4]

Refer to flow chart 26.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Alfredo et al., 2011.[2] The RCT was performed in Brazil. The study included 40 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with LLLT (700Hz) in addition to exercise therapy (n = 20) and the other group received a placebo LLLT in addition to exercise therapy (n = 20). Treatment was performed 3 times per week for 3 weeks. Follow-up: 11 weeks
- Kheshie et al., 2014.[3] The RCT was performed in China. The study included 33 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with LLLT (1 KHz) (n = 18) and the other group received placebo LLLT (n = 15). The treatments with LLLT took place 2 times per week for 6 weeks. Follow-up: 6 weeks.
- Tascioglu et al., 2004.[4] The RCT was performed in Turkey. The study included 40 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with LLLT (n = 20) and the other group received no treatment with LLLT (n = 20). Treatment was performed 5 times per week for 2 weeks. Follow-up: 6 months.

Quality of the evidence

- Measure of outcome "physical functioning" (patient-reported outcomes) when comparing LLLT plus exercise therapy to exercise therapy only. The studies by Alfredo et al.[2] and Kheshie et al.[3] have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (n = 73). There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is very low. (table 26.3)
- Measure of outcome "physical functioning" (patient-reported outcomes) when comparing LLLT to no LLLT. The study by Tascioglu et al. has a reasonable RoB; so down-grading was performed based on design. [4] Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (n = 40). There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is very low. (table 26.3)

Table 26.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Alfredo et al., 2011 [2]	+	+	-	-	?	?	+
Kheshie et al., 2014 [3]	+	+	-	-	?	?	+
Tascioglu et al., 2004 [4]	+	+	-	-	?	?	+

Effectiveness

- Measure of outcome "physical functioning" (patient-reported outcomes) when comparing LLLT plus exercise therapy to exercise therapy only. Alfredo et al. demonstrated a small effect on physical functioning in favour of LLLT plus exercise therapy compared to exercise therapy alone.[2] In contrast, Kheshie et al. found no effect on physical functioning between the intervention and control groups.[3] (table 26.4)
- Measure of outcome "physical functioning" (patient-reported outcomes) comparing LLLT to no LLLT. Tascioglu et al. found no effect on physical functioning between the intervention and control groups.[4] (table 26.4)

Tabel 26.4. Evidencetabel effectiviteit low level laser therapie bij heup- en/of knieartrose.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Outcome QALY							
2, *n* = 73	reasonable RoB	no	no	yes, *n* = 73	yes	Alfredo et al. demonstrated a small effect on physical functioning in favour of LLLT plus exercise therapy compared to exercise therapy alone.[2] Kehsie et al. could not demonstrate any significant difference between the intervention and control group.[3]	very low[1]
1, *n* = 40	reasonable RoB	no	no	yes, *n* = 4	yes	Tascioglu et al. found no significant difference in effect on physical functioning between the intervention and control group.[4]	very low[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for inaccuracy and publication bias publicatiebias LLLT: low level laser therapie.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 26.5)

Table 26.5. Evidence to decision form.

	LLLT						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Huang Z, Chen J, Ma J, et al. Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis. Osteoarthritis Cartilage. 2015;23(9):1437-44.

2 Alfredo PP, Bjordal JM, Dreyer SH, et al. Efficacy of low level laser therapy associated with exercises in knee osteoarthritis: a randomized double-blind study. Clin Rehabil. 2012;26(6):523-33.

3 Kheshie AR, Alayat MS, Ali MM. High-intensity versus low-level laser therapy in the treatment of patients with knee osteoarthritis: a randomized controlled trial. Lasers Med Sci. 2014;29(4):1371-6.

4 Tascioglu F, Armagan O, Tabak Y, et al. Low power laser treatment in patients with knee osteoarthritis. Swiss Med Wkly. 2004;134(17-18):254-8.

Note 27. Passive mobilisations

Initial question

Is treatment with passive mobilisations[a] recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with passive mobilisations* (I), compared to no treatment with passive mobilisations (C), recommended for patients with osteoarthritis of the hip and/or knee (P) in order to improve their physical functioning (O)?

a *The working group exclusively defines passive mobilisations as mobilisation techniques such as tractions, translations and passive stretching. Specific manual therapy techniques (HVT techniques) and active stretching (range-of-motion exercises) are not included.*

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with passive mobilisations in patients with hip and knee osteoarthritis. (tables 27.1 and 27.2)

Table 27.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with passive mobilisations
Types of comparisons	no treatment with passive mobilisations
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 27.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (“Motion Therapy, Continuous Passive”[Mesh] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Passive Stretching”[tw] OR “PNF Stretching”[tw] OR “musculoskeletal manipulations”[Mesh] OR “musculoskeletal manipulations”[tw] OR “Applied Kinesiology”[tw] OR “Chiropractic Manipulation”[tw] OR “Osteopathic Manipulation”[tw] OR “Soft Tissue Therapy”[tw] OR “Acupressure”[tw] OR “Massage”[Mesh] OR “massage”[tw] OR massag*[tw] OR “Zone Therapy”[tw] OR “Reflexology”[tw] OR “Rolfing”[tw] OR “Bodywork”[tw] OR Bodywork*[tw] OR “Electric stimulation therapy”[Mesh:NoExp] OR “electric stimulation therapy”[tw] OR “electrical stimulation therapy”[tw] OR “therapeutic electric stimulation”[tw] OR “therapeutic electrical stimulation”[tw] OR “electrotherapy”[tw] OR electrotherap*[tw] OR “interferential current electrotherapy”[tw] OR “electrical stimulation”[tw] OR “electrical nerve stimulation”[tw] OR “transcutaneous electric nerve stimulation”[Mesh:NoExp] OR “TENS”[tw] OR “transcutaneous electric nerve stimulation”[tw] OR “Ultrasonic Therapy”[Mesh] OR “therapeutic ultrasound”[tw] OR ultrasound therap*[tw] OR “ultrasonic therapy”[tw] OR “electromagnetic therapy”[tw] OR “Electromagnetic Radiation/therapeutic use”[Mesh] OR

General search terms#	"Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "IIIt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to non-exercise therapy interventions, including passive mobilisations, for patients with hip and knee osteoarthritis yielded 478 SRs and 1157 RCTs. The SR by Wang et al. forms the basis for answering this initial question.[1] The review included literature up to October 2014 and has a good score on the AMSTAR (10/10). The KNGF complemented the review by Wang et al. by performing a search for RCTs up to 14 August 2017. Ultimately, one RCT (*n* = 86) met the selection criteria relating to the initial question.[2]

Refer to flow chart 27.1 for a total overview of the systematic literature study (appendix).

Description of studies

French et al., 2013 [2]. The RCT was performed in the United Kingdom. The study included 86 male and female patients with knee osteoarthritis. The patients were randomly assigned to two groups: one group received treatment with passive mobilisations in addition to exercise therapy (*n* = 43) and the other group received exercise therapy only (*n* = 43). The intervention consisted of 6 to 8 sessions with mobilisation techniques lasting 15 minutes, focussing on relieving pain and stiffness, in addition to 30 minutes of exercise therapy, over the course of 8 weeks. The control group received 6 to 8 sessions consisting only of 30 minutes of exercise therapy, over the course of 8 weeks. Follow-up: 18 weeks.

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing passive mobilisations plus exercise therapy versus exercise therapy only: The study by French, 2013 [2] has a reasonable RoB; so down-grading was not performed based on design.[2] Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (*n* = 86). There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is low. (table 27.3)

Table 27.3. Methodological quality of the included study.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
French et al., 2013 [2]	+	+	-	-	+	?	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing passive mobilisations plus exercise therapy versus exercise therapy only. French et al. found no effect on physical functioning between the intervention and control groups.[2] (table 27.4)

Table 27.4. Evidence table for effectiveness of passive mobilisations for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other		
Measure of outcome "physical functioning"							
1, *n* = 86	low RoB	N/A	no	yes, *n* = 86	yes	French et al. found no significant difference in effect on physical functioning between treatment with passive mobilisations in addition to exercise therapy and exercise therapy alone.[2]	low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*

***1** Down-grading for inaccuracy and publication bias.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 27.5)

Table 27.5. Evidence to decision form.

	Passive mobilisations						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured

Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea			
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea			
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea	
Variation in required resources (costs)	high	moderate	low	very low	no idea			
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Wang Q, Wang TT, Qi XF, et al. Manual therapy for hip osteoarthritis: a systematic review and meta-analysis. Pain Physician. 2015;18(6):E1005-20.

2 French HP, Cusack T, Brennan A, et al. Exercise and manual physiotherapy arthritis research trial (EMPART) for osteoarthritis of the hip: a multicenter randomized controlled trial. Arch Phys Med Rehabil. 2013;94(2):302-14.

Note 28. Shock wave

Initial question

Is treatment with shock wave recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with shock wave (I), compared to no treatment with shock wave (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with shock wave in patients with hip and knee osteoarthritis. (tables 28.1 and 28.2)

Table 28.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with shock wave
Types of comparisons	no treatment with shock wave
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 28.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (“Motion Therapy, Continuous Passive”[Mesh] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Passive Stretching”[tw] OR “PNF Stretching”[tw] OR “musculoskeletal manipulations”[Mesh] OR “musculoskeletal manipulations”[tw] OR “Applied Kinesiology”[tw] OR “Chiropractic Manipulation”[tw] OR “Osteopathic Manipulation”[tw] OR “Soft Tissue Therapy”[tw] OR “Acupressure”[tw] OR “Massage”[Mesh] OR “massage”[tw] OR massag*[tw] OR “Zone Therapy”[tw] OR “Reflexology”[tw] OR “Rolfing”[tw] OR “Bodywork”[tw] OR Bodywork*[tw] OR “Electric stimulation therapy”[Mesh:NoExp] OR “electric stimulation therapy”[tw] OR “electrical stimulation therapy”[tw] OR “therapeutic electric stimulation”[tw] OR “therapeutic electrical stimulation”[tw] OR “electrotherapy”[tw] OR electrotherap*[tw] OR “interferential current electrotherapy”[tw] OR “electrical stimulation”[tw] OR “electrical nerve stimulation”[tw] OR “transcutaneous electric nerve stimulation”[Mesh:NoExp] OR “TENS”[tw] OR “transcutaneous electric nerve stimulation”[tw] OR “Ultrasonic Therapy”[Mesh] OR “therapeutic ultrasound”[tw] OR ultrasound therap*[tw] OR “ultrasonic therapy”[tw] OR “electromagnetic therapy”[tw] OR “Electromagnetic Radiation/therapeutic use”[Mesh] OR “Electromagnetic Phenomena/therapeutic use”[Mesh] OR “thermotherapy”[tw] OR “hot pack”[tw] OR “hot packs”[tw] OR hot pack*[tw] OR hotpack*[tw] OR “cold pack”[tw] OR “cold packs”[tw] OR cold pack*[tw] OR coldpack*[tw] OR “cold treatment”[tw] OR “heat treatment”[tw] OR “Hyperthermia, Induced”[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR “Induced Hyperthermia”[tw] OR Thermotherap*[tw] OR “Therapeutic Hyperthermia”[tw] OR “Local Hyperthermia”[tw] OR “Hot Temperature”[mesh] OR “Cold Temperature”[mesh] OR “Cryotherapy”[mesh] OR “Hypothermia, induced”[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR “Induced Hypothermia”[tw] OR therapeutic hypotherm*[tw] OR “low level laser therapy”[tw] OR “low level laser treatment”[tw] OR “low intensity laser”[tw] OR “soft-laser therapy”[tw] OR “low energy laser therapy”[tw] OR “low-power laser therapy”[tw] OR “low level laser”[tw] OR “low level lasers”[tw] OR “low intensity lasers”[tw] OR “low energy laser”[tw] OR “low energy lasers”[tw] OR “low-power laser”[tw] OR “low-power lasers”[tw] OR “lllt”[tw] OR “Low-Level Light Therapy”[Mesh] OR “medical taping”[tw] OR “taping”[tw] OR “tape”[tw] OR “tapes”[tw] OR “taped”[tw] OR “kinesiotaping”[tw] OR “kinesio taping”[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR “Bandages”[mesh] OR “Athletic Tape”[mesh] OR “Bandages”[tw] OR “Bandage”[tw] OR “Athletic Tape”[tw] OR “Athletic Tapes”[tw] OR “Hydrocolloid Bandages”[tw] OR “Biological Dressings”[tw] OR “Compression Bandages”[tw] OR “Compression Stockings”[tw] OR “Occlusive Dressings”[tw] OR “Hydrocolloid Bandage”[tw] OR “Biological Dressing”[tw] OR “Compression Bandage”[tw] OR “Compression Stocking”[tw] OR “Occlusive Dressing”[tw] OR “Dry needling”[tw] OR dry needl*[tw] OR “Acupuncture Therapy”[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR “Meridians”[tw] OR “Moxibustion”[tw] OR “Trigger

General search terms#	Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search yielded 478 systematic literature studies and 1157 RCTs. This search did not yield any systematic reviews that focussed specifically on treatment with shock wave. However, three RCTs were found that met the selection criteria for the initial question.[1-3]

Refer to flow chart 28.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Cho et al., 2016 [1]. The RCT was performed in South Korea. The study included 18 male and female patients with knee osteoarthritis who had suffered a stroke more than two years previously. The patients were randomly assigned to a group treated with shock wave therapy (1000 impulses at 0.05 mJ/mm2) and a group that received placebo shock wave therapy. Three treatments were performed at intervals of one week. Follow-up: 1 week.
- Imamura, 2017 [2]. The RCT was performed in Brazil. The study included 105 female patients with knee osteoarthritis. The patients were randomly assigned to a group treated with shock wave therapy (2000 impulses at 0.10 to 0.16 mJ/mm2) and a group that received placebo shock wave therapy. Three treatments were performed at intervals of one week. Follow-up: 3 months.
- Zhao, 2013 [3]. The RCT was performed in China. The study included 70 male and female patients with knee osteoarthritis. The patients were randomly assigned to a group treated with shock wave therapy (4000 impulses at 0.25 mJ/mm2) and a group that received placebo shock wave therapy. Four treatments were performed at intervals of one week. Follow-up: 12 weeks.

Quality of the evidence

For the measure of outcome "physical functioning" (patient-reported outcomes) when comparing shock wave versus no shock wave. The three studies had a low RoB and were, therefore, not down-graded based on design. The studies were down-graded based on inconsistency. The degree of indirectness was not applicable and did not require down-grading. Inaccuracy does apply, due to the small number of participants (n = 193). There appears to be a real risk of publication bias and the study was therefore down-graded for this. Based on GRADE, the quality of the evidence was assessed as "very low". (table 28.3)

Table 28.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Cho et al., 2016 [1]	+	?	+	+	+	+	+
Imamura et al., 2017 [2]	+	+	-	-	+	+	+
Zhao et al., 2013 [3]	+	-	+	+	+	+	+

Effectiveness

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing treatment with shock wave versus no shock wave. Zhao et al. demonstrated a large and significant difference in effect on physical functioning in favour of shock wave compared to no shock wave [3]. (table 28.4) However, both Cho et al. and Imamura et al. found no significant difference in physical functioning between the intervention and control groups.[1,2] (table 28.4)

Tabel Table 28.4. Evidence table for effectiveness of shock wave treatment for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients and effect estimates**[d]	**Quality of the evidence**
	Design[a]	Inconsis-tency[b]	Indirect-ness	Inaccuracy[c]	Other		
Outcome QALY							
3, *n* = 193	reason-able RoB	yes	no	yes, *n* = 193	yes	Zhao et al. (*n* = 70) found a significant difference in effect on physical functioning in favour of shock wave versus no shock wave.[3] Two studies - those by Cho et al. and Imamura et al. (*n* = 123) - found no difference in effect on physical functioning between the intervention and control groups.[1,2]	very low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*

***1** Down-grading for design, inconsistency and inaccuracy.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 28.5)

Table 28.5. Evidence to decision form.

	Shock wave						
Desired effects	very small	small	moderate	large	varies	no idea	not mea-sured
Undesirable effects	large	moderate	small	very small	varies	no idea	not mea-sured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not mea-sured
Balance between desired and undesirable effects	the unfa-vourable effects definitely outweigh the favour-able effects	the unfa-vourable effects probably outweigh the favour-able effects	the favour-able and unfavour-able effects are equal	the favour-able effects probably outweigh the unfa-vourable effects	the favour-able effects definitely outweigh the unfa-vourable effects	varies	no idea	no unde-sirable effects mea-sured

Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Cho SJ, Yang JR, Yang HS, et al. Effects of extracorporeal shockwave therapy in chronic stroke patients with knee osteoarthritis: a pilot study. Ann Rehabil Med. 2016;40(5):862-70.

2 Imamura M, Alamino S, Hsing WT, et al. Radial extracorporeal shock wave therapy for disabling pain due to severe primary knee osteoarthritis. J Rehabil Med. 2017;49(1):54-62.

3 Zhao Z, Jing R, Shi Z, et al. Efficacy of extracorporeal shockwave therapy for knee osteoarthritis: a randomized controlled trial. J Surg Res. 2013;185(2):661-6.

Note 29. Taping

Initial question

Is treatment with taping recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is treatment with taping (I), compared to no treatment with taping (C), recommended for patients with osteoarthritis of the hip and/or knee (P) in order to improve their physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with taping in patients with hip and knee osteoarthritis. (tables 29.1 and 29.2)

Literature found

Table 29.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with taping
Types of comparisons	no treatment with taping
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 29.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	((“hip osteoarthritis”[tw] OR “knee osteoarthritis”[tw] OR “Osteoarthritis, Knee”[MeSH] OR “Osteoarthritis, Hip”[mesh] OR ((“Osteoarthritis”[Mesh] OR “osteoarthritis”[tw] OR osteoarthrit*[tw] OR “osteoarthrosis”[tw] OR osteoarthro*[tw] OR “degenerative arthritis”[tw] OR degenerative arthriti*[tw] OR “osteoarthrosis deformans”[tw]) AND (“Knee”[Mesh] OR “knee”[tw] OR “knees”[tw] OR “Knee Joint”[Mesh] OR “Hip”[Mesh] OR “hip”[tw] OR “hips”[tw] OR “Hip Joint”[Mesh] OR “menisci”[tw] OR “meniscus”[tw] OR menisc*[tw] OR “coxa”[tw] OR “coxas”[tw] OR “patellofemoral”[tw] OR “Patella”[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND (“Motion Therapy, Continuous Passive”[Mesh] OR “Continuous Passive Motion Therapy”[tw] OR “Continuous Passive Movement”[tw] OR “CPM Therapy”[tw] OR “Passive Stretching”[tw] OR “PNF Stretching”[tw] OR “musculoskeletal manipulations”[Mesh] OR “musculoskeletal manipulations”[tw] OR “Applied Kinesiology”[tw] OR “Chiropractic Manipulation”[tw] OR “Osteopathic Manipulation”[tw] OR “Soft Tissue Therapy”[tw] OR “Acupressure”[tw] OR “Massage” [Mesh] OR “massage”[tw] OR massag*[tw] OR “Zone Therapy”[tw] OR “Reflexology” [tw] OR “Rolfing”[tw] OR “Bodywork”[tw] OR Bodywork*[tw] OR “Electric stimulation therapy”[Mesh:NoExp] OR “electric stimulation therapy”[tw] OR “electrical stimulation therapy”[tw] OR “therapeutic electric stimulation”[tw] OR “therapeutic electrical stimulation”[tw] OR “electrotherapy”[tw] OR electrotherap*[tw] OR “interferential current electrotherapy”[tw] OR “electrical stimulation”[tw] OR “electrical nerve stimulation”[tw] OR “transcutaneous electric nerve stimulation” [Mesh:NoExp] OR “TENS”[tw] OR “transcutaneous electric nerve stimulation”[tw] OR “Ultrasonic Therapy”[Mesh] OR “therapeutic ultrasound”[tw] OR ultrasound therap*[tw] OR “ultrasonic therapy”[tw] OR “electromagnetic therapy”[tw] OR “Electromagnetic Radiation/therapeutic use”[Mesh] OR “Electromagnetic Phenomena/therapeutic use”[Mesh] OR “thermotherapy”[tw] OR “hot pack”[tw] OR “hot packs”[tw] OR hot pack*[tw] OR hotpack*[tw] OR “cold pack”[tw] OR “cold packs”[tw] OR cold pack*[tw] OR coldpack*[tw] OR “cold treatment”[tw] OR “heat treatment”[tw] OR “Hyperthermia, Induced”[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR “Induced Hyperthermia”[tw] OR Thermotherap*[tw] OR “Therapeutic Hyperthermia”[tw] OR “Local Hyperthermia”[tw] OR “Hot Temperature”[mesh] OR “Cold Temperature”[mesh] OR “Cryotherapy”[mesh] OR “Hypothermia, induced” [mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR “Induced Hypothermia”[tw] OR therapeutic hypotherm*[tw] OR “low level laser therapy”[tw] OR “low level laser treatment”[tw] OR “low intensity laser”[tw] OR “soft-laser therapy”[tw] OR “low energy laser therapy”[tw] OR “low-power laser therapy”[tw] OR “low level laser”[tw] OR “low level lasers”[tw] OR “low intensity lasers”[tw] OR “low energy laser”[tw] OR “low energy lasers”[tw] OR “low-power laser”[tw] OR “low-power lasers”[tw] OR “IIlt”[tw] OR “Low-Level Light Therapy”[Mesh] OR “medical taping”[tw] OR “taping”[tw] OR “tape”[tw] OR “tapes”[tw] OR “taped”[tw] OR “kinesiotaping”[tw] OR “kinesio taping”[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR “Bandages”[mesh] OR “Athletic Tape”[mesh] OR “Bandages”[tw] OR “Bandage”[tw] OR “Athletic Tape”[tw] OR “Athletic Tapes”[tw] OR “Hydrocolloid Bandages”[tw] OR “Biological Dressings”[tw] OR “Compression Bandages”[tw] OR “Compression Stockings”[tw] OR “Occlusive Dressings”[tw] OR “Hydrocolloid Bandage”[tw] OR “Biological Dressing”[tw] OR “Compression Bandage”[tw] OR “Compression Stocking”[tw] OR “Occlusive Dressing”[tw] OR “Dry needling”[tw] OR dry needl*[tw] OR “Acupuncture Therapy”[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR “Meridians”[tw] OR “Moxibustion”[tw] OR “Trigger

General search terms#	Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

The literature search relating to non-exercise therapy interventions, including treatment with taping, for patients with hip and knee osteoarthritis yielded 478 systematic literature studies (SRs) and 1157 RCTs. However, this search did not yield any systematic reviews that focussed specifically on treatment with taping. We did find three RCTs that met the selection criteria for the initial question.[1-3] In order to formulate the recommendation regarding this initial question based on the correct argumentation - for this specific intervention and at the request of the working group - pain was added as a secondary measure of outcome.

Refer to flow chart 29.1 for a total overview of the systematic literature study (appendix).

Description of studies

- Wageck et al., 2016 [1]. The RCT was performed in Brazil. The study included 76 male and female patients with knee osteoarthritis. The patients were randomly assigned to an intervention group that received kinesiotaping (*n* = 38) or a control group that received placebo taping (*n* = 38). In the intervention group, the taping technique focussed on pain, strength and swelling. Measurements were performed four days after applying the tape (post-intervention).
- Kocyigit et al., 2015 [2]. The RCT was performed in Turkey. The study included 43 male and female patients with knee osteoarthritis. The patients were randomly assigned to an intervention group that received kinesiotaping (*n* = 22) or a control group that received placebo taping (*n* = 21). The "Y strip" was applied in the intervention group. The tape was applied three times, with an intervening period of four days each time. Measurements were performed twelve days after applying the first tape (post-intervention).
- Hinman et al., 2003 [3]. The RCT was performed in Australia. The study included 18 male and female patients with knee osteoarthritis. The patients received three different treatments consecutively in a randomised order: therapeutic taping, placebo taping and no taping. In the treatment that consisted of therapeutic taping, the technique focussed on "medial patella gliding". Measurements were performed five minutes after applying the tape (post-intervention).

Quality of the evidence

Measure of outcome "physical functioning" (patient-reported outcomes) when comparing taping versus no taping. The three studies have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading.
Inaccuracy did apply, due to the small number of participants (*n* = 137). There appears to be a real risk of publication bias and the study was therefore down-graded for this. The quality of the evidence is low. (table 29.3)
Effectiveness

Table 29.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Wageck et al., 2016 [1]	+	+	-	-	-	?	+
Kocygit et al., 2015 [2]	+	?	-	-	+	?	+
Hinman et al., 2003 [3]	+	+	-	-	+	?	+

- Measure of outcome "physical functioning" (patient-reported outcomes; 3 RCTs; *n* = 137) when comparing taping versus no taping. The quality of the evidence immediately after the intervention is low for no effect (SMD = -0.01; 95% CI = -0.43 to 0.24) of treatment with taping versus no taping on functioning of patients with knee osteoarthritis. (table 29.4)
- Measure of outcome "pain" (based on previously included literature) when comparing taping versus no taping. Based on the three included RCTs, we can conclude that taping probably has no clinically relevant effect on pain for patients with knee osteoarthritis.

Table 29.4. Evidence table for effectiveness of taping for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
3, *n* = 138	reasonable RoB	no, I^2 = 0%	no	yes, *n* = 138	no	69	69	SMD = -0,01 (95%-BI = -0,43 tot 0,24)	low[1]

a *Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other.* ***b*** *I^2 > 40%;* ***c*** *Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400);* ***d*** *Positive: effect is in favour of exercise therapy.*
1 *Down-grading for design and inaccuracy. SMD = standardized mean difference.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 29.5)

Table 29.5. Evidence to decision form.

	Taping						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		

Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Wageck B, Nunes GS, Bohlen NB, et al. Kinesio taping does not improve the symptoms or function of older people with knee osteoarthritis: a randomised trial. J Physiother. 2016;62(3):153-8.

2 Kocyigit F, Turkmen MB, Acar M, et al. Kinesio taping or sham taping in knee osteoarthritis? A randomized, double-blind, sham-controlled trial. Complement Ther Clin Pract. 2015;21(4):262-7.

3 Hinman RS, Bennell KL, Crossley KM, et al. Immediate effects of adhesive tape on pain and disability in individuals with knee osteoarthritis. Rheumatology. 2003;42(7):865-9.

Note 30. Thermotherapy

Initial question

Is thermotherapy (hot or cold therapy) recommended for patients with osteoarthritis of the hip and/or knee in order to improve their physical functioning?

Complete initial question according to PICO

Is thermotherapy (hot or cold therapy) (I), compared to no thermotherapy (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of thermotherapy with regard to physical functioning in patients with hip and knee osteoarthritis. (tables 30.1 and 30.2)

Table 30.1. Selection criteria of systematic review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of thermotherapy
Types of comparisons	no thermotherapy
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 30.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND ("Motion Therapy, Continuous Passive"[Mesh] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Passive Stretching"[tw] OR "PNF Stretching"[tw] OR "musculoskeletal manipulations"[Mesh] OR "musculoskeletal manipulations"[tw] OR "Applied Kinesiology"[tw] OR "Chiropractic Manipulation"[tw] OR "Osteopathic Manipulation"[tw] OR "Soft Tissue Therapy"[tw] OR "Acupressure"[tw] OR "Massage"[Mesh] OR "massage"[tw] OR massag*[tw] OR "Zone Therapy"[tw] OR "Reflexology"[tw] OR "Rolfing"[tw] OR "Bodywork"[tw] OR Bodywork*[tw] OR "Electric stimulation therapy"[Mesh:NoExp] OR "electric stimulation therapy"[tw] OR "electrical stimulation therapy"[tw] OR "therapeutic electric stimulation"[tw] OR "therapeutic electrical stimulation"[tw] OR "electrotherapy"[tw] OR electrotherap*[tw] OR "interferential current electrotherapy"[tw] OR "electrical stimulation"[tw] OR "electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation"[Mesh:NoExp] OR "TENS"[tw] OR "transcutaneous electric nerve stimulation"[tw] OR "Ultrasonic Therapy"[Mesh] OR "therapeutic ultrasound"[tw] OR ultrasound therap*[tw] OR "ultrasonic therapy"[tw] OR "electromagnetic therapy"[tw] OR "Electromagnetic Radiation/therapeutic use"[Mesh] OR "Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "lllt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to non-exercise therapy interventions, including thermotherapy, for patients with hip and knee osteoarthritis yielded 478 SRs and 1157 RCTs. However, the search did not yield any SRs or RCTs that focussed specifically on thermotherapy.

Refer to flow chart 30.1 for a total overview of the systematic literature study (appendix).

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 30.3)

Table 30.3. Evidence to decision form.

	Thermotherapy						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured
Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea		
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea		
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea
Variation in required resources (costs)	high	moderate	low	very low	no idea		
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Note 31. Ultrasound

Initial question

Is treatment with ultrasound recommended for patients with osteoarthritis of the hip and/or knee in order to to improve their physical functioning?

Complete initial question according to PICO

Is treatment with ultrasound (I), compared to no treatment with ultrasound (C), recommended for the treatment of patients with hip and/or knee osteoarthritis (P) to improve physical functioning (O)?

Search strategy

The KNGF performed a literature search on 14 August 2017 in PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare and CINAHL, to find summaries of the literature (i.e., systematic reviews; SRs) and randomised controlled trials (RCTs) relating to the effectiveness of treatment with ultrasound in patients with hip and knee osteoarthritis. (tables 31.1 and 31.2)

Table 31.1. Selection criteria of systematic literature review.

Type of study	SR and RCT
Type of patient	adults with a clinical diagnosis of osteoarthritis*
Type of intervention	any form of treatment with ultrasound
Types of comparisons	no treatment with ultrasound
Types of outcomes	physical functioning (patient-reported outcomes)

** For reasons of efficiency, the searches for hip and knee were launched simultaneously and completed separately. SR = systematic review; RCT = randomised controlled trial.*

Table 31.2. Search terms.

Search date	14 August 2017
Consulted databases	PubMed, EMBASE, Web of Science, Cochrane Library, CENTRAL, EmCare, CINAHL.
General search terms#	(("hip osteoarthritis"[tw] OR "knee osteoarthritis"[tw] OR "Osteoarthritis, Knee"[MeSH] OR "Osteoarthritis, Hip"[mesh] OR (("Osteoarthritis"[Mesh] OR "osteoarthritis"[tw] OR osteoarthrit*[tw] OR "osteoarthrosis"[tw] OR osteoarthro*[tw] OR "degenerative arthritis"[tw] OR degenerative arthriti*[tw] OR "osteoarthrosis deformans"[tw]) AND ("Knee"[Mesh] OR "knee"[tw] OR "knees"[tw] OR "Knee Joint"[Mesh] OR "Hip"[Mesh] OR "hip"[tw] OR "hips"[tw] OR "Hip Joint"[Mesh] OR "menisci"[tw] OR "meniscus"[tw] OR menisc*[tw] OR "coxa"[tw] OR "coxas"[tw] OR "patellofemoral"[tw] OR "Patella"[Mesh] OR patella*[tw])) OR coxarthro*[tw] OR gonarthro*[tw]) AND ("Motion Therapy, Continuous Passive"[Mesh] OR "Continuous Passive Motion Therapy"[tw] OR "Continuous Passive Movement"[tw] OR "CPM Therapy"[tw] OR "Passive Stretching"[tw] OR "PNF Stretching"[tw] OR "musculoskeletal manipulations"[Mesh] OR "musculoskeletal manipulations"[tw] OR "Applied Kinesiology"[tw] OR "Chiropractic Manipulation"[tw] OR "Osteopathic Manipulation"[tw] OR "Soft Tissue Therapy"[tw] OR "Acupressure"[tw] OR "Massage"[Mesh] OR "massage"[tw] OR massag*[tw] OR "Zone Therapy"[tw] OR "Reflexology"[tw] OR "Rolfing"[tw] OR "Bodywork"[tw] OR Bodywork*[tw] OR "Electric stimulation therapy"[Mesh:NoExp] OR "electric stimulation therapy"[tw] OR "electrical stimulation therapy"[tw] OR "therapeutic electric stimulation"[tw] OR "therapeutic electrical stimulation"[tw] OR "electrotherapy"[tw] OR electrotherap*[tw] OR "interferential current electrotherapy"[tw] OR "electrical stimulation"[tw] OR "electrical nerve stimulation"[tw] OR "transcutaneous electric nerve stimulation"[Mesh:NoExp] OR "TENS"[tw] OR "transcutaneous electric nerve stimulation"[tw] OR "Ultrasonic Therapy"[Mesh] OR "therapeutic ultrasound"[tw]

General search terms#	OR ultrasound therap*[tw] OR "ultrasonic therapy"[tw] OR "electromagnetic therapy"[tw] OR "Electromagnetic Radiation/therapeutic use"[Mesh] OR "Electromagnetic Phenomena/therapeutic use"[Mesh] OR "thermotherapy"[tw] OR "hot pack"[tw] OR "hot packs"[tw] OR hot pack*[tw] OR hotpack*[tw] OR "cold pack"[tw] OR "cold packs"[tw] OR cold pack*[tw] OR coldpack*[tw] OR "cold treatment"[tw] OR "heat treatment"[tw] OR "Hyperthermia, Induced"[Mesh] OR fever therap*[tw] OR heat therap*[tw] OR "Induced Hyperthermia"[tw] OR Thermotherap*[tw] OR "Therapeutic Hyperthermia"[tw] OR "Local Hyperthermia"[tw] OR "Hot Temperature"[mesh] OR "Cold Temperature"[mesh] OR "Cryotherapy"[mesh] OR "Hypothermia, induced"[mesh] OR cold temperature*[tw] OR Cryotherap*[tw] OR "Induced Hypothermia"[tw] OR therapeutic hypotherm*[tw] OR "low level laser therapy"[tw] OR "low level laser treatment"[tw] OR "low intensity laser"[tw] OR "soft-laser therapy"[tw] OR "low energy laser therapy"[tw] OR "low-power laser therapy"[tw] OR "low level laser"[tw] OR "low level lasers"[tw] OR "low intensity lasers"[tw] OR "low energy laser"[tw] OR "low energy lasers"[tw] OR "low-power laser"[tw] OR "low-power lasers"[tw] OR "IIIt"[tw] OR "Low-Level Light Therapy"[Mesh] OR "medical taping"[tw] OR "taping"[tw] OR "tape"[tw] OR "tapes"[tw] OR "taped"[tw] OR "kinesiotaping"[tw] OR "kinesio taping"[tw] OR kinesiotap*[tw] OR kinesio tap*[tw] OR "Bandages"[mesh] OR "Athletic Tape"[mesh] OR "Bandages"[tw] OR "Bandage"[tw] OR "Athletic Tape"[tw] OR "Athletic Tapes"[tw] OR "Hydrocolloid Bandages"[tw] OR "Biological Dressings"[tw] OR "Compression Bandages"[tw] OR "Compression Stockings"[tw] OR "Occlusive Dressings"[tw] OR "Hydrocolloid Bandage"[tw] OR "Biological Dressing"[tw] OR "Compression Bandage"[tw] OR "Compression Stocking"[tw] OR "Occlusive Dressing"[tw] OR "Dry needling"[tw] OR dry needl*[tw] OR "Acupuncture Therapy"[mesh] OR Acupunctur*[tw] OR Electroacupunctur*[tw] OR "Meridians"[tw] OR "Moxibustion"[tw] OR "Trigger Points"[tw] OR "Trigger Point"[tw] OR "Shockwave therapy"[tw] OR "Shock wave therapy"[tw] OR shockwav*[tw] OR shock wav*[tw] OR "High-Energy Shock Waves"[mesh] OR "HESW"[tw] OR "High Energy Shock Waves"[tw] OR "High-Energy Shock Wave"[tw] OR "Ultrasonic Shock Wave"[tw] OR "Ultrasonic Shock Waves"[tw] OR "Ultrasonic Shockwave"[tw] OR "Ultrasonic Shockwaves"[tw] OR "Ultrasonic Waves"[mesh] OR "Lithotripsy"[mesh] OR "Lithotripsy"[tw])) NOT ("Animals"[mesh] NOT "Humans"[mesh]))

 # For reasons of efficiency, the searches for hip and knee were launched simultaneously and then completed separately.

Literature found

The literature search relating to non-exercise therapy interventions, including treatment with ultrasound, for patients with hip and knee osteoarthritis yielded 478 systematic literature studies and 1157 RCTs. The systematic review by Zhang et al. forms the basis for answering this initial question.[1] This review included literature up to September 2015 and has a good score on the AMSTAR (7/10). The KNGF complemented the review by Zhang et al. by performing a search for RCTs up to 14 August 2017. Ultimately, three RCTs (n = 119) met the selection criteria for the initial question.[2-4]

Refer to flow chart 31.1 for a total overview of the systematic literature study (appendix).

Description of studies (n = 3 RCTs)

The studies included 119 male and female patients with osteoarthritis of the knee. The treatments with ultrasound used an average voltage of 1 MHz. The frequency of the treatments varied from 3 to 5 times per week, for 2 to 8 weeks. Follow-up varied from 12 to 52 weeks.

Quality of the evidence

Measure of outcome 'physical functioning' (patient-reported outcomes). Both studies have a reasonable RoB and were, therefore, down-graded based on design. Inconsistency and degree of indirectness were not applicable and did not require down-grading. Inaccuracy did apply, due to the small number of participants (n = 119). There appears to be a real risk of publication bias and the study was therefore down-graded for this. Based on GRADE, the quality of the evidence was assessed as "low". (table 31.3)

Table 31.3. Methodological quality of the included studies.

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessement	Incomplete outcome data	Selective reporting	Other bias
Ulus et al., 2012 [2]	+	?	–	–	+	?	+
Tascioglu et al., 2010 [3]	+	+	–	–	+	?	+
Loyola Sanchez et al., 2012 [4]	+	+	–	–	+	?	+

Effectiveness

Measure of outcome 'physical functioning' (patient-reported outcomes). Three RCTs (n = 119) studying the effect of ultrasound versus no ultrasound revealed no effect immediately after the intervention on the physical functioning of people with knee osteoarthritis (SMD = 0.11; 95% CI = -0.26 to 0.46).[1,2,3] (table 31.4)

Table 31.4. Evidence table for effectiveness of ultrasound for osteoarthritis of the hip and/or knee.

Number of studies	**GRADE**					**Number of patients**		**Effect estimated**[d]	**Quality of the evidence**
	Design[a]	Inconsistency[b]	Indirectness	Inaccuracy[c]	Other	Intervention	Control		
Physical functioning – post intervention									
3, n = 119	reasonable RoB	no, I^2 = 0%	no	yes, n = 119	no	59	60	SMD = 0,11 (95%-BI = -0,26 tot 0,46)	low[1]

***a** Low risk of bias (RoB): randomisation adequate + allocation concealed + intention to treat (ITT); high RoB: < 3 items low risk; moderate RoB: other. **b** I^2 > 40%; **c** Dichotomous measure of outcome for population (n > 300); continuous measure of outcome for population (n > 400); **d** Positive: effect is in favour of exercise therapy.*

***1** Down-grading for design and inaccuracy. SMD = standardized mean difference.*

Evidence to decision

In addition to the conclusion from the scientific literature, additional considerations (including values/preferences of the patient, applicability in practice) were also included in determining the formulation (direction and strength) of recommendations. The GRADE "Evidence to decision" method was followed for this and the existing "GRADE Evidence to decision" form was translated into Dutch. This form was discussed by the working group during a working group meeting, after which the formulation of the recommendation was determined. (table 31.5)

Table 31.5. Evidence to decision form.

	Ultrasound						
Desired effects	very small	small	moderate	large	varies	no idea	not measured
Undesirable effects	large	moderate	small	very small	varies	no idea	not measured
Quality of desired effects	very low	low	reasonable	high	varies	no idea	not measured

Balance between desired and undesirable effects	the unfavourable effects definitely outweigh the favourable effects	the unfavourable effects probably outweigh the favourable effects	the favourable and unfavourable effects are equal	the favourable effects probably outweigh the unfavourable effects	the favourable effects definitely outweigh the unfavourable effects	varies	no idea	no undesirable effects measured
Value of desired effects	very low	low	reasonable	large	no idea			
Variation in value of desired effects	large variation	moderate variation	low variation	no variation	no idea			
Required resources (costs)	high costs	moderate costs	virtually no costs or savings	moderate savings	high savings	varies	no idea	
Variation in required resources (costs)	high	moderate	low	very low	no idea			
Cost-effectiveness	not cost-effective	probably not cost-effective	intervention and standard care are equal	probably cost-effective	cost-effective	varies	no studies available	

Type of recommendation	strong recommendation against intervention	conditional recommendation against intervention	conditional recommendation neither in favour nor against the intervention	conditional recommendation for intervention	strong recommendation for intervention	expert opinion

Sources

1 Zhang C, Shi J, Zhu C, et al. Effect of ultrasound therapy for knee osteoarthritis: a meta-analysis of randomized, double-blind, placebo-controlled clinical trials. Int J Clin Exp Med, 2016;9(11):20552-61.

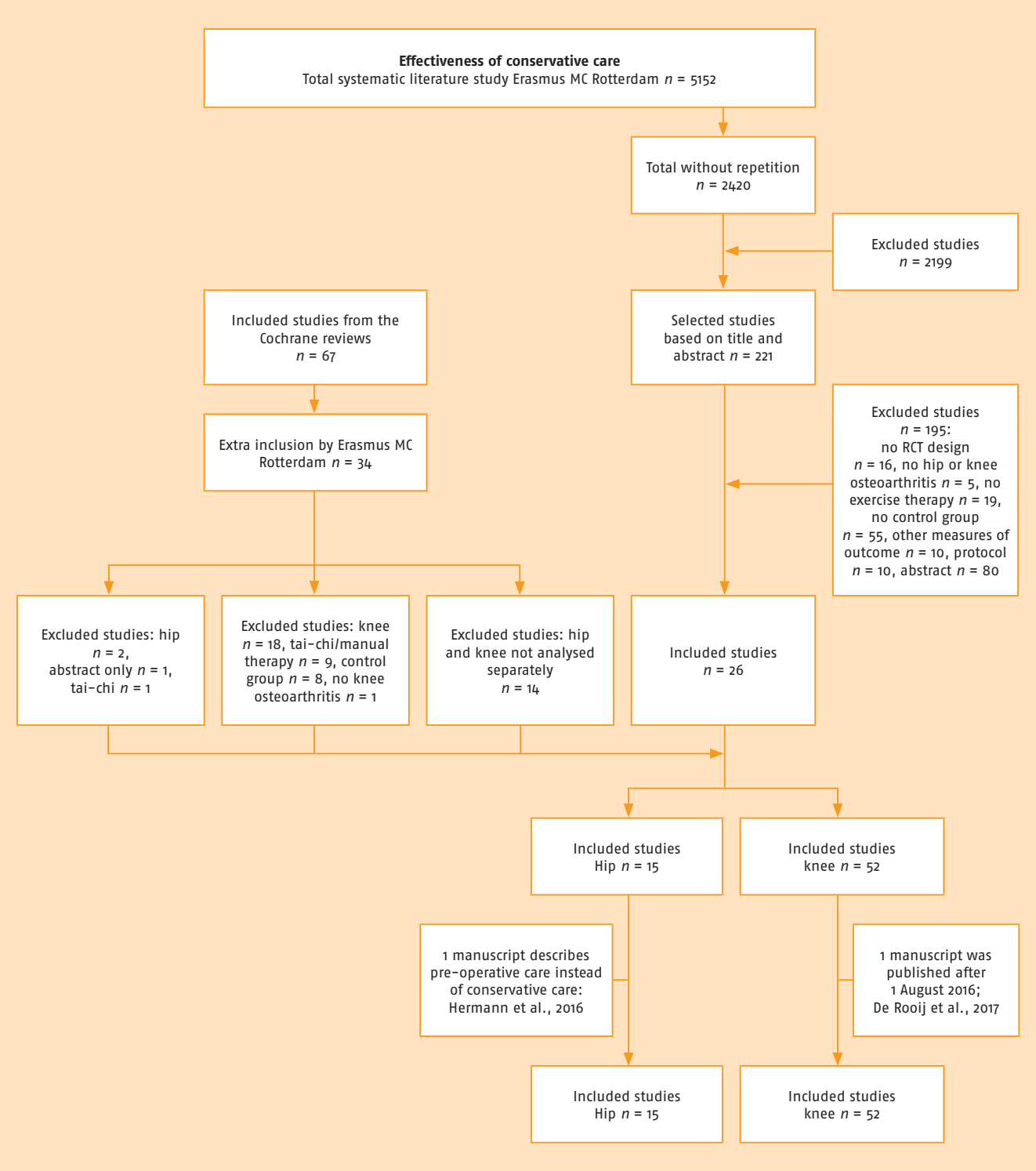
2 Ulus Y, Tander B, Akyol Y, et al. Therapeutic ultrasound versus sham ultrasound for the management of patients with knee osteoarthritis: a randomized double-blind controlled clinical study. Int J Rheum Dis. 2012;15(2):197-206.

3 Tascioglu F, Kuzgun S, Armagan O, et al. Short-term effectiveness of ultrasound therapy in knee osteoarthritis. J Int Med Res. 2010;38(4):1233-42.

4 Loyola-Sanchez A, Richardson J, Beattie KA, et al. Effect of low-intensity pulsed ultrasound on the cartilage repair in people with mild to moderate knee osteoarthritis: a double-blinded, randomized, placebo-controlled pilot study. Arch Phys Med Rehabil. 2012;93(1):35-42.

Appendix Flow charts of the systematic literature studies

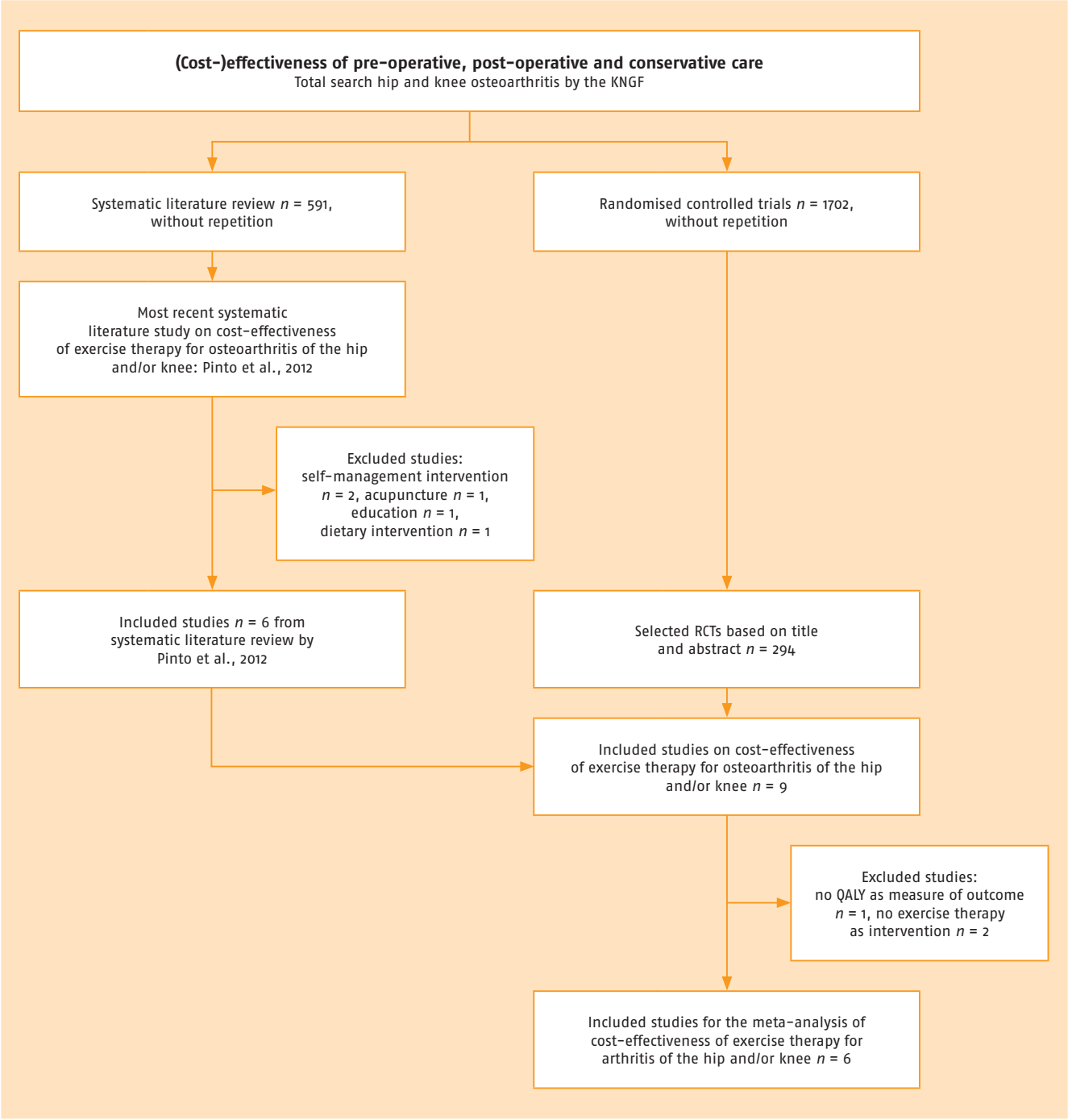
Flow chart 12.1. Systematic literature study into the effectiveness of exercise therapy for osteoarthritis of the hip in the conservative phase.



Literature

- Hermann A, Holsgaard-Larsen A, Zerahn B, et al. Preoperative progressive explosive-type resistance training is feasible and effective in patients with hip osteoarthritis scheduled for total hip arthroplasty - a randomized controlled trial. Osteoarthritis Cartilage. 2016;24(1):91-8.
- de Rooij M, van der Leeden M, Cheung J, et al. Efficacy of tailored exercise therapy on physical functioning in patients with knee osteoarthritis and comorbidity: a randomized controlled trial. Arthritis Care Res (Hoboken). 2017;69(6):807-16.

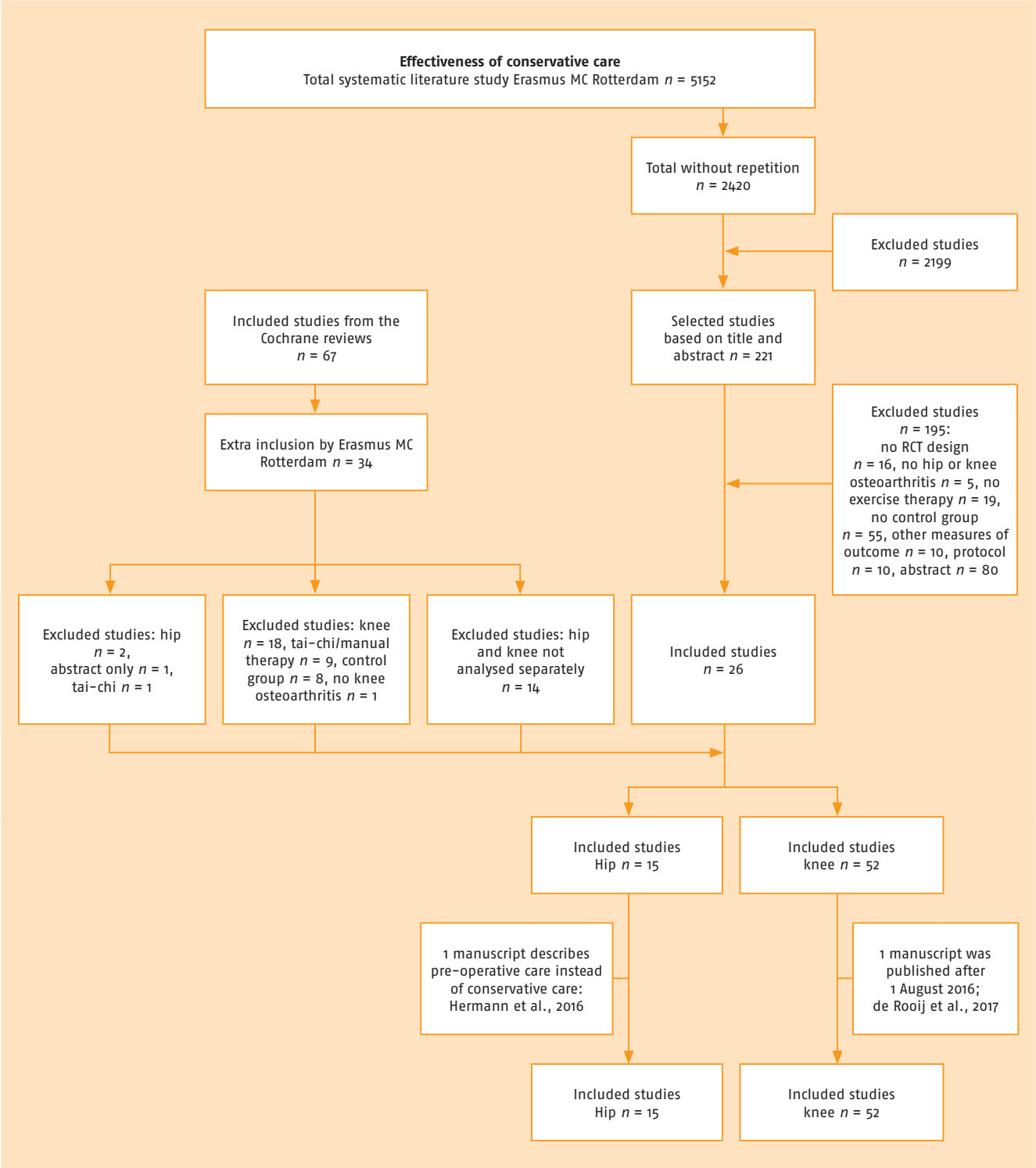
Flow chart 12.2. Systematic literature study into the (cost-)effectiveness of exercise therapy for hip and knee osteoarthritis.



Literature

Pinto D, Robertson MC, Hansen P, et al. Cost-effectiveness of nonpharmacologic, nonsurgical interventions for hip and/or knee osteoarthritis: systematic review. Value Health. 2012;15(1):1-12.

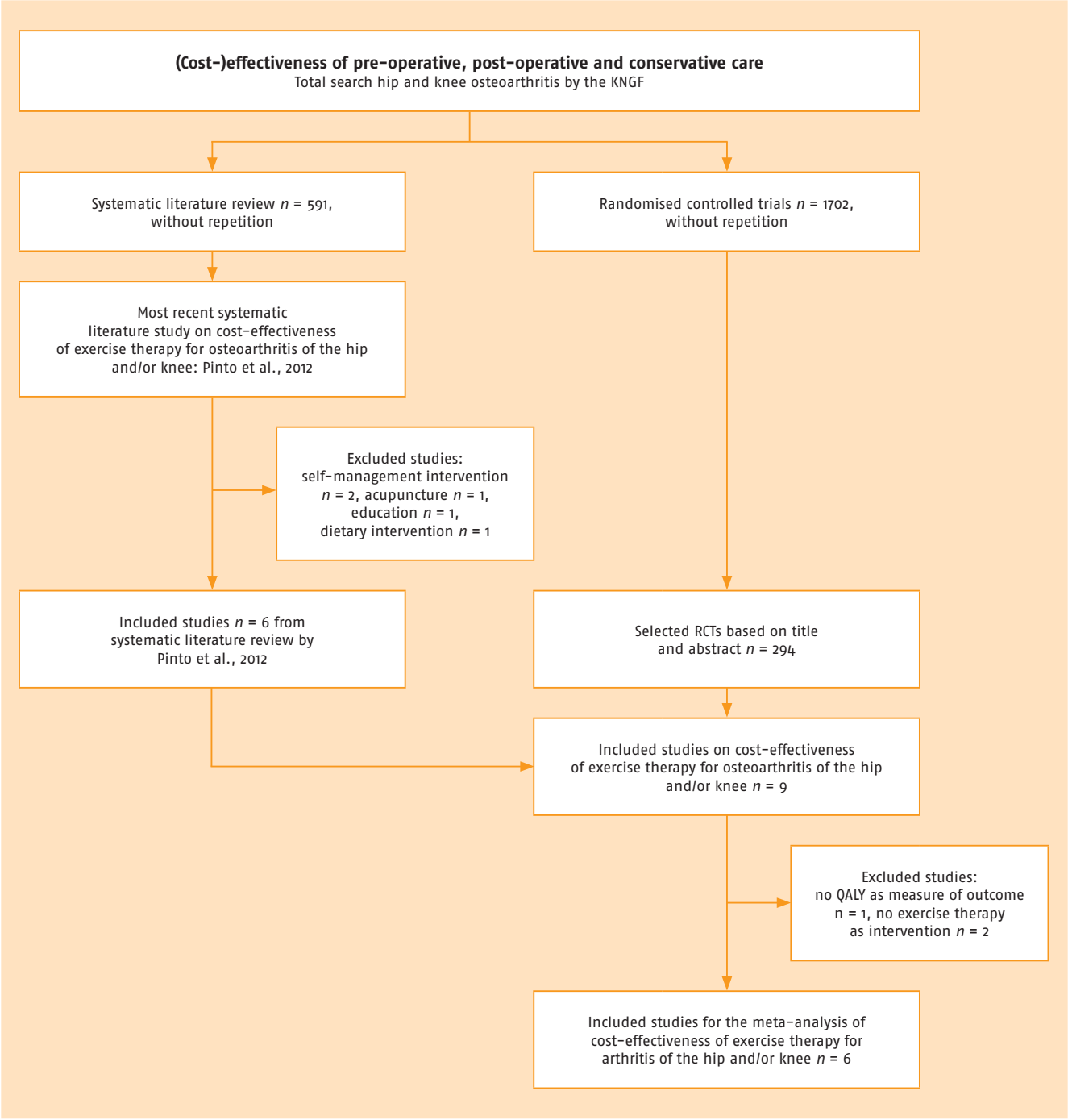
Flow chart 13.1. Systematic literature study into the effectiveness of exercise therapy for knee osteoarthritis.



Literature

- Hermann A, Holsgaard-Larsen A, Zerahn B, et al. Preoperative progressive explosive-type resistance training is feasible and effective in patients with hip osteoarthritis scheduled for total hip arthroplasty - a randomized controlled trial. Osteoarthritis Cartilage. 2016;24(1):91-8.
- de Rooij M, van der Leeden M, Cheung J, et al. Efficacy of tailored exercise therapy on physical functioning in patients with knee osteoarthritis and comorbidity: a randomized controlled trial. Arthritis Care Res (Hoboken). 2017;69(6):807-16.

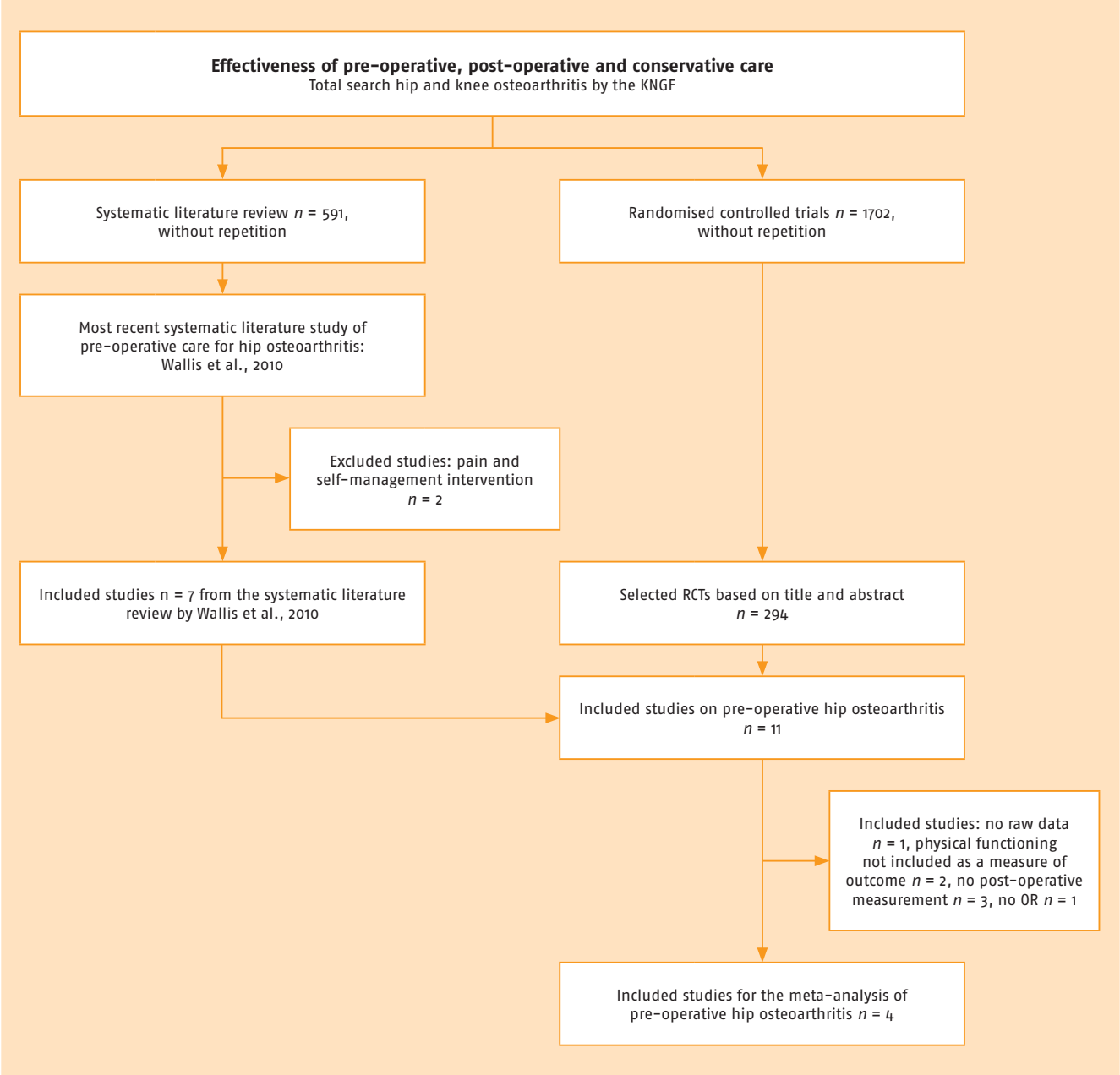
Flow chart 13.2. Systematic literature study into the (cost-)effectiveness of exercise therapy for hip and knee osteoarthritis.



Literature

Pinto D, Robertson MC, Hansen P, et al. Cost-effectiveness of nonpharmacologic, nonsurgical interventions for hip and/or knee osteoarthritis: systematic review. Value Health. 2012;15(1):1-12.

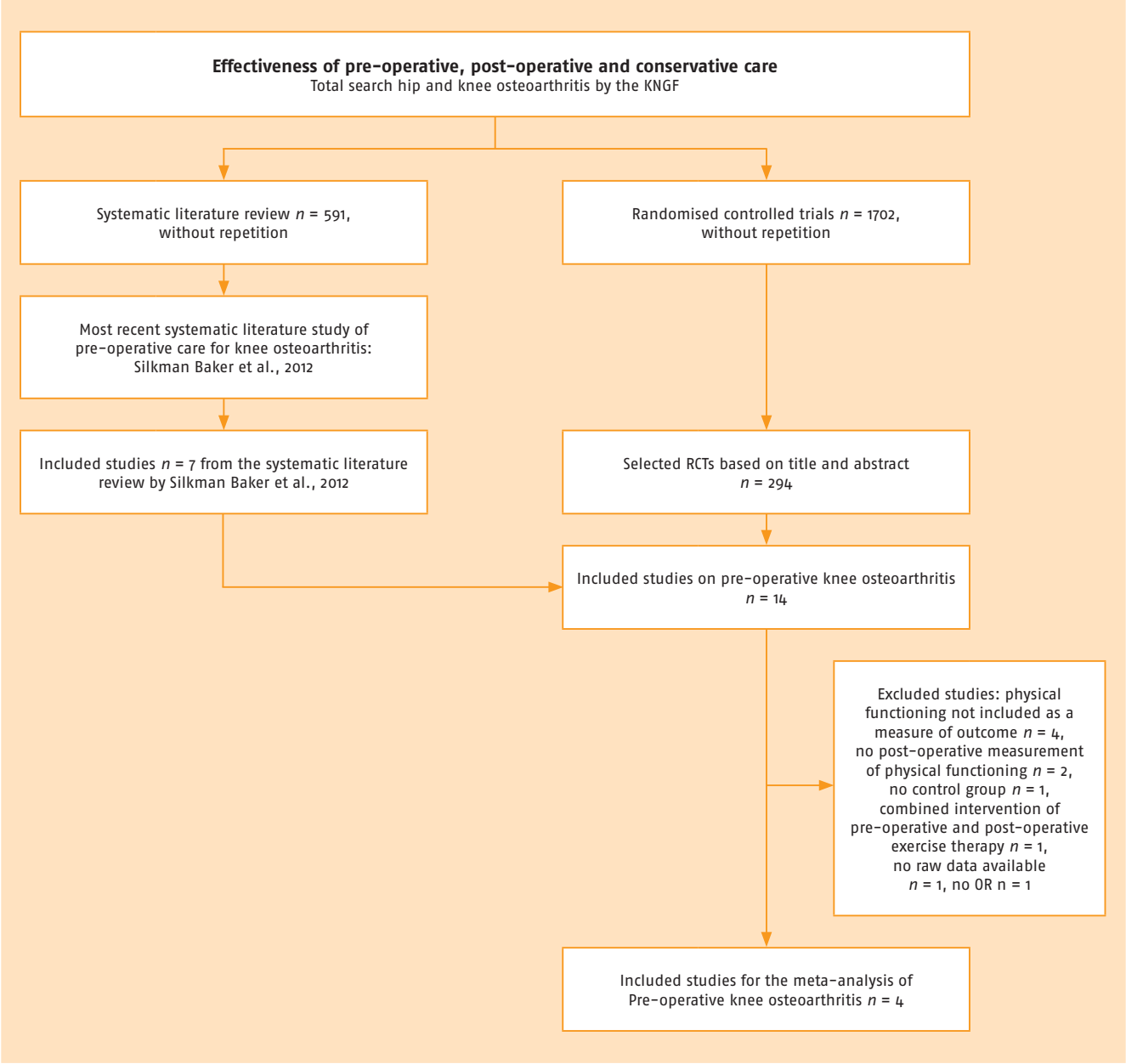
Flow chart 14.1. Systematic literature study into the effectiveness of pre-operative exercise therapy prior to joint replacement for hip osteoarthritis.



Literature

Wallis JA, Taylor NF. Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery - a systematic review and meta-analysis. Osteoarthritis Cartilage. 2011 Dec;19(12):1381-95.

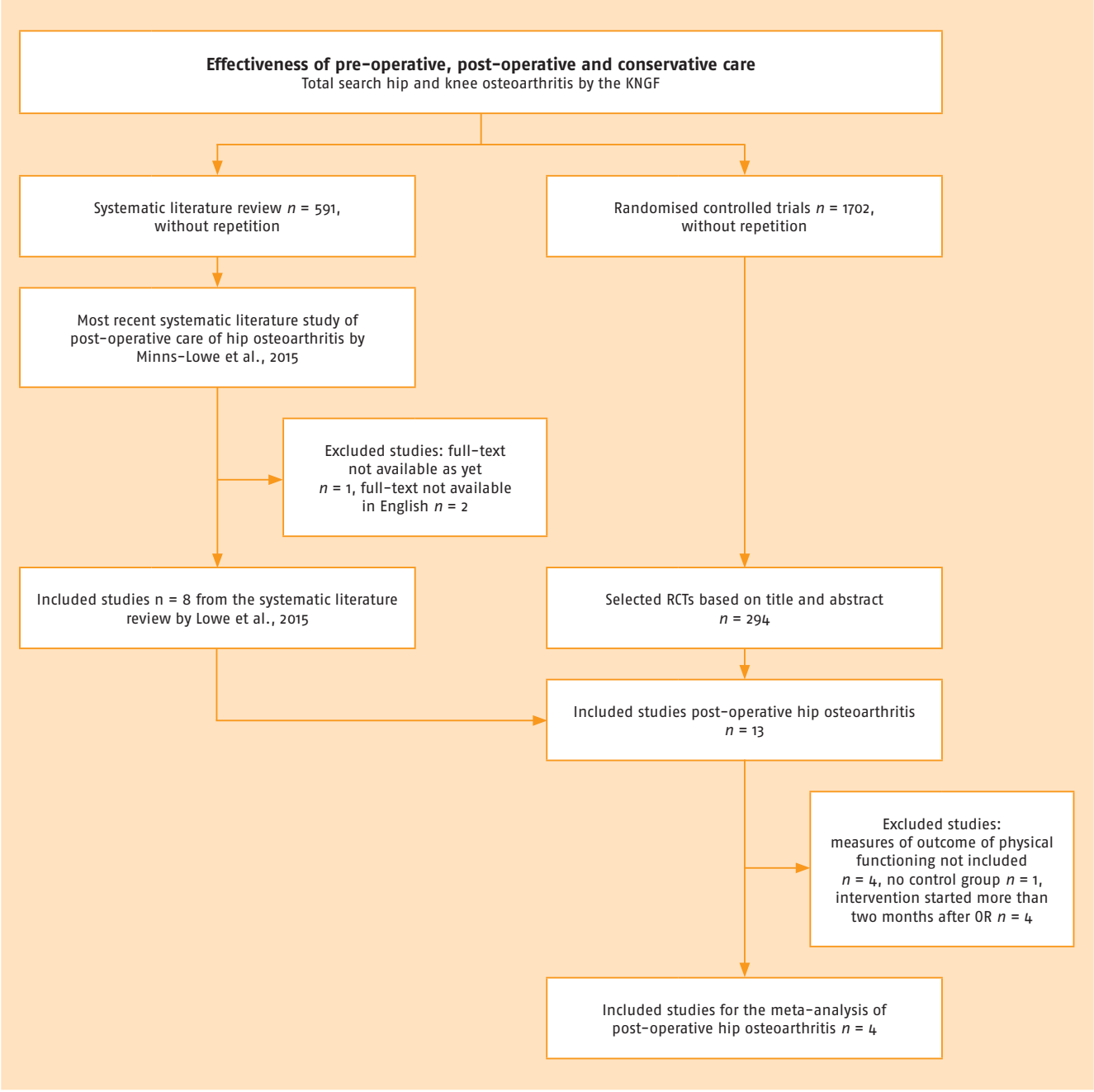
Flow chart 15.1. Systematic literature study into the effectiveness of pre-operative exercise therapy prior to joint replacement for knee osteoarthritis.



Literature

Silkman Baker C, McKeon JM. Does preoperative rehabilitation improve patient-based outcomes in persons who have undergone total knee arthroplasty? A systematic review. PM R. 2012 Oct;4(10):756-67.

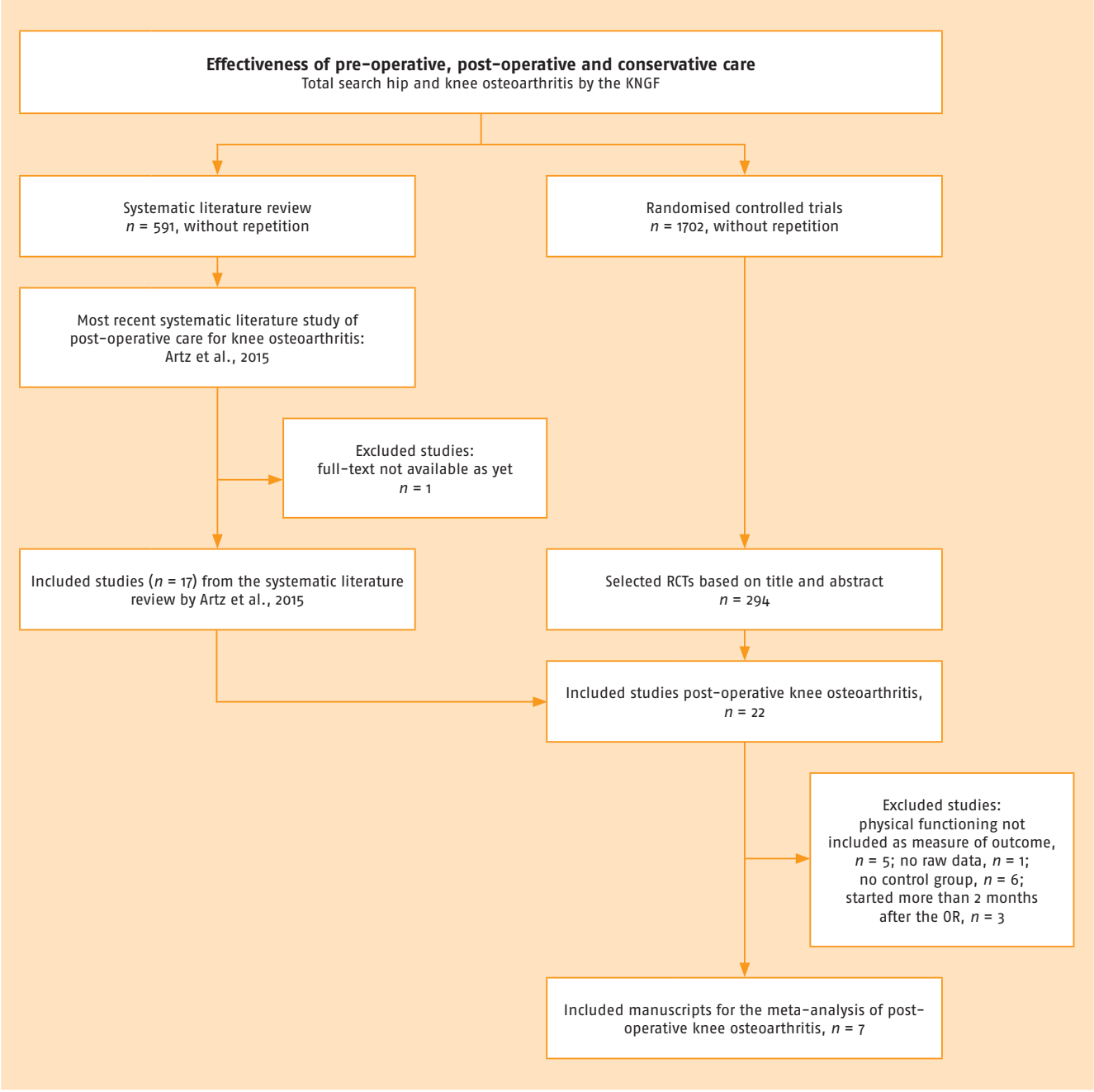
Flow chart 16.1. Systematic literature study into the effectiveness of post-operative exercise therapy after joint replacement for hip osteoarthritis.



Literature

Lowe CJ, Davies L, Sackley CM, Barker KL. Effectiveness of land-based physiotherapy exercise following hospital discharge following hip arthroplasty for osteo-arthritis: an updated systematic review. Physiotherapy. 2015 Sep;101(3):252-65.

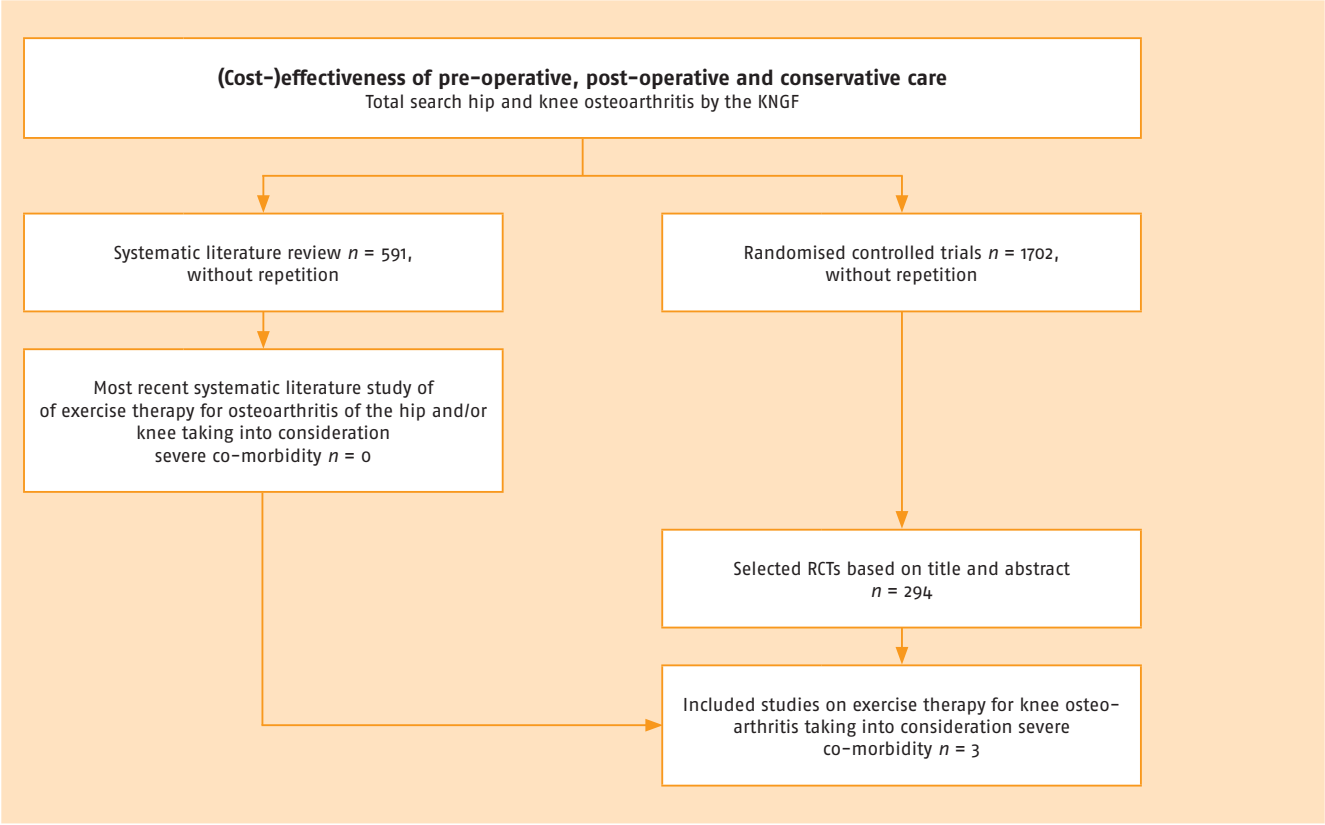
Flow chart 17.1. Systematic literature study into the effectiveness of post-operative exercise therapy after joint replacement for knee osteoarthritis.



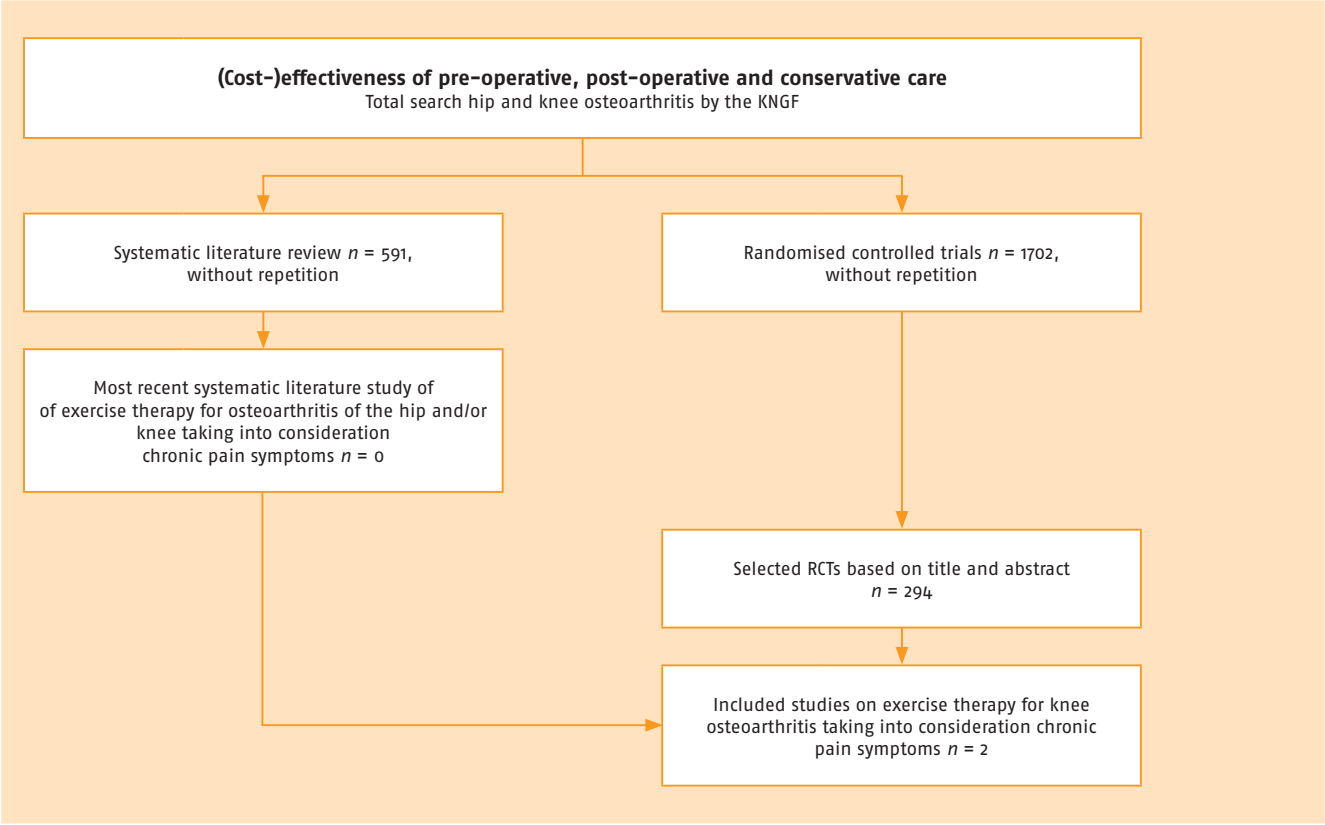
Literature

Artz N, Elvers KT, Lowe CM, et al. Effectiveness of physiotherapy exercise following total knee replacement: systematic review and meta-analysis. BMC Musculoskelet. Disord. 2015 Feb 7;16:15.

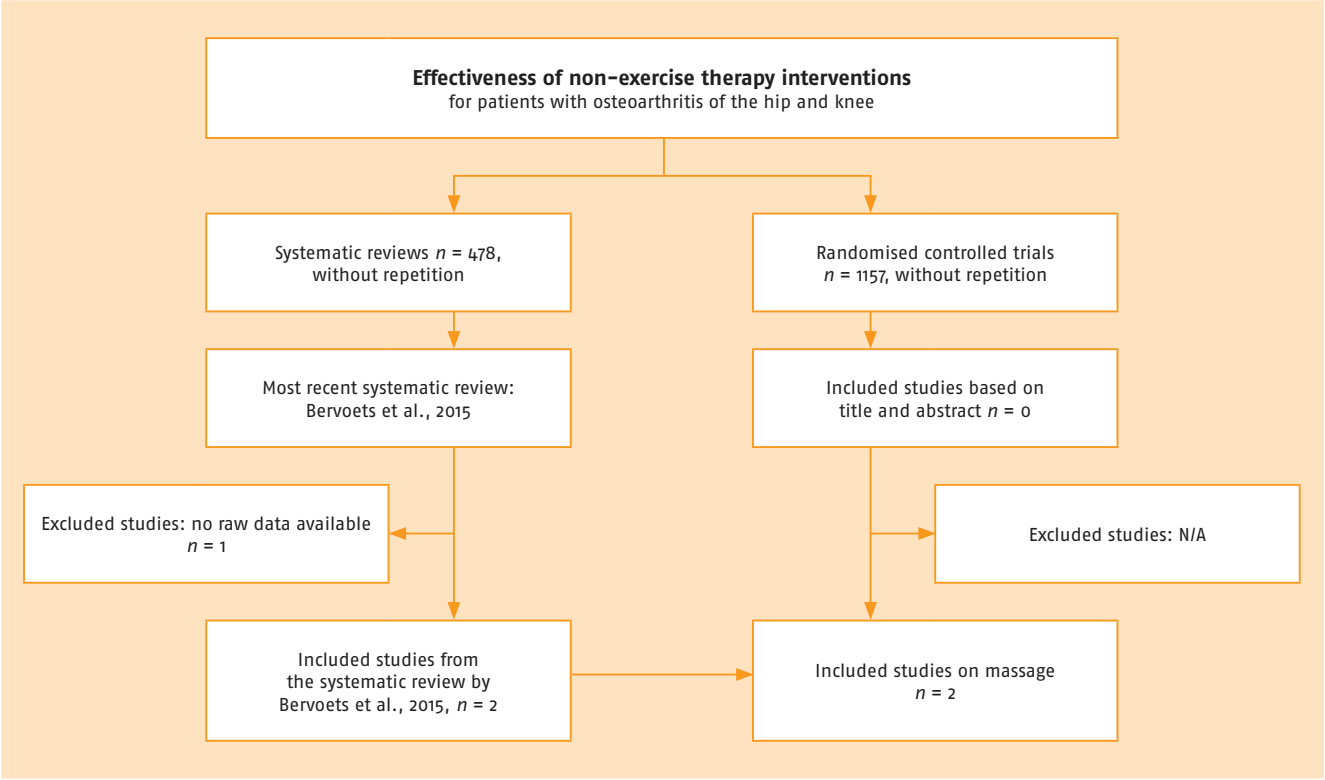
Flow chart 19.1. Systematic literature study into the effectiveness of modifications to exercise therapy due to co-morbidity.



Flow chart 20.1. Systematic literature study into the effectiveness of modifications to exercise therapy due to inadequate pain coping.



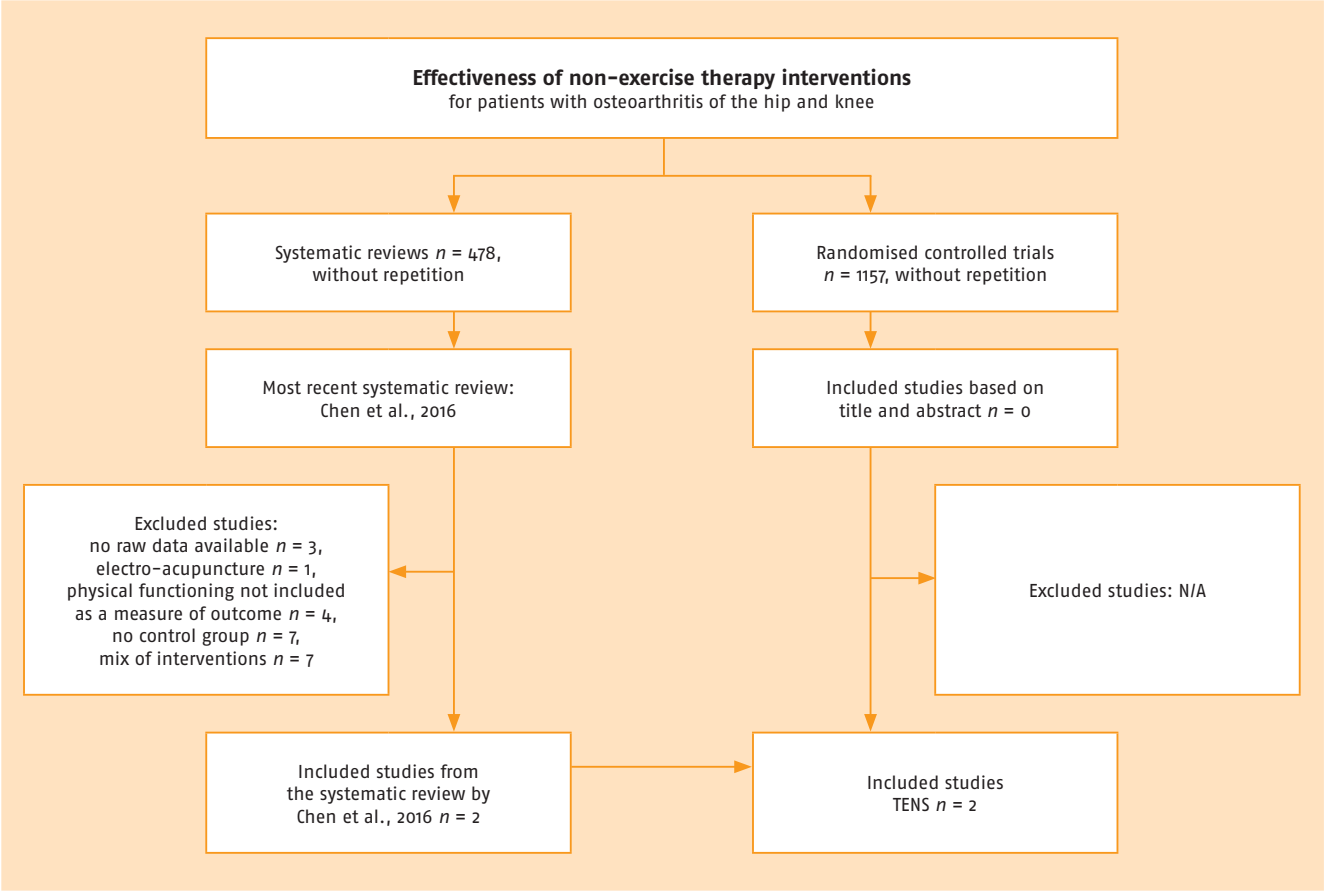
Flow chart 22.1. Systematic literature study into the effectiveness of massage.



Literature

Bervoets DC, Luijsterburg PA, Alessie JJ, et al. Massage therapy has short-term benefits for people with common musculoskeletal disorders compared to no treatment: a systematic review. J Physiother. 2015;61(3):106-16.

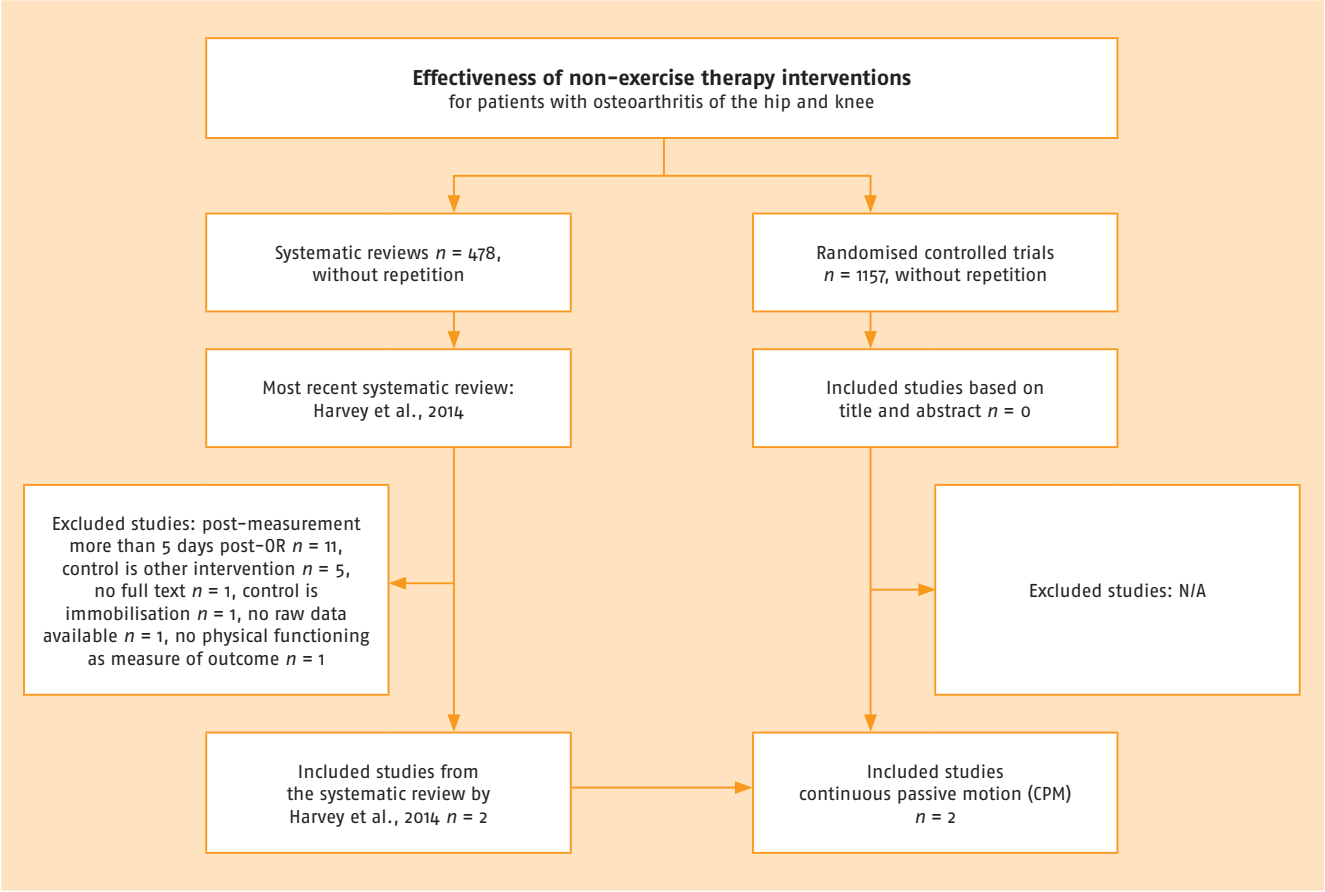
Flow chart 23.1. Systematic literature study into the effectiveness of TENS.



Literature

Chen LX, Zhou ZR, Li YL, et al. Transcutaneous electrical nerve stimulation in patients with knee osteoarthritis: evidence rom randomized-controlled trials. Clin J Pain. 2016;32(2):146-54.

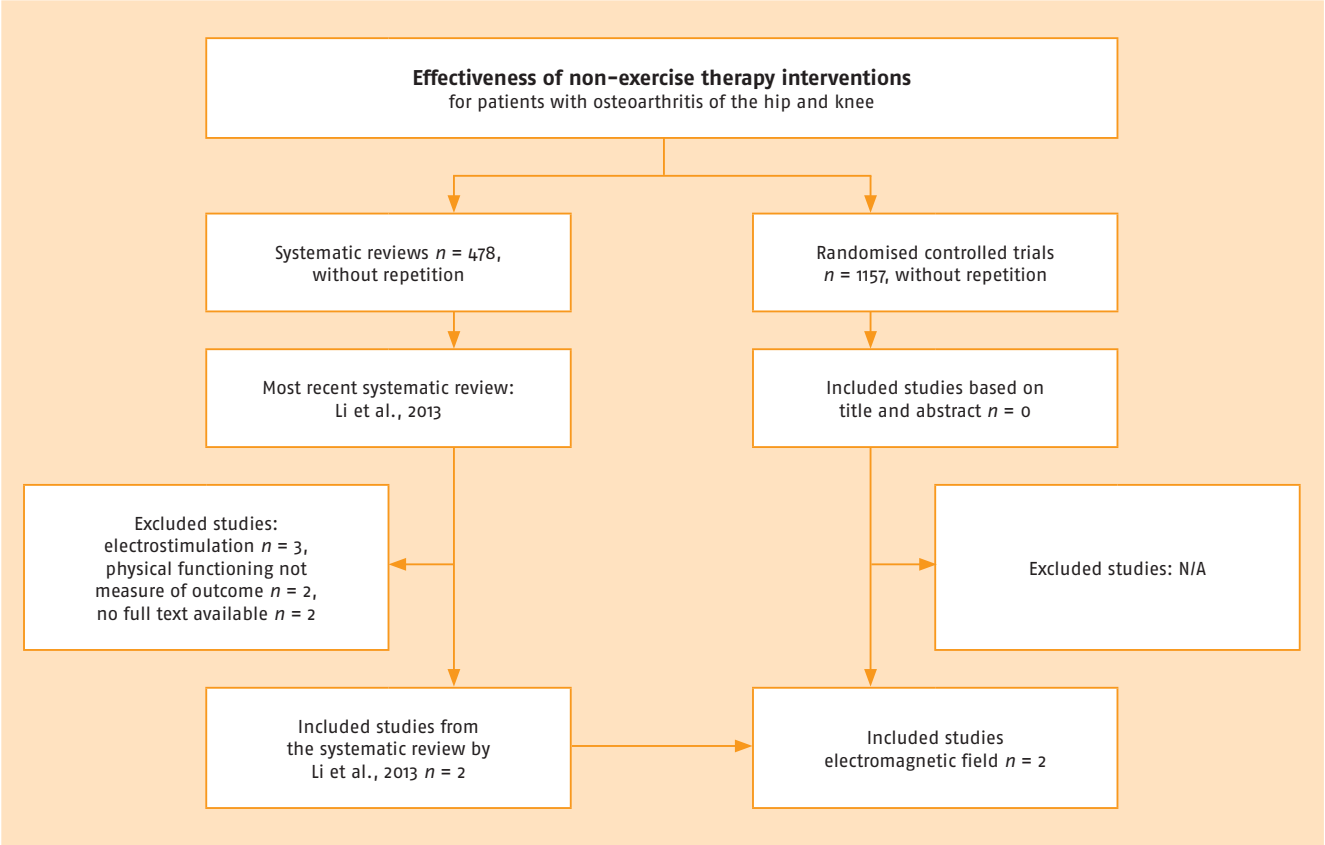
Flow chart 24.1. Systematic literature study into the effectiveness of continuous passive motion.



Literature

Harvey LA, Brosseau L, Herbert RD. Continuous passive motion following total knee arthroplasty in people with osteoarthritis. Cochrane Database Syst Rev. 2014;(2):CD004260.

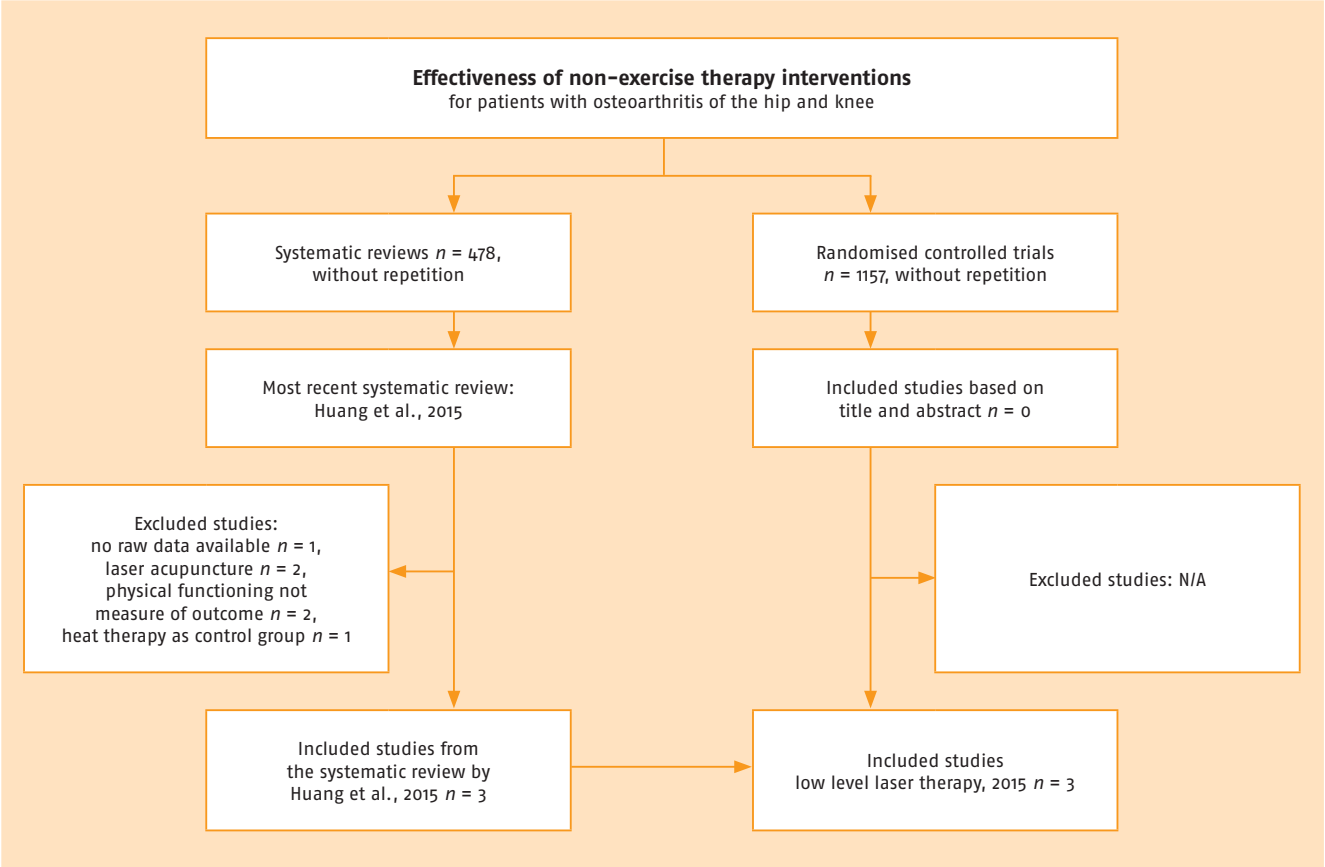
Flow chart 25.1. Systematic literature study into the effectiveness of an electromagnetic field.



Literature

Li S. Yu B, Zhou D, et al. Electromagnetic fields for treating osteoarthritis. Cochrane Database of Systematic Reviews. 2013;(12).

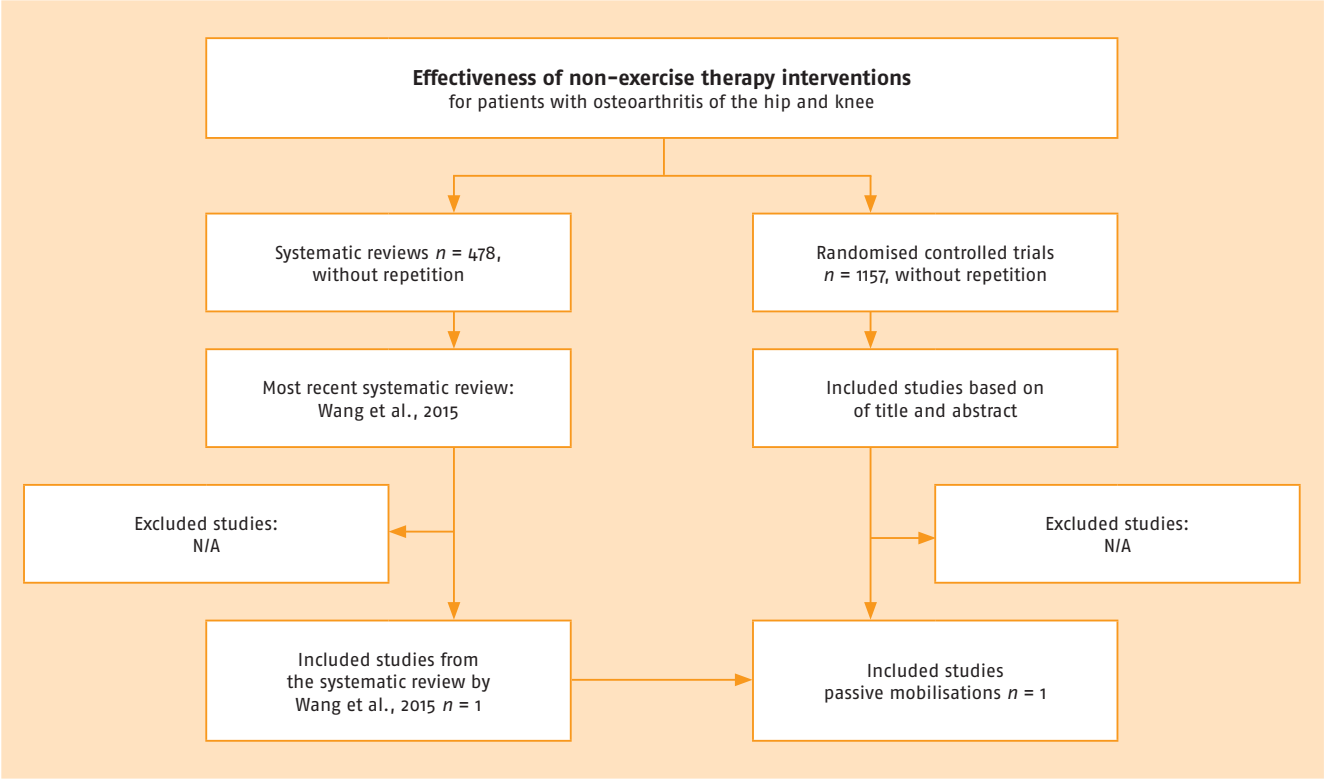
Flow chart 26.1. Systematic literature study into the effectiveness of low level laser therapy.



Literature

Huang Z, Chen J, Ma J, et al. Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis. Osteoarthritis Cartilage. 2015;23(9):1437-44.

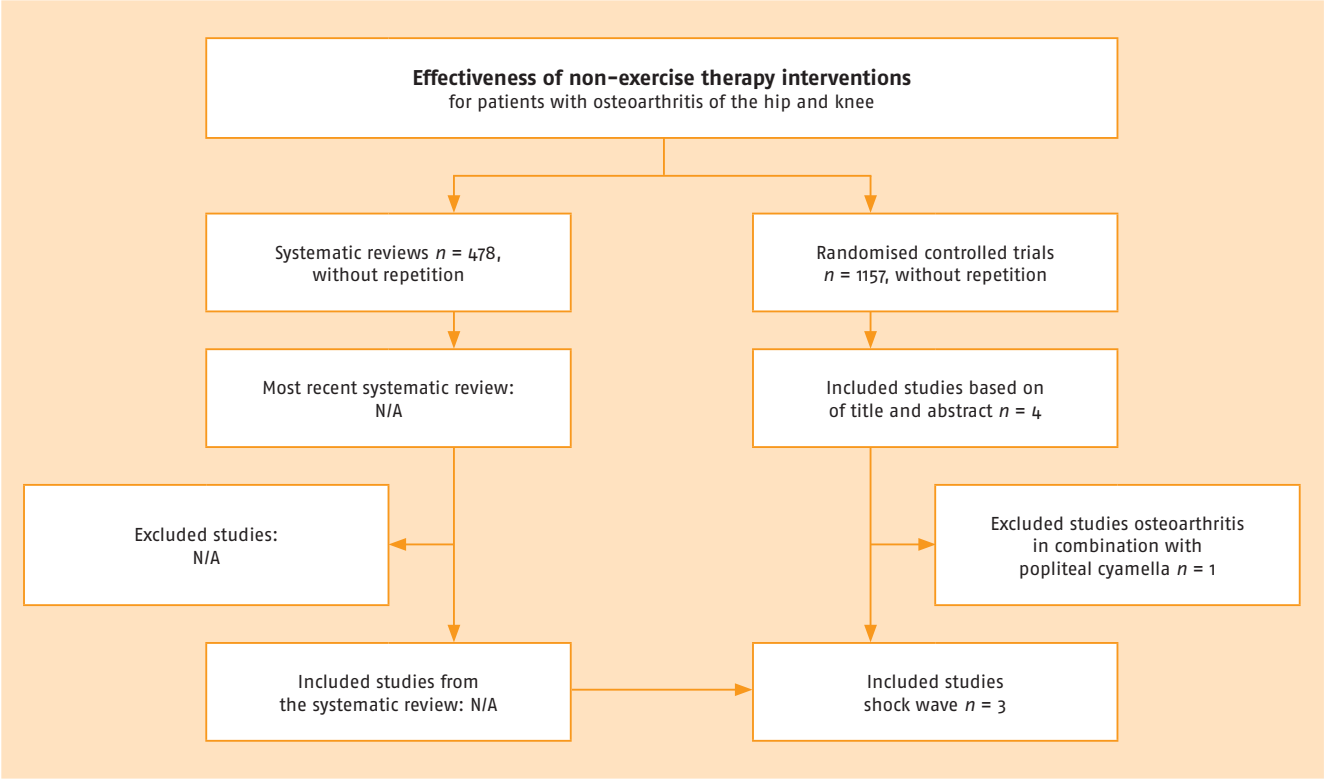
Flow chart 27.1. Systematic literature study into the effectiveness of passive mobilisations.



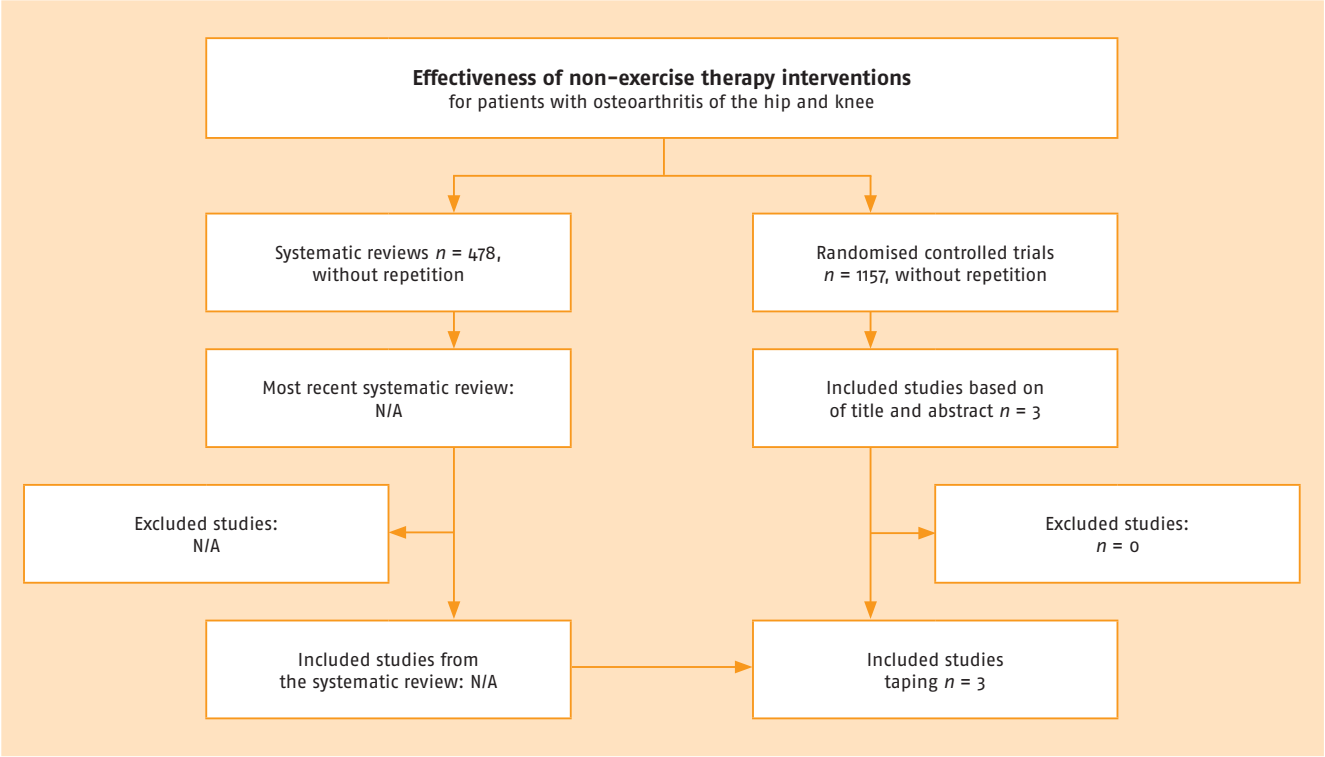
Literature

Wang Q, Wang TT, Qi XF, et al. Manual therapy for hip osteoarthritis: a systematic review and metaanalysis. Pain Physician. 2015;18(6):E1005-20.

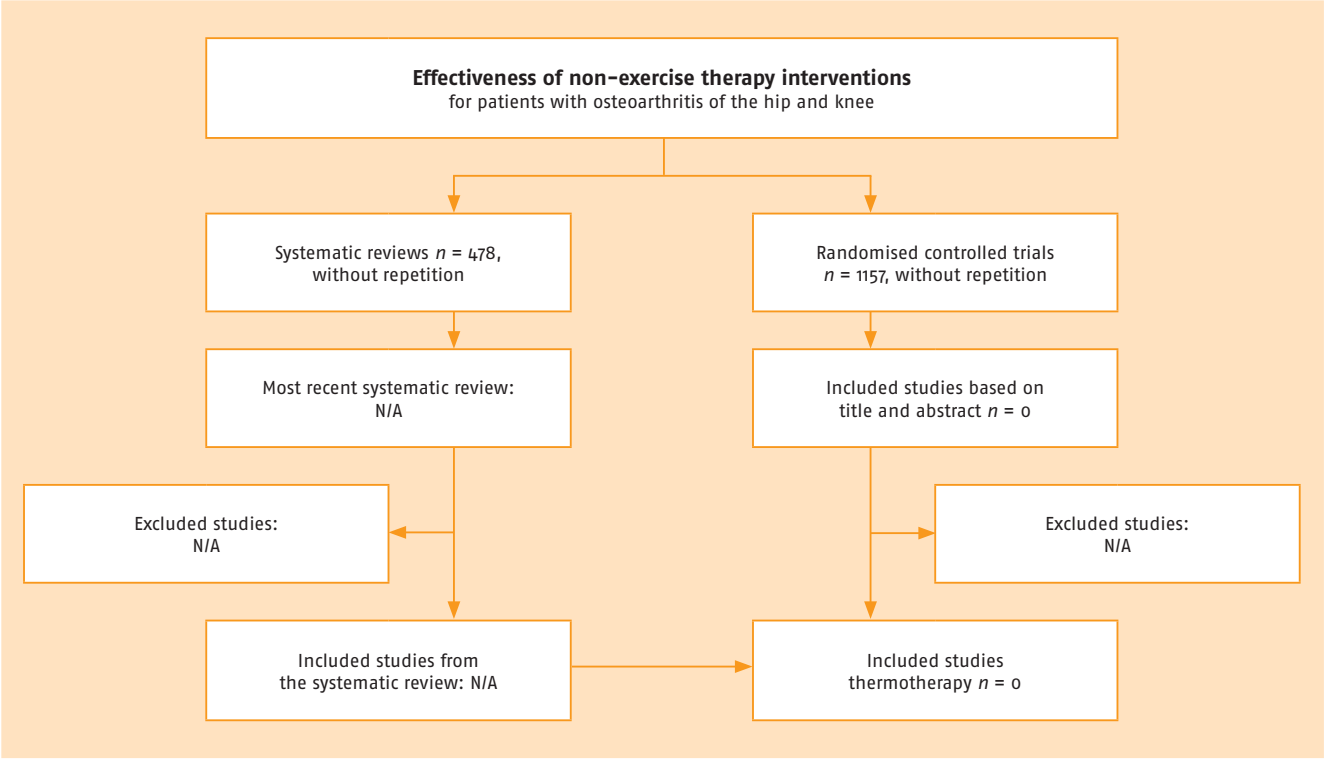
Flow chart 28.1. Systematic literature study into the effectiveness of shock wave.



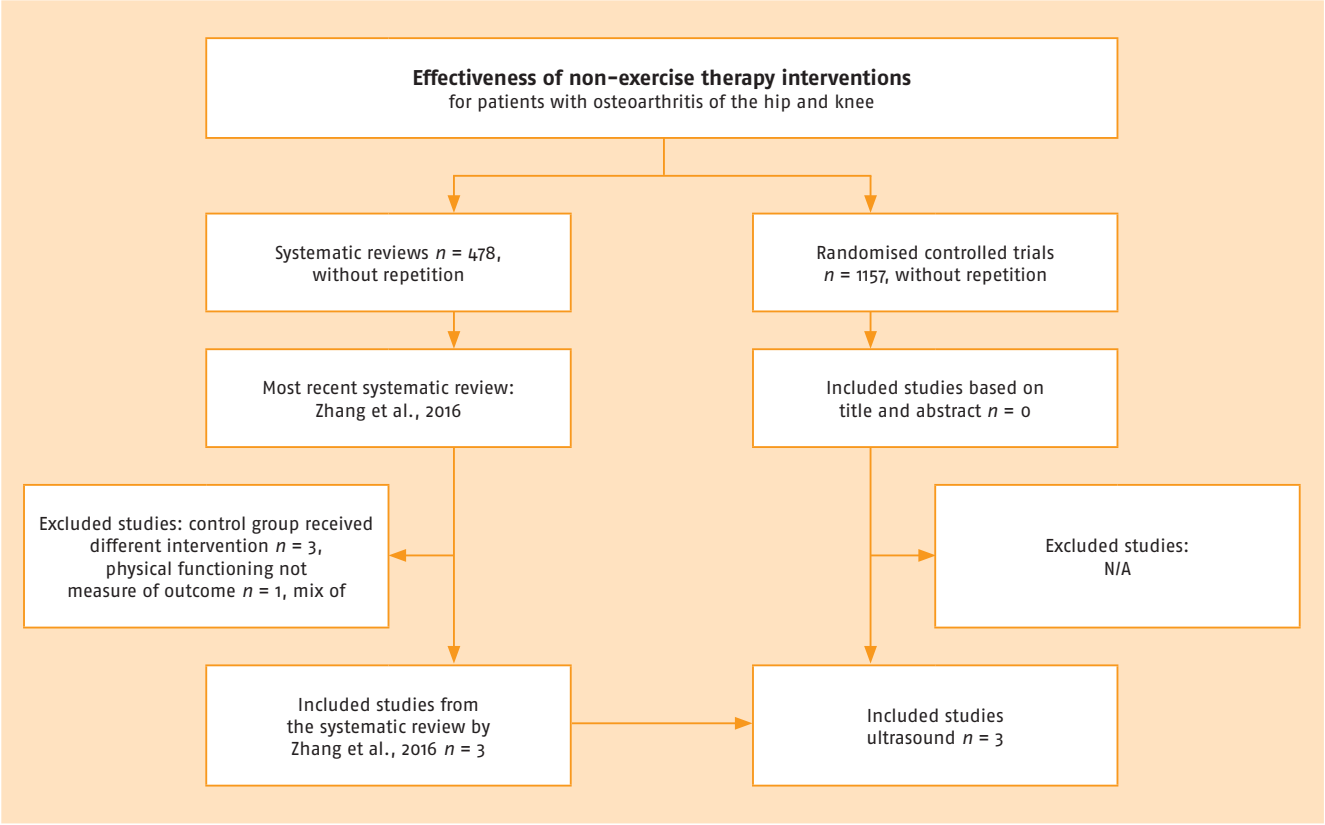
Flow chart 29.1. Systematic literature study into the effectiveness of taping.



Flow chart 30.1. Systematic literature study into the effectiveness of thermotherapy.



Flow chart 31.1. Systematic literature study into the effectiveness of ultrasound.



Literature

Zhang C, Shi J, Zhu C, et al. Effect of ultrasound therapy for knee osteoarthritis: a meta-analysis of randomized, double-blind, placebo-controlled clinical trials. Int J Clin Exp Med, 2016;9(11):20552-61.

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